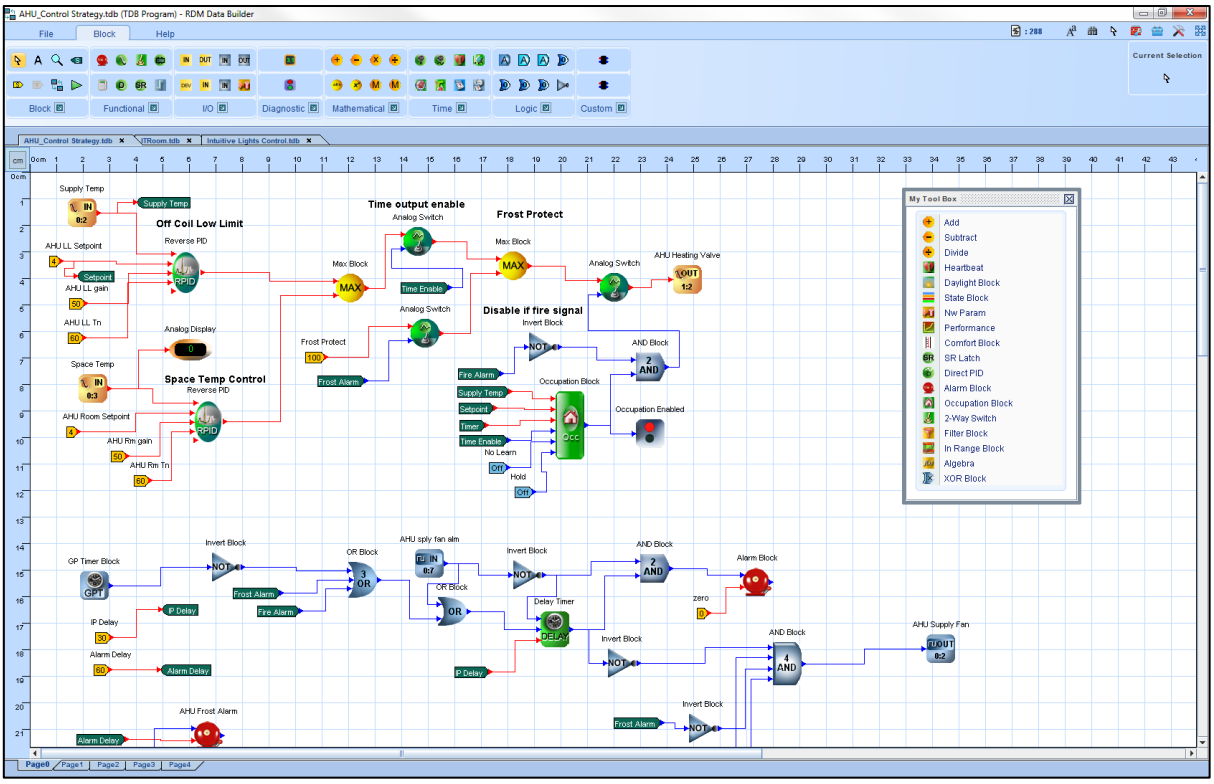
Resource
Data Management

The Data Builder (TDB) Desktop Editor

Commissioning/User Guide
Revision 2.5.1



TDB Desktop Editor

Contents

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The Data Builder Desktop Editor 2

From Resource Data Management

The Data Builder is a user-friendly programming tool used for designing bespoke applications to run on multiple hardware platforms produced by Resource Data Management. The Data Builder has a comprehensive library of functional blocks giving the ability to design virtual devices and control algorithms for any conceivable application. The control strategy can be as simple or as sophisticated as the application requires.

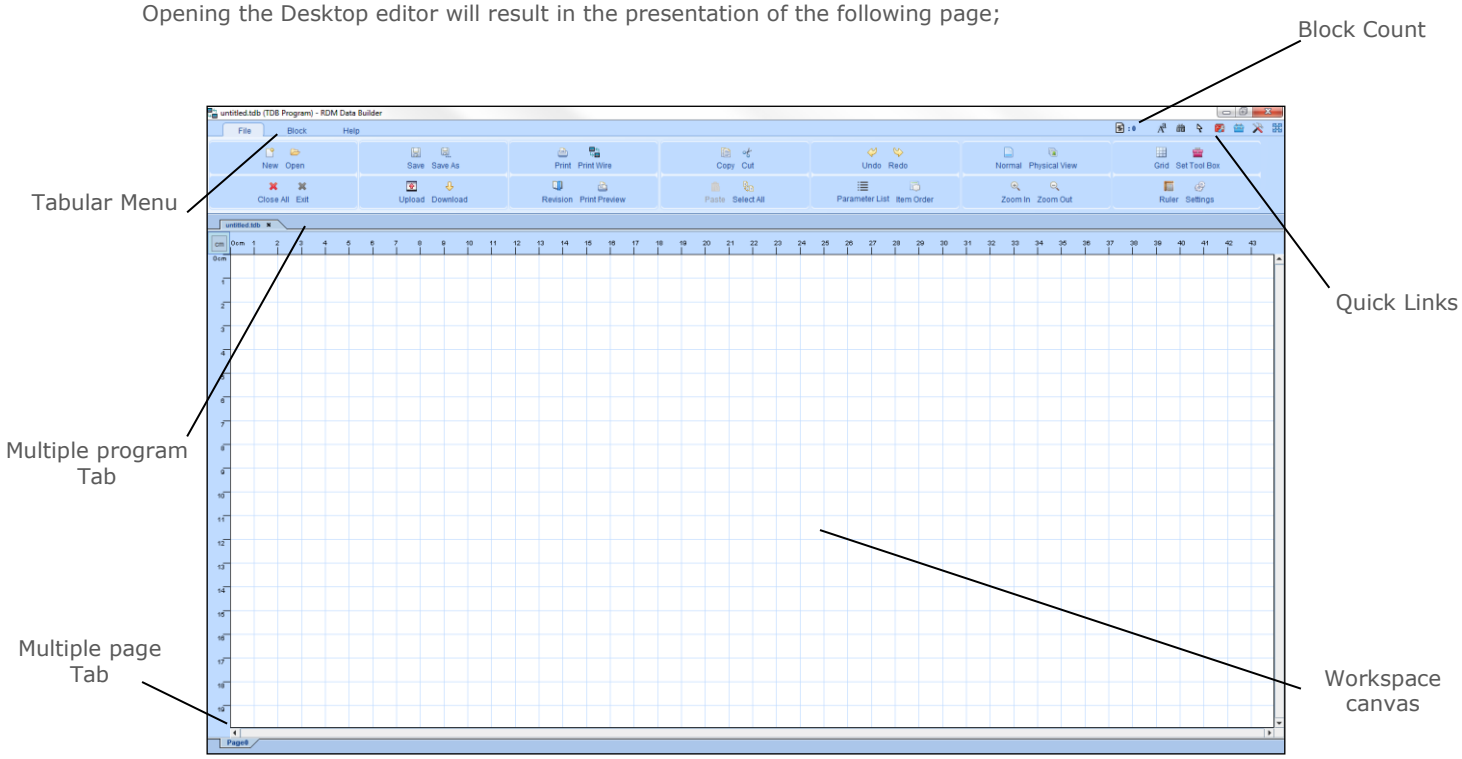
The PLC application can be created for a number of RDM TDB products including the Data Manager, Intuitive Plant and Intuitive Mercury platforms and therefore utilises all the devices IO's. The devices can additionally have expansion boards and daughter cards further expanding the potential for the application (please see the individual product for information) all of which are accessible from the TDB program.

The TDB Desktop Editor can therefore be set to whichever device platform (with optional expansions etc.) providing the user control over all IO and control blocks to create their application.

Furthermore, the TDB desktop editor allows the user to design and simulate TDB programs for free, download the latest version of Editor from the Software Download section on the RDM web site www.resourcedm.com.

Getting Started

Opening the Desktop editor will result in the presentation of the following page;

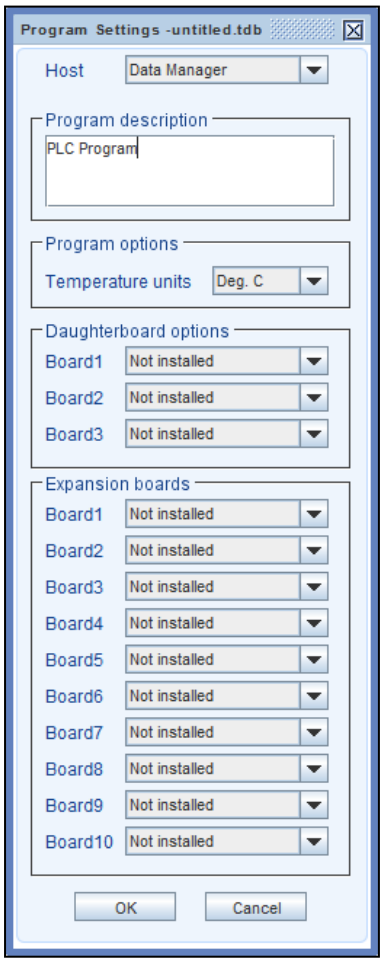


The editor automatically opens an 'untitled' blank canvas and is ready to interact with. Before beginning any project, you must select the platform you are wishing to upload the program to. Therefore, click on the 'Settings' button (located within the File tabular menu). Else 'right clicking anywhere on the canvas and click 'Settings'. Both operations will result in the Settings menu be shown;

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

Program Settings Menu

From the program settings menu the user **must** define the hardware that the PLC application they are designing will be placed in.



Host: The Host is the specific hardware platform the PLC application will be used with.

Program Description: Enter a suitable description for the TDB program being created.

Temperature Units: Select between Degrees Celsius or Fahrenheit operation from the drop-down list. This will affect all temperature related IO blocks.

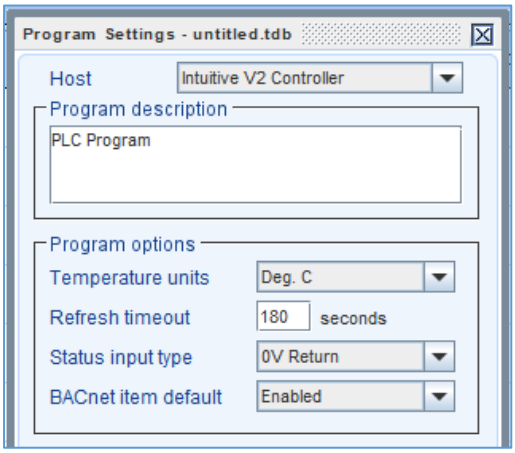
Refresh Timeout: Enter a time in seconds. This is used with certain TDB blocks such as Network Inputs. **Note**: this option will only be visible with Plant and Intuitive Plant Hosts.

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**: this option will only be visible with Plant and Intuitive Plant Hosts.

Daughterboard Options/ Expansion Boards: Depending on the Host chosen these options may or may not be visible. These are simply the listings of all available IO that the chosen Host may be ordered with.

Once the basic Program settings have been confirmed, click 'ok' to apply. The saving of the Program Settings will additionally dictate the available blocks for the user to use. The PLC application is now ready to be created.

Note: Always set the 'Host' type before creating a new PLC application. As the host automatically provides restrictions on the number of available IO.



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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**: this option will only be visible with Plant and Intuitive Plant Hosts.

BACnet Item Default: Allows you to specify if the feature is enabled or disabled by default

The maximum number of blocks permitted in a Data Manager TDB is 4096, Intuitive Mercy TDB is 2048 and the Intuitive TDB, Mini Intuitive TDB and Touch XL TDB are 10,000.

BACnet Object ID / Names

From Intuitive TDB version 4.3 the user can now assign a BACnet Object ID and BACnet Object Name to a block. This is so that the controller can be configured to communicate with 3rd party equipment that require items, like Inputs and Outputs, to have a pre-defined BACnet Object ID and BACnet Object Name. The list of compatible points is Inputs, Outputs, Parameters, Alarms and Control States. The user can also select if they want a given object to be included in the BACnet list by using the BACnet enable tick box found in a blocks properties.

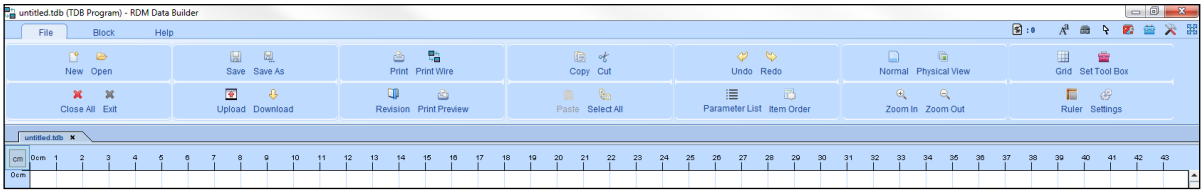
Note: The BACnet Object Name must be kept to a maximum of 16 characters

Note: Using this feature in a controller with software that is pre 4.3 will result in the editor displaying different BACnet IDs than that which will appear on the BACnet network. This is due to the software in the controller not being able to recognise the BACnet IDs and Names set within the editor.

TDB Editor Interface

File Menu

Within the File menu there are multiple tools available to the user, each one with its feature is outlined below;



New

Opens a new, blank TDB canvas with all program settings back to default. The new program will open in a new tab located across the top of the canvas. Multiple tabs/ programs can be edited within the editor simultaneously.

Open

Allows the user to open a program that has been created previously. Similar to above, the program will be opened in a new tab.

Close All

Option allows, with one click, to close all opened programs and reverts the editor to a blank canvas. If any unsaved changes have been made to any program it will prompt the user to save.

Exit

Exits the Editor. Again, prompting the user to save any unsaved changes before doing so.

Save / Save As

Any changes made to a program will be saved. If the program has never been saved it will prompt the user with a 'Save As' box. Additionally, the option of adding a read and or write password will be offered. The 'Save As' option provides the option to save the current program in a location of the user's choice where the name of the file is also stipulated. Additionally, the option of adding a read and or write password will be offered.
Note: The password limit is 16 characters. If a password created is longer, it will be truncated to 16.

Upload / Download

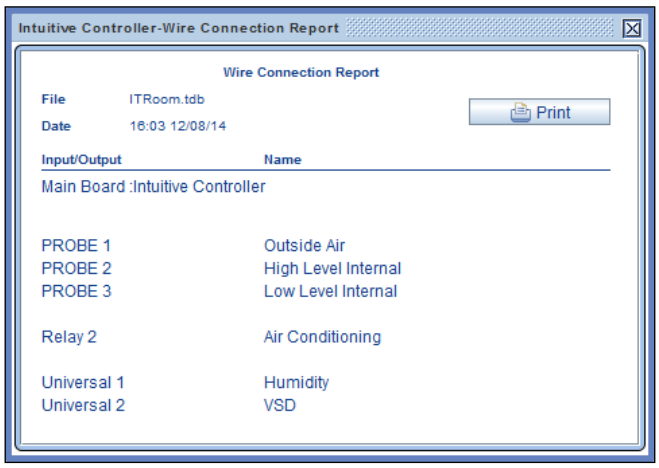
These two options apply only when programming the application for an Intuitive Mercury TDB device. Once any program has been created and saved for the Mercury range platform it can be 'uploaded' to the controller by inserting the IP address of the controller here. The PC/ laptop running the editor must be able to communicate to the device that's on the IP address. Similarly, a program can be 'downloaded' from a Mercury range platform by clicking on the download option. **Note:** A new untitled canvas opens with the downloaded program.

Print / Print Preview

Clicking the Print button will immediately open the Printer settings box for the user to confirm and proceed to printing the entire open program. Print preview will permit the user to view the proposed file, page by page before confirming or cancelling the print request.

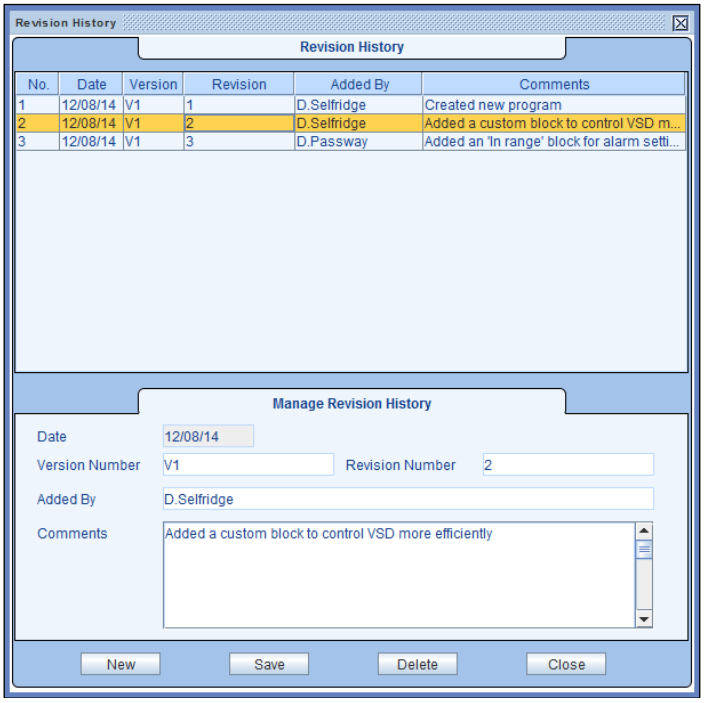
Print Wire

This feature provides the user with a succinct listing of the physical inputs / outputs and their associated hardwired positions on the selected platform the program will be used on. Below shows an example;



Revision

This feature is an optional method for keeping track of amendments and updates to the program created. The Revision History will be saved alongside the program itself and can be added to and edited accordingly.



Cut / Copy / Paste / Select All

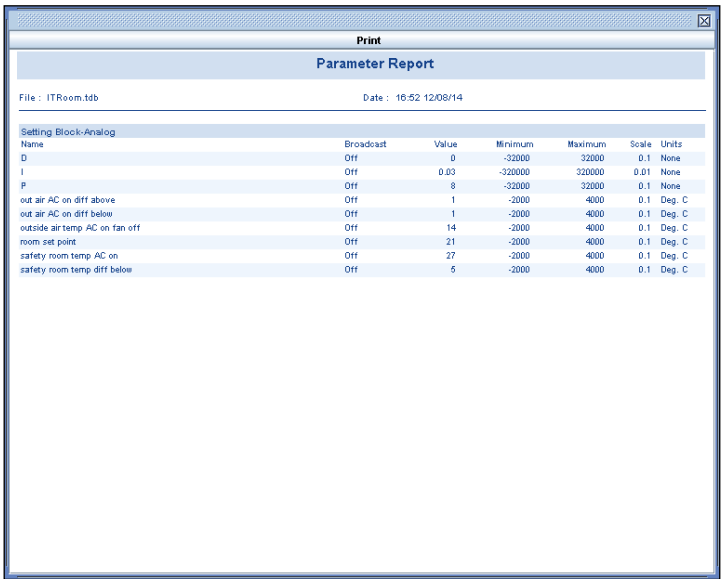
Tools used to edit a program. Areas of the program can be highlighted, by clicking and dragging over single or multiple blocks and subsequently cut, copied, or pasted. **Note:** when copying Inputs and Outputs the program will increment the physical IO location until there is no more IO space available on the hardware platform. A warning will advise the user when no available IO slots are available.

Undo / Redo

Quick editing functions to reverse any placement of block, movement, paste etc. with one click. Redo will simply carry out the same action before 'Undo' was clicked.

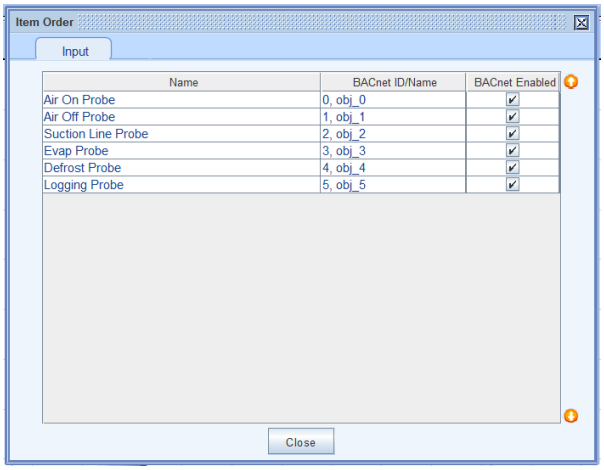
Parameter List

This function offers a quick view of all parameters with associated properties that will appear in the device's setting page. If the setting block has been set as 'internal' then it will not show in this list (see setting block properties in following section for details). An example is below;



Item Order

When the PLC application is viewed on the device it is intended it will list all designated Inputs, Outputs, parameters, states etc. This feature allows the user to order these 'items' in the specific application. Using the simple tabs and 'Up' 'Down' arrows the order can be easily changed. The user can also turn on and off an items BACnet status. Holding down Ctrl + Left click of the mouse will toggle all items on and off.



Zoom In / Zoom Out / Normal

Provides the option to zoom out to view the canvas providing a smaller scale. Similarly use the zoom in to lessen the scale with 'normal' to reset all zoom levels back to the default setting.

Physical View

This feature provides the user with a simplified wiring diagram of the hardware the PLC application is designed for. Ensure the program is saved before using this feature, if not you will be prompted to do so. **Note**: For specific wiring details please see product documentation.

Grid / Ruler

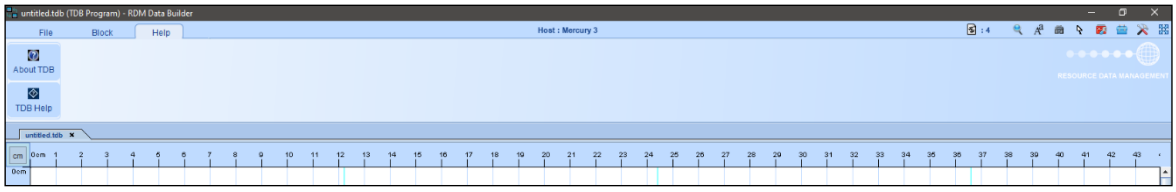
The 'grid' button is used to toggle the visibility of a grid on the working canvas. Depending on the user's needs the grid may assist aligning the blocks within the program. The 'ruler' button will toggle the visibility of the guiding ruler located along the top and left of the canvas. Also, located on the top left hand corner of the canvas there is the added functionality to toggle between sizes of the ruler/ grid spacing. It can be set to either 'cm' and 'in'.

Settings

Clicking on the 'settings' button will open up the same window to define the properties of the PLC application as was outlined in the previous section; Program Settings Menu.

Help Menu

The Help menu will provide some basic assistance and information on the Editor.



About TDB

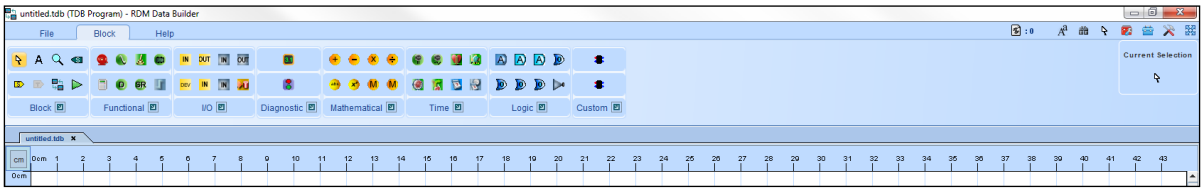
General information including the software version, release date and Resource Data Management contact details.

TDB Help

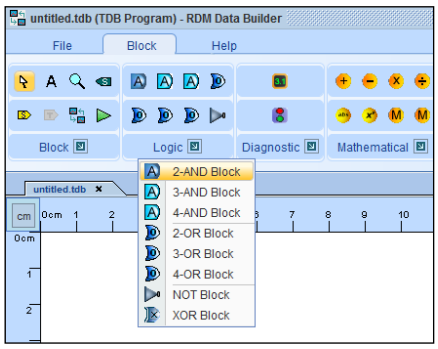
Quick link to a User Document offering help with using the TDB Editor. **Note:** The User guide can also be accessed online.

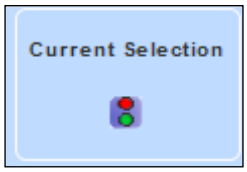
Block Menu

The Block menu is for use while implementing the design of the PLC application. The Blocks are categorised into separate types grouping them conveniently for ease of locating them.



The categories of the blocks fall under; Block, Functional, I/O, Diagnostic, Mathematical, Time, Logic and Custom. They are displayed and accessible firstly through the visible icons as depicted above. They can be selected as required. Else, from the same menu there is an 'expand' arrow to present a drop down menu listing all available blocks in that category.





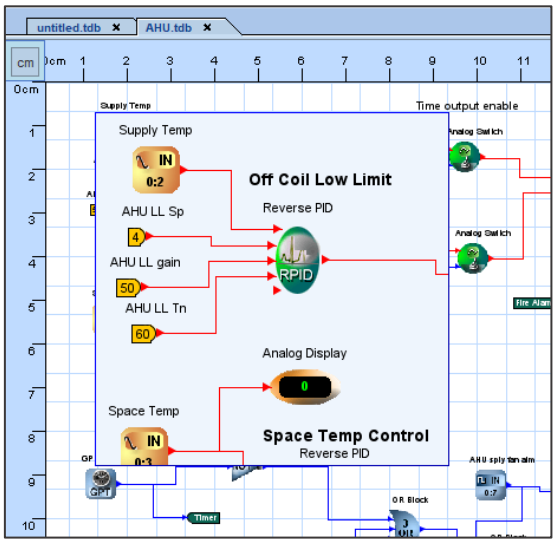
Once the desired block has been selected, at the top right of the editor there is a box to confirm which block the user is currently using. This will change as and when new blocks are selected. For a detailed description of all blocks and their usage, please see the Toolbox Items section.

Quick Tools

Located at the top right of the editor the 'Quick Tools' menu is visible, offering the user the option of which tool boxes they wish to use along with find/ replace feature. Also in this section the 'block count' will be displayed.

Magnifying Window

User in conjunction with the 'Zooming' function within the Block menu, while 'zoomed out' from the canvas, this tool can be used as a magnifying window.

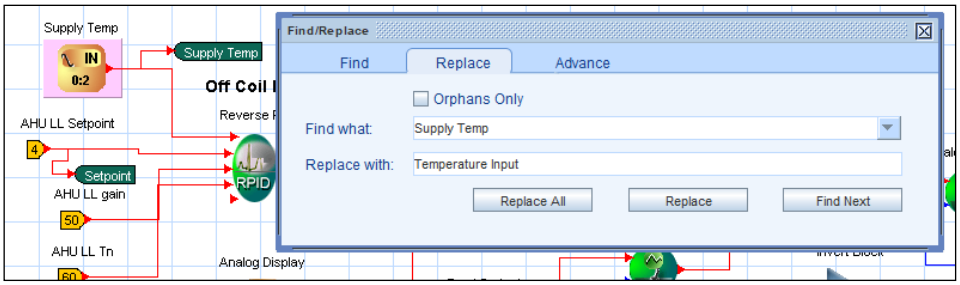


Language Select

The first instance the editor is opened, it will be set for Default, which will be the language which the PC being used is set for as long as this language is also available within the editor. Otherwise, the default language will be English. If at any time the language is required to be changed, click on the Language select icon and select the new language. **Note:** after the selection, the editor must be restarted.

Find and Replace

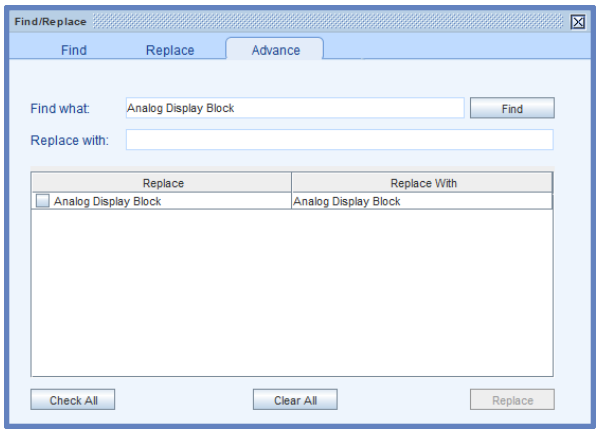
By clicking the 'Find and Replace' icon (binoculars), blocks and items can be easily searched for throughout the users program. This makes it easier to find certain blocks quickly if required. Additionally, the aliases of the blocks can then be amended by using the 'replace' feature and inserting the text that it is to be changed to.



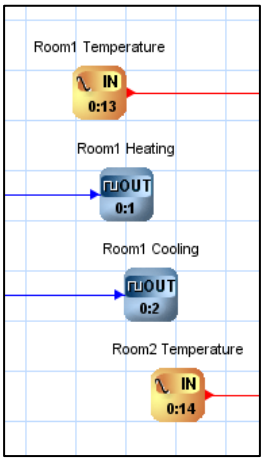
Advance Find and Replace

The Advanced Find and Replace option allow users to search for blocks sharing part of the same name. Using a 'Wildcard' character (*), blocks simply containing the search string can be found.

Within the 'Find and Replace' window, clicking on the 'Advance' tab will result in a similar window to below;



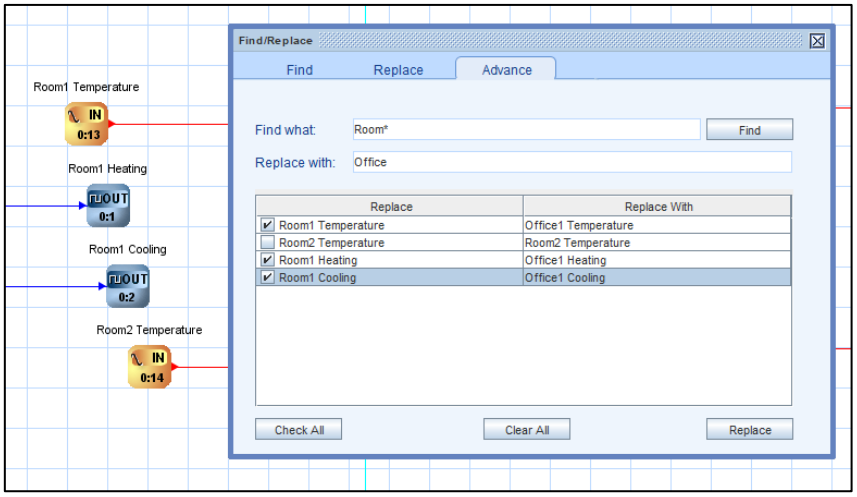
Within a TDB, a user may have created a similar program to the below, where blocks contain the word 'Room'.



In the example to the left, there are 4 blocks;

- Room1 Temperature
- Room1 Heating
- Room1 Cooling
- Room2 Temperature

If it was required that all the blocks containing the text 'Room1' needed to be converted to 'Office1', the below criteria could be entered;



Entering the text 'Room' while using the wildcard character * at the end, any block beginning with 'Room' (with any text string following), will be found. In the above example, not only did it find 'Room1', it also found 'Room2'.

Within the list of found items it will show all blocks it matches. The 'Check All' button will select all listed items to be changed or alternatively the user can click the individual tick boxes to confirm whether they wish to replace the text or not. In the above example all items apart from 'Room2 Temperature' have been checked.

The user can then enter the text string they wish to be inserted within the 'Replace with' field.

'Clear All' will remove any selected items.

'Replace' will replace all blocks with the given criteria.

Example

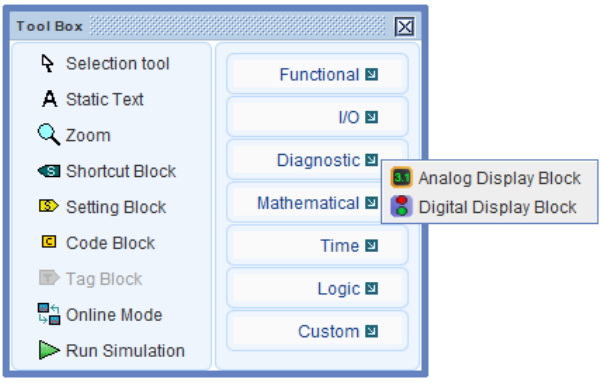
1. Searching for *Room* will find all items containing 'Room', e.g., Front Room 1; Room 5. It will not find; room 2; Bedroom.

Note: The search facility is case sensitive.

Selection Tool / Hide Tool Bar 

The selection tool, depicted by the 'arrow pointer', simply removes association to any block the user has been using and causes the cursor to act as a normal pointing cursor.
The 'Show / Hide toolbar' button will toggle the visibility of the main tool bar strip at the top of the Editor.

Tool Box 



The Tool Box option offers the user another choice of floating tool box to access the different blocks. The floating panel will remain on 'top' of all windows of the editor to save it from ever being hidden. The same blocks here are also visible from the 'Block Menu' outlined in the previous section. From here, the user can navigate to the expanding category menu from where the block required is located. Again, the selected block will show in the 'Current Selection' box at the top right of the editor within the 'Block tab'.

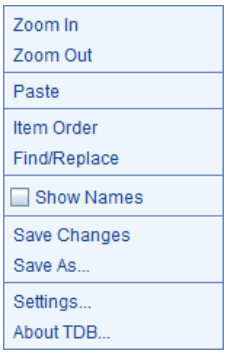
Note: the block descriptions and usage will be outlined in the Toolbox Items section.

'Right Click' Menu

By 'Right Clicking' anywhere on the editing canvas it will show the menu illustrated on the left.

From here it offers a quick, shortened list of some settings and options normally located in different areas of the TDB editor.

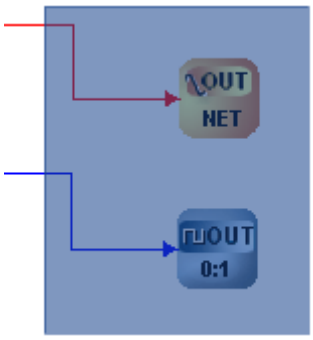
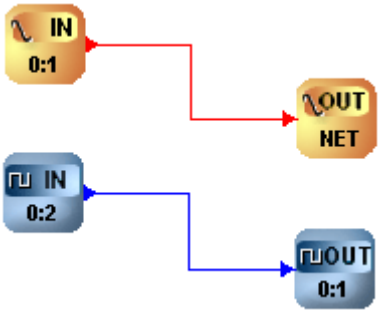
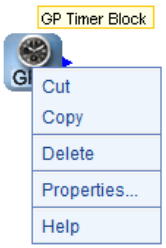
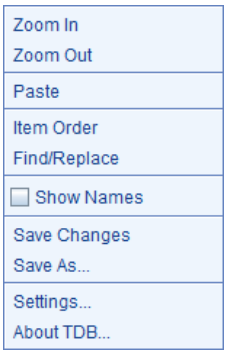
The one option here not located anywhere else is 'Show Names'. This is a check box that toggles the actual block names on and off when viewing the program on the editing canvas.



Designing the Application

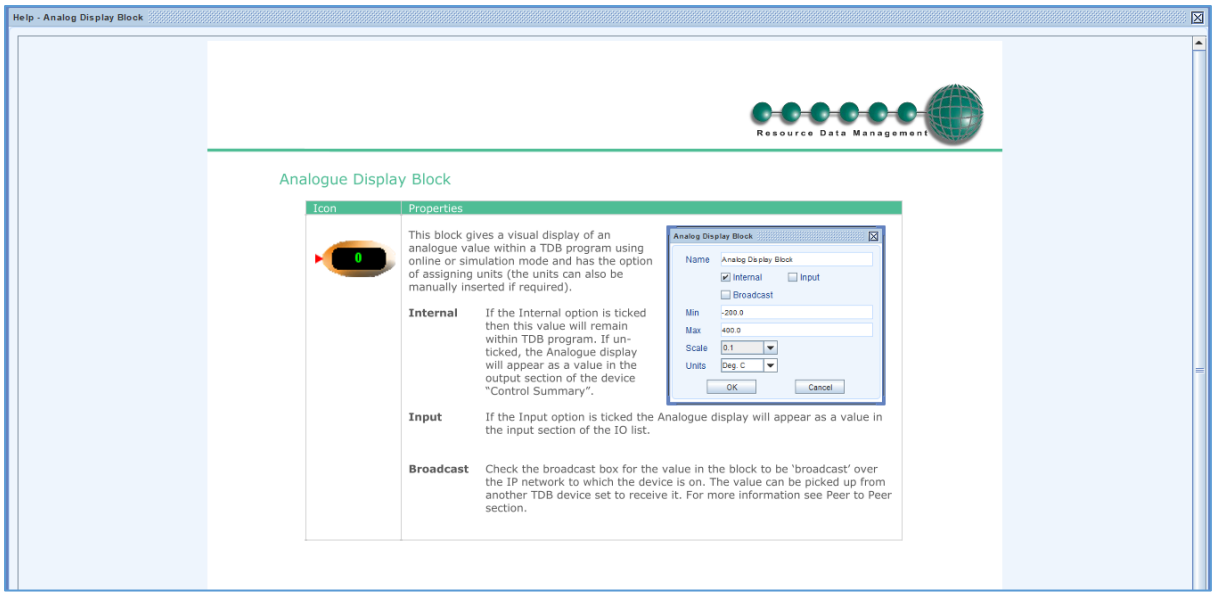
The PLC application is designed upon a Canvas or Editing Workspace. This area is where the blocks can be placed along with all connecting 'wires' and control logic the user is implementing.

General Editing Principles

Mouse Action	Result
Left double click on object	Opens object properties box
Left click on object, 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 (digital), or red points to red (analogue). **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 the connecting objects
Right click on object	 The resulting sub menu is shown. From here the user has basic options as listed. Clicking on Properties will subsequently show the properties box of the selected block. Clicking on 'Help' will show the help page of the block. See Individual Block Help.
Right click on workspace (i.e. not on an object).	 From the menu shown, it offers a quick, shortened list of some settings and options normally located in different areas of the TDB editor. The one option here not located anywhere else is 'Show Names'. This is a check box that toggles the actual block names on and off when viewing the program on the editing canvas.

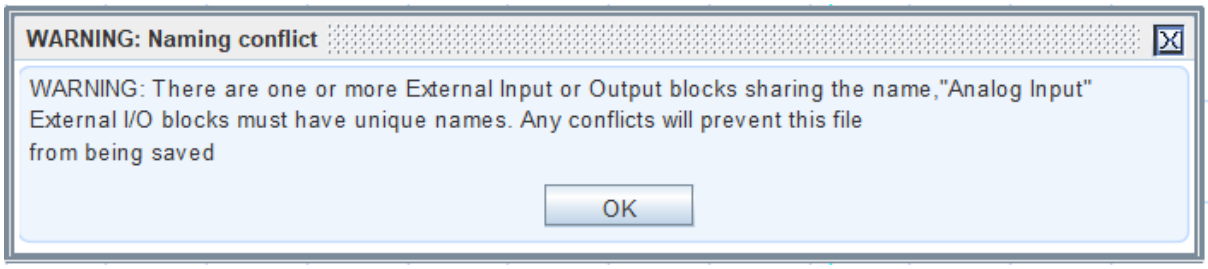
Individual Block Help

When a block has been placed on the canvas, the user can right click on the block and select 'Help'. It will show the configurable options and operation when it is used.



Naming Blocks

Any block that generates an external input, output, parameter or certain blocks that carry out saves internally such as accumulator blocks, will require a unique name given. If two or more blocks meeting these criteria are placed with the same name, a warning message similar to below will be displayed.



Any naming conflicts will need to be corrected before the program can be saved. If the conflict is not corrected at this stage, a further warning message will be displayed when the user tries to save the program.

Note: Any block that has the option to set to 'Internal' and is set as such, will not be subject to a naming conflict check.

Allowable Characters

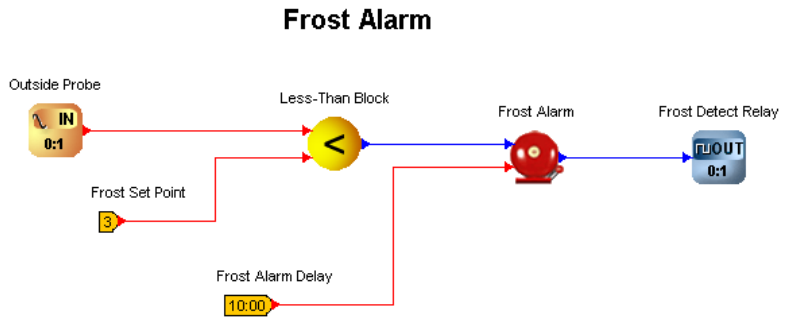
Any text used to name a block within TDB editor must be alphanumeric and cannot use non-standard English characters, for example; A b c D X y Z are allowable, & - + : $ Æ Ö are not. Blocks with non-alphanumeric characters contained in them may not operate correctly.

Note: Static 'Text Blocks' used in a program do not have any functional use, so are unaffected by the non-alphanumeric characters.

Building an application Example

Using the tools provided in the toolbox, place the objects that form your application onto the workspace. Connect the objects, inputs and outputs and using the properties box, set the appropriate values for each. It is always highly recommended to run a simulation to prove the design before implementing a PLC application in to the hardware.

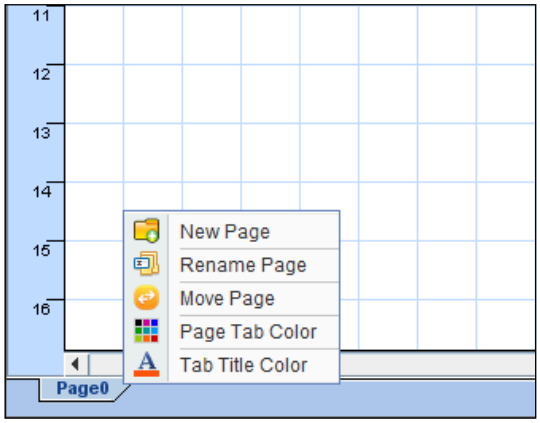
Once the design is complete, save your application.

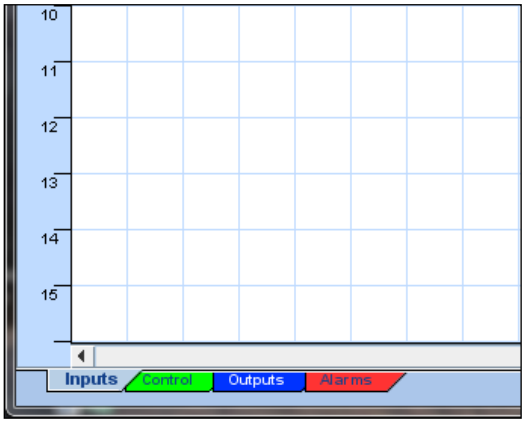


The above diagram shows a simple TDB application for a frost alarm. An outside temperature probe is connected to an analogue input and this is compared to a frost set-point. If the temperature goes below this set point (using a less than block) the output of the less than block goes 'on'. This signal goes to the alarm block that has a time delay of 10 minutes before the 'Frost Alarm' is generated. Additionally, after that time period, the output of the Alarm block would turn to an 'on' signal, energising the relay on the device.

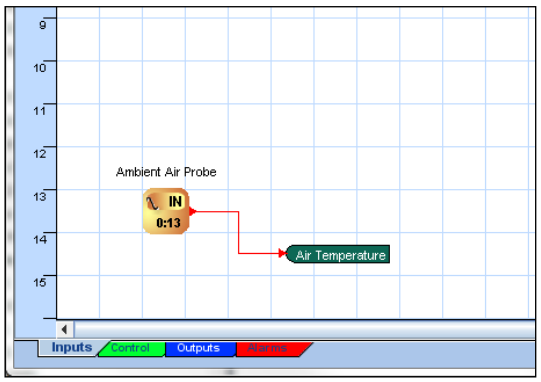
Pages

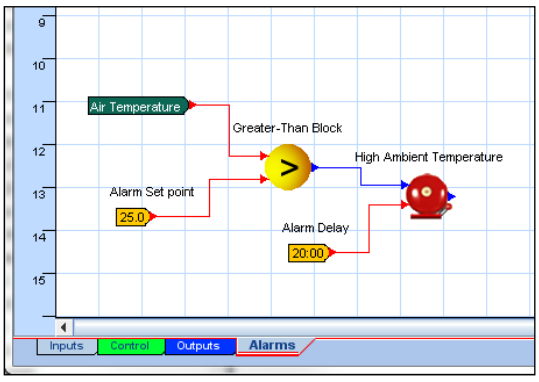
TDB programs can be separated into multiple pages. The PLC can be created on one canvas area, however at times it may be more convenient and manageable to split the program into sections. The individual pages can be given different colours and aliases to easily differentiate between the sections. They can also be moved and deleted when organising.





The sections/ pages can be bridged or linked together by means of shortcut blocks if necessary.

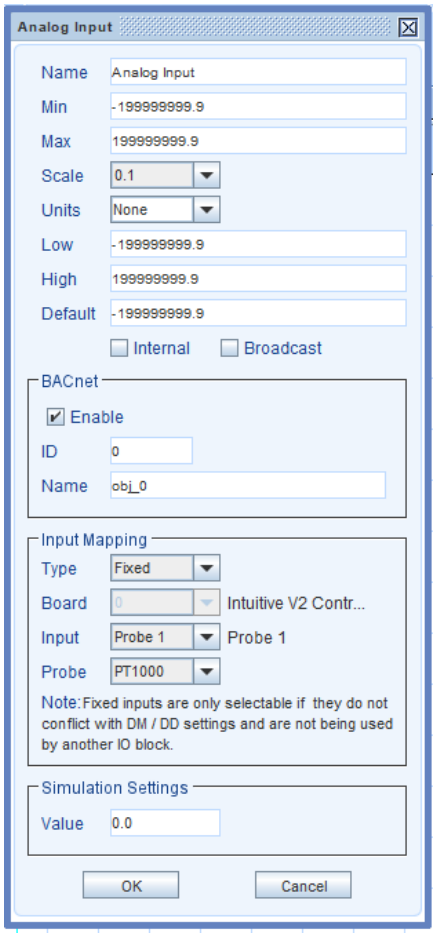




Note: pages have been disabled on binary TDB applications.

Configuring the blocks

Each type of block has an associated properties box which can be edited to configure the block and the way it will operate while the program is running. Depending on the 'host' selected to implement your application, will dictate some of the property fields and their associated values. To offer a general example of a typical properties box see below (Analogue Input);



Name: Type in the Name of the Item or leave as default.

Min: Minimum value that will be displayed on the web page summary screen of controller or Data Manager. Values below this value will show '????'.

Max: Maximum value allowed that can be displayed on the web page summary screen of controller or Data Manager. Values above will show '????'.

Scale: This field will be fixed and dependant on the Units selected.

Units: Select the type of unit to be associated to the block (e.g., Deg. C, bar etc.). The user can also manually type in the unit type if required.

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 box to prevent the Block/ Setting/ Item from being displayed in the summary screen of controller or DM.

Broadcast: Check the 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. See Peer to Peer section.

Enable: Option to enable or disable BACnet point in list of values.

ID: Allows you to specify BACnet Object ID.

Name: Allows you to specify BACnet Object Name.

Type: Depending on the platform the TDB is intended the 'type' of input can either be 'Fixed' or 'Network'. Fixed will allow the user to associate a hardwired probe from the device. Networked will permit the device to pick up a value from another TDB device. See specific block for more details.

Board: Again, depending on the hardware the program is to be sent to, there may be different expansion boards and/ or daughter cards available to associate the IO block to. Board '0' will refer to the main platform the program is on, all subsequent board numbers will refer to the expansions.

Input/ Probe: With the desired board selected choose the physical probe location and associated probe type connected to the hardware.

Simulation Setting: While in 'simulation mode' this will be the value the block will possess.
Note: the value can be changed during the simulation.

For further info on the 'Analogue Input' block please see the Toolbox Items section.

Toolbox Items

Mentioned in the Editor Interface section, there are a few methods of which to access the blocks to implement the PLC application. All blocks are categorised in to different types, further simplifying locating the block required. As different hardware (the application is intended for) offers varied IO, the blocks within the toolbox change accordingly. Therefore, some blocks will be accessible for certain platforms and some will not. To ensure the correct blocks are visible, always ensure to select the correct 'Host' before beginning your program (see Program Settings). The categories are as follows;

- Block
- Logic
- Diagnostic
- Mathematical
- Time
- I/O
- Functional
- Custom

Block

- Selection Tool
- Static Text
- Magnifier
- Shortcut Block
- Settings Block
- Code Block
- Tag Block
- Online Mode
- Run Simulation

Logic

- 2-AND Block
- 3-AND Block
- 4-AND Block
- 2-OR Block
- 3-OR Block
- 4-OR Block
- NOT Block
- XOR Block

Diagnostic

- Analogue Display Block
- Digital Display Block

Custom

- User defined Custom Blocks

Mathematical

- Add Block
- Subtract Block
- Multiply Block
- Divide Block
- Absolute Block
- X power Y Block
- Min Block
- Max Block
- Equals Block
- Less than Block
- Greater than Block
- Less than Or Equal Block
- Greater than Or Equal Block
- 2 Average Block
- 3 Average Block
- 4 Average Block
- Limit Block
- In Range Block
- Min, Max, Average Block
- Filter Block
- Accumulator Block
- Algebra Block

Time

- Delay Timer
- Pulse Timer
- Heartbeat
- Run On Block
- Run Hours Block
- Changeover Block
- Pump Block
- Match Date
- Date Time Block
- Summer Winter Block
- Daylight Block
- Time Block
- Schedule Block
- Day of Week Block

I/O

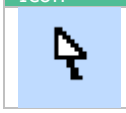
- Analogue In
- Analogue Out
- Stepper Out
- PWM out
- Digital In
- Digital Out
- Analogue Sensor
- Analogue Device Input
- String Input
- Network Analogue In
- Network Digital In
- Network Parameter
- Alarm Input
- Drop List
- Pack Broadcast
- Pulse Input
- CT Monitor/ CT Monitor 2
- GP Timer Block
- GP Timer 2 Block
- GP Timer 3 Block
- GP Timer 4 Block
- Defrost Signal
- Pack/ Rack Optimisation
- Defrost Timer Block
- State Block
- Plant Display
- Intuitive Display
- Intuitive V2 Display
- Humidistat Display
- Humidistat 2 Display
- Air Quality Wall Display Block
- Coldroom Display
- Mercury Display
- Mercury 2 Display

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
- Pressure to Temperature / Pressure to Temperature 2
- Comfort Block
- Offline Indicator
- Display Cascade Block
- Display Override Block
- Display 3-Way Block
- Display Slide Block

General Blocks

Selection Tool

Icon	Properties
	Once selected it can be used to select individual or multiple blocks, drag and drop to move objects and link objects with 'wires.

Static Text

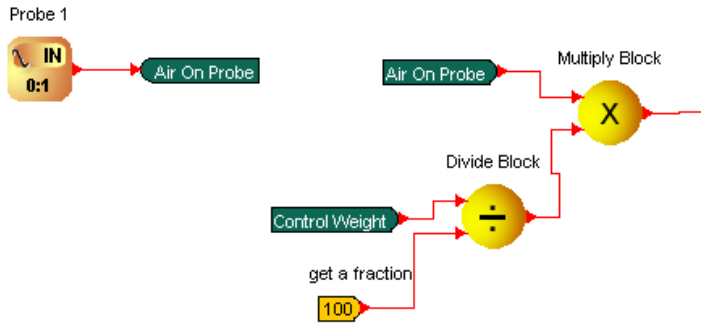
Icon	Properties
	Select the 'text' block to write lines of text on the workspace canvas. Once selected, left click where the text is to be placed. 'Double clicking' on or 'right click' on the 'Static Text' and selecting properties, will open the Static Text Properties window. From here you can input the text string that is to be written on the canvas and choose text style and size. It will provide a sample of the text style to illustrate how it will appear on the canvas.

Magnifier Tool

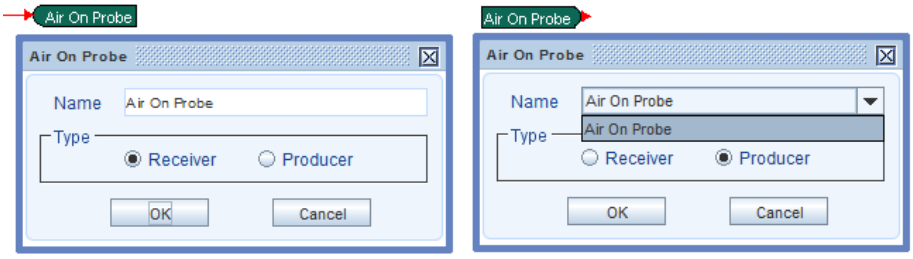
Icon	Properties
	When selected, the 'left click' and 'right click' will zoom in and zoom out respectively of the canvas offering different perspectives of the program.

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.



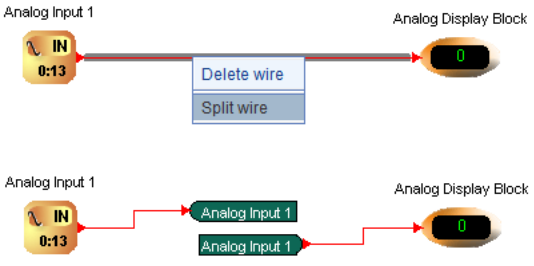
The below example will outline the basic setup.



Split Wire

By right clicking on any wire between two blocks the user has the ability to 'Split' a wire. By selecting it, the wire will be 'cut' and two linked shortcut blocks will be created, similar to the example on the right.

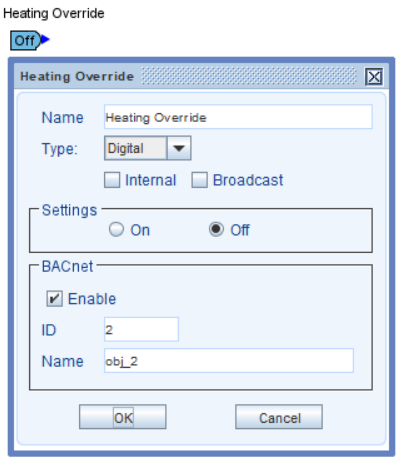
The name of the shortcuts will be automatically assigned that of the block the wire is coming from.



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

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 device's 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.

Enable: Option to enable or disable BACnet point in list of values.

ID: Allows you to specify BACnet Object ID.

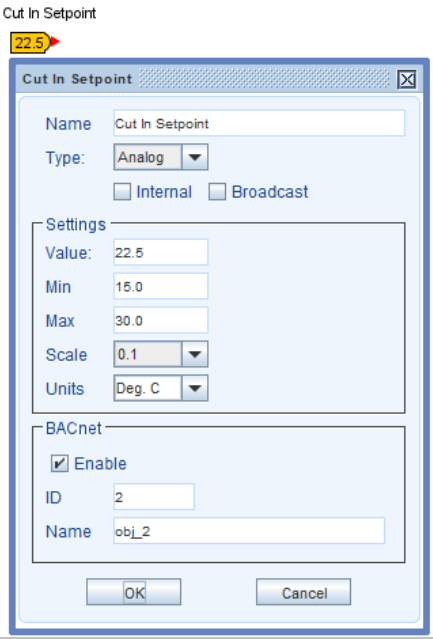
Name: Allows you to specify BACnet Object Name.

Analogue

While set for 'Analogue' the settings shown on the left will be visible.

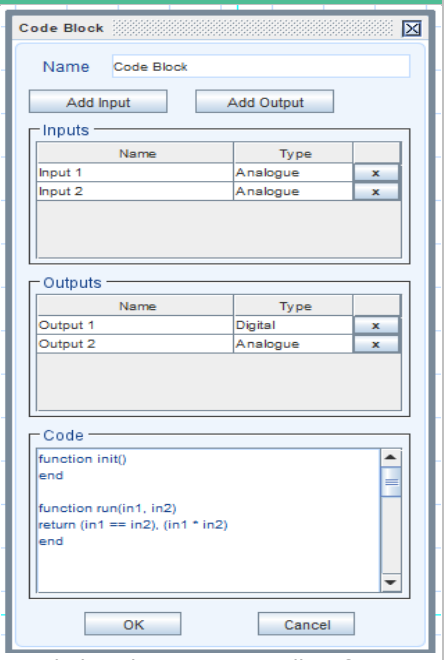
The Internal and Broadcast options are identical to that above.

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.



Code Block

Icon	Properties
Code Block	The code block can be used to carry out mathematical functions using multiple inputs to return multiple or singular outputs. This block can be utilised to help reduce the number of blocks used in a program by allowing for processes that are used multiple times in a program to be carried out within one block such as a 10 Analog input selector as shown in Appendix 6 - Code Block Use.



Inputs and Outputs

Inputs and outputs are added to the block using the "Add Input" and "Add Output" buttons. They can then be set to either 'Digital' or 'Analogue' via clicking on the type and choosing the option. The "X" beside each input or output removes it. Please note, that in order to delete an input or output, all others in that category below them must be disconnected from wires.

Code

There are two functions within the block, 'init' and 'run'. The 'init' function is called when the program starts so it can be used to do a calculation needed at the start or to allow for a value to be used that is not an input to the block.

The 'run' function is called each time the program loops. The parameters to the function need to correlate with the inputs that have been set up in the block i.e. 'in1' will be the first input, 'in2' the second input and so on. The inputs can still be named as required. The outputs come from what is returned from the function and again need to correlate with what is returned.

In the example above, this would take in1 and in2 and return 'true' if they are the same, 'false' if not for the first output. The two values for in1 and in2 would be multiplied for the second output.

The language used for this block is LUA, for the full functions available, please refer to https://www.lua.org/manual/5.1/manual.html. Please be advised that the only standard library utilised by the block is 'math'.

For further information and more complex example of how the block can be used, please see section Appendix 6.

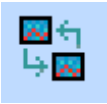
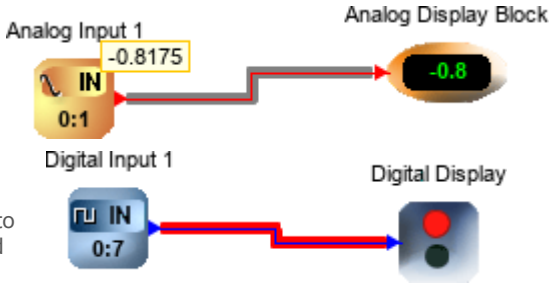
Note 1: Due to the function of the block, this block will not operate in simulation mode within the editor.

Note 2: Block only available in Desktop Editor V 2.3.6 or later, DM4.0 or later and in Plant TDB 4.2 or later.

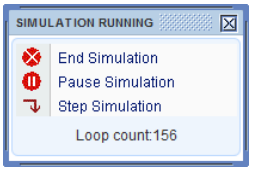
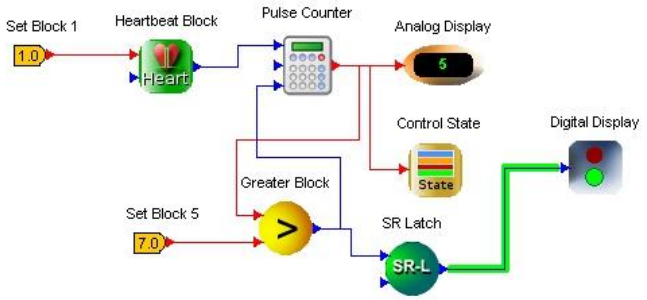
Tag Block

Icon	Properties
	The 'Tag' block is used when creating custom blocks. The custom blocks, after being saved, will then be accessible for later use in creating TDB programs. Please see Custom Block Section for more details.

Online Mode

Icon	Properties
	To use 'Online mode' within the editor it must be connected (via IP) directly to the TDB device. To utilise the online mode the TDB program must be identical to that within the device it is to be connected to. **Important:** Following any amendments to the plc it must be saved and/ or uploaded to the connected device.  With the program saved/ uploaded to the TDB device, the icon can be clicked to 'link' the editor and device so that the user can witness real time updates and readings. Within the pop up window, enter the device's IP address to connect. While 'Online' the user can roll the pointer over a block's 'end point' to view the current reading of that block, digital wires will also illuminate indicating their state.

Run Simulation

Icon	Properties
	Before uploading any PLC program it is recommend the user runs a simulation and test all sections of the program to confirm the expected result and control. While in Simulation mode, the editing facility of the Editor is temporarily removed. Certain blocks can be 'clicked' on so the user can input values to recreate the environment it will be in. Notice within I/O blocks there will be 'Simulation Settings'. These values will be used while the program is in this mode. Additionally, the user will notice the 'Simulation Running' window.  

I/O Blocks

Analogue In

Icon	Properties

Each Analogue Input block has similar settings, outlined by;

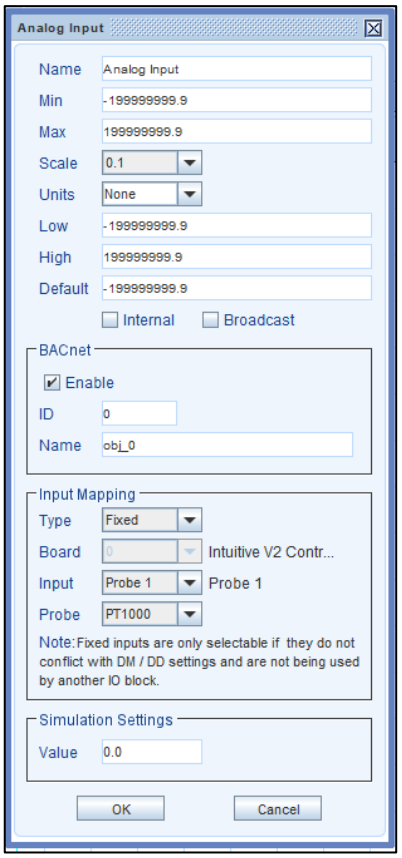
Name: Provide a unique alias for the input.
Min/ Max: When 'units' is selected, the values self-populate, else they can be entered manually. If the input value goes out with these bounds, the value read on the IO list will be '??????'.
Scale: When 'units' is selected, the scale self-populates, else it can be altered to suit the requirements.
Units: Depending on the measurement, select the appropriate unit.
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.

Enable: Option to enable or disable BACnet point in list of values.

ID: Allows you to specify BACnet Object ID.

Name: Allows you to specify BACnet Object Name.

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



Input Mapping

Analogue Inputs can be defined as 'Fixed' or 'Network'.

Network

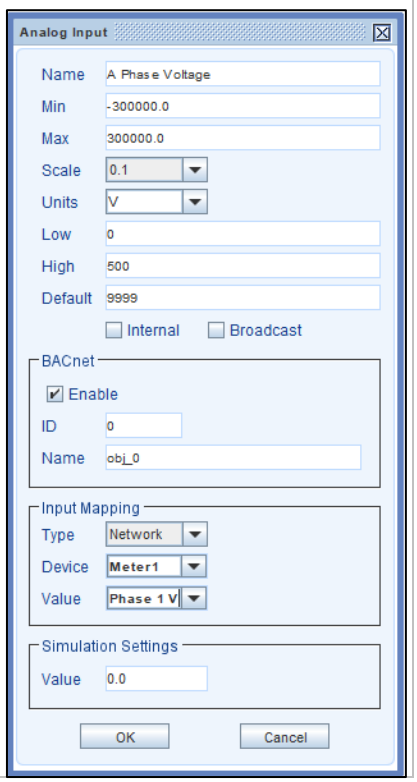
Networked Inputs are values taken from other devices on the IP network.

Note: not available on the Mercury platform range

Device: For a DM TDB the device can be one from the Device list. The text in this field would then have to match identically that of the device name.

Value: The value is the item alias on the device's IO list that the block is intending to use.

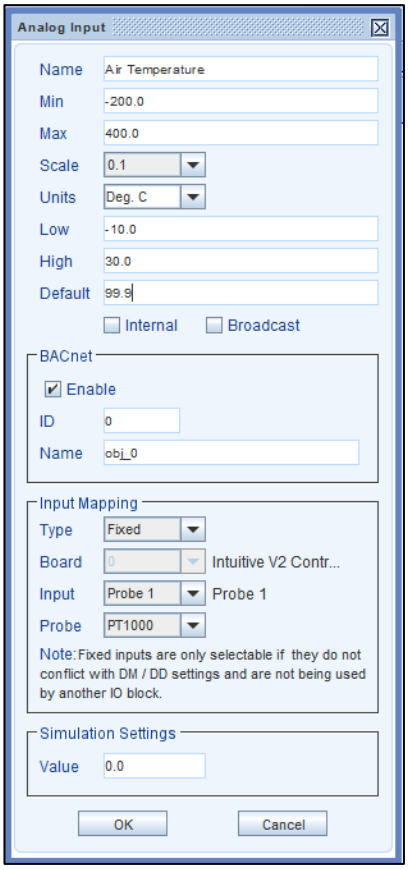
Note: For Intuitive and TouchXL TDB devices the 'Device' would refer to a Modbus device logged on the controller. See the specific Intuitive TDB document for more details.



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

Fixed

Fixed Inputs are those that are mapped to a physical Input on the hardware platform the PLC app is being installed on to.



Board: The board is the device the input is to be mapped, for instance this can be the main board (DM, Intuitive, TouchXL or Mercury controller), one of the expansion boards or daughter cards connected to the main device.

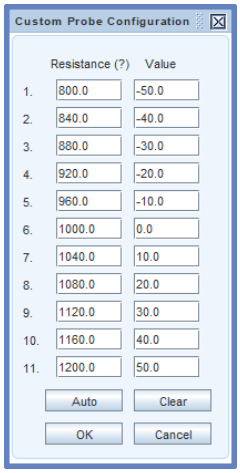
Input: Select which physical connection on the device the input is to be mapped to.

Probe: Choose the probe type that will be connected to the unit; 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

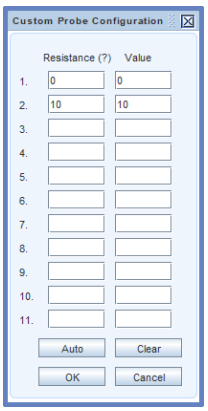
***Light: Used in conjunction with the RDM Light Level Sensor (PR0193). **Note**: It will not require any further resistors or computational blocks.

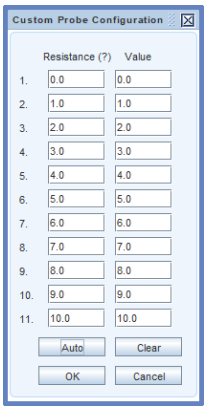


Define: If selecting either a 'Custom' probe type or a Universal Input, the user must configure the conversion table manually. A resistance conversion table (for custom probe type) is shown on the left.

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

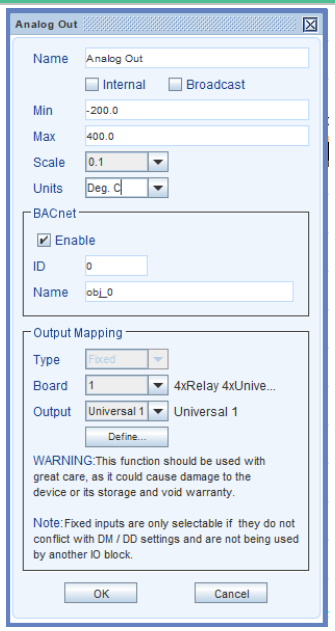
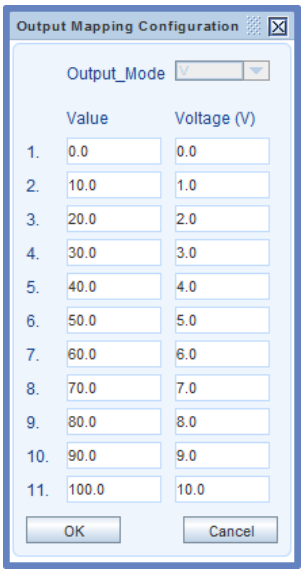
For convenience there are 'Auto' and 'Clear' buttons to aid in the entering of the details. Pressing 'Clear' will clear the complete table of all values. To utilise the 'Auto' calculation feature a minimum of 2 values must be entered. Then pressing 'Auto' will automatically calculate the remaining fields,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





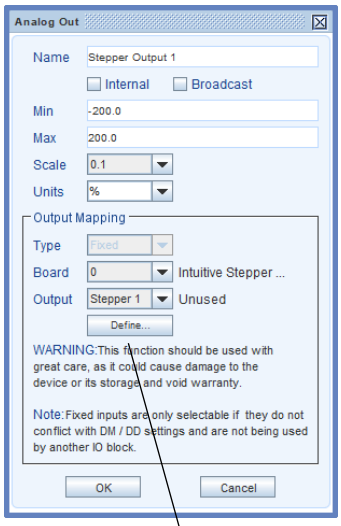
Please ensure all power is switched off before installing or maintaining this product.

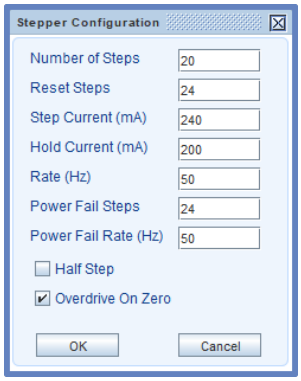
Analogue Out

Icon	Properties
	Type can be fixed or Network Similar to the Analogue in, the general properties can first be set (Name, Min, Max etc.). **Fixed Output Mapping** Once Fixed is selected the properties box will show the option of 'Board', 'Output' and has the 'Define' option. **Board**: The board refers to the hardware the output will be mapped to. Depending on the properties defined in the Program Settings there will a board number associated to the output board. Only those boards that have 'outputs' will be selectable. **Output**: Select the Output position on the selected board. In the example on the right, board 1 is a 4 x Relay, 4 x Universal Output. The Analogue output can then be defined;  **Output Mapping Configuration** Output mode is dependent on the type of expansion board fitted, in the example to the right, Voltage is selected. The user must then define an input value to the block and the associated output value. There are 11 definable points, and between points there is a linear interpolation (must be ascending). As a default, the configuration will be a linear output with 0-10V, scaled to 0-100 units input value. **Note**: The analogue output block should not be used to change parameters on networked devices, the 'NW Param' block should be used for this.  **Network Output Mapping** Network outputs are only available on the DM platform and are used when the user wishes to use another device on the network to have their output used on. Similar to the Analogue Input setup the user defines the 'Device' name and 'Value'. These names must match identically to the devices on the DM's device list.

Stepper Out

Icon	Properties





Similar to the Analogue in, the general properties can first be set (Name, Min, Max etc.).

Type will be '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.

Stepper outputs need to be defined before implemented;

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 holding current of the stepper motor in mA. **Note:** an incorrect value entered may damage the attached Stepper motor (Range 1 to 825mA).

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: Check 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 1: The block will always complete the overdrive process (once activated) before sending the new requested output.

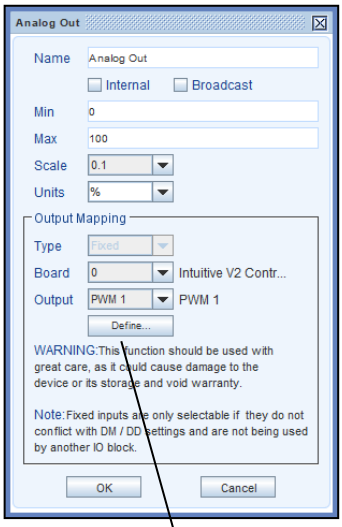
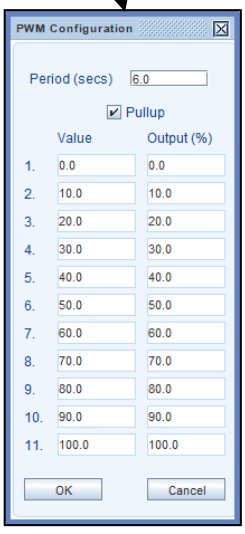
***Note 2**: Both the 'Power Fail Steps' and 'Power Fail Rate' settings are only compatible with the **Intuitive Stepper I/O Auto Close module.** For more details on its connections please refer to the relevant documentation.

Example
Using the example settings (above right);
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 analogue value of 0 is entered then the stepper motor will be overdriven and would step back 24 steps.

Important: 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.

	Each time the TDB device is powered on **it will have no knowledge of the current stepper motor position** for any stepper valve motor attached to a Stepper Expansion board. During start-up the device 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 synchronize 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% during normal use and this must be accounted for in the users TDB program. See also Appendix 5 - Stepper Rate with regards to setting the Rate parameter for a stepper motor.

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. **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, the board that has the PWM outputs. **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 In

Icon	Properties

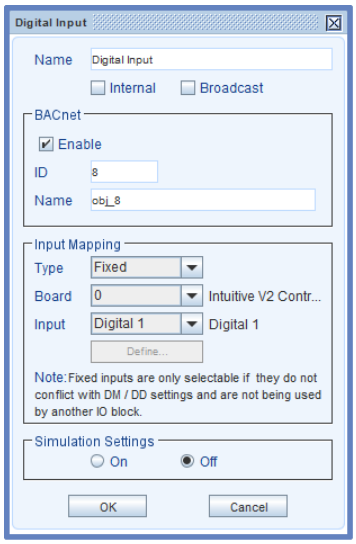
Name: Provide a unique alias for the input.
Internal: Check the 'Internal' field if the input is not to be shown on the device's IO list.
Broadcast: Check the 'Broadcast' field to broadcast the input's value across the IP network. See Peer to Peer for more details.

Enable: Option to enable or disable BACnet point in list of values.

ID: Allows you to specify BACnet Object ID.

Name: Allows you to specify BACnet Object Name.

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.

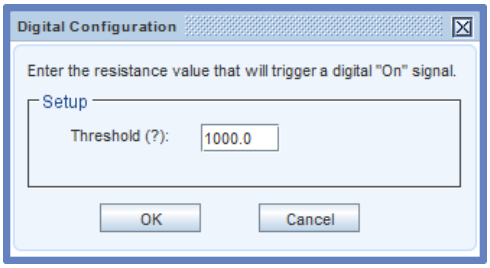
Fixed

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

Board: The Intuitive controller 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.

Define: If a 'Probe Input' is selected, the define button will appear and allow the user to manually enter the resistance level of which will trigger an 'On' signal. See below.

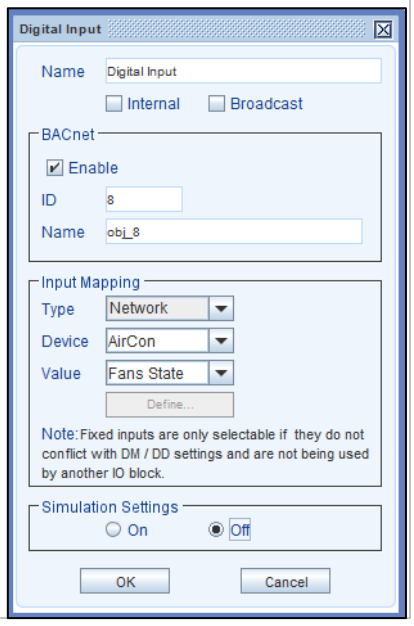


Network

Network inputs are for use with the DM host and are those from devices listed within the DM's device list. For Plant TDB variants, please see Network Digital In block.

Device: Type the Device name as appears in the Network/ Device list "AirCon" from example to the right.
Value: Type the Item's name from within the Device's IO. "Fans State" from the example is an item from within device "AirCon".

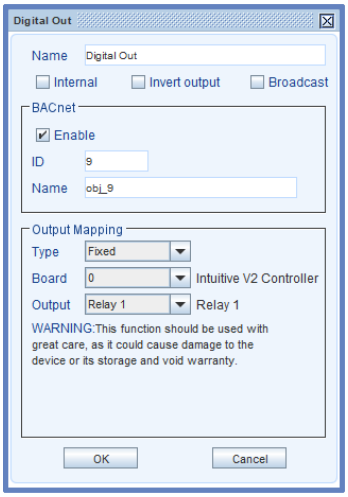
Note: The names must be identical to the names in the device list.



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

Digital Out

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.

Type is Fixed or Network

Fixed Output

In this example the fixed output is 'Relay 1' of the Data Manager.

Board: Using the drop-down menu select from the list of 'boards' previously configured in the Program Settings.
Output: Select which output is to be used from the drop-down menu.

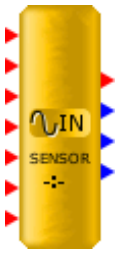
Network Output

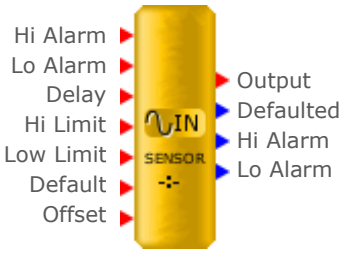
Network Digital outputs are for use with remote network devices and are configured similarly to an Analogue Output, whereby the output is mapped via "Device" and "Value".

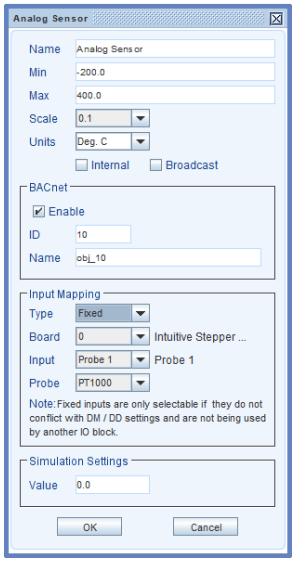
If used with either an Intuitive or TouchXL TDB the network outputs refer to relays on networked devices, for example the Wireless Mesh device 2I2O (PR0731). When selected as 'Network', enter the Device Name as it appears on the 'Network List'. Then the device's Value as it appears on the device's IO list.

Analogue Sensor

Icon	Properties





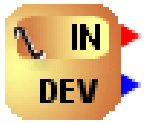


The properties of the Analogue Sensor are similar to the setup of the Analogue Input block.

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

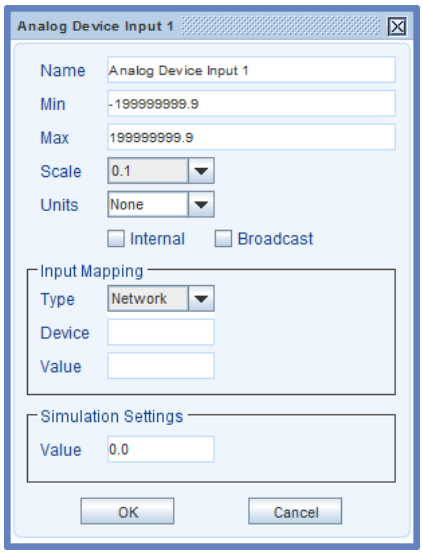


The device input block is used with the Intuitive and TouchXL TDB hosts.

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

Please consult the Intuitive or TouchXL TDB document for information on logging devices on to the controller.

Fill in the details concerning the block's 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.

Type: The type will always be 'Network'.

Device: 'Device' must match the exact text string of the device name logged on to the controller.

Value: 'Value' must match the text string of the value that is to be taken from the device.

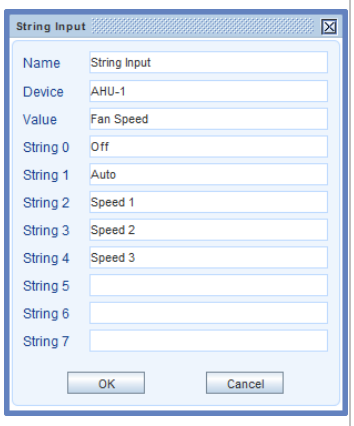
The offline output will switch on if the networked device stops communicating with the controller.

String Input

Icon	Properties

The String input block is for use with DM hosts only

The block can be used to pick up specific text strings from an item (I/O or parameter) listed within another device.



Name: Assign a name to the block. Note it will not appear in the IO list.

Device: The name of the device as it appears in the Data Manager's device list. E.g., "AHU-1"

Value: The name of the item as it appears in the device's IO list. E.g., "Fan Speed".

String 0 – 1: Enter in the possible text strings the item in the device can show.

Note: All entries must match the text strings of the device/ item/ string exactly.

When running, the output of the block will be a numerical value ranging from 0 – 7. Depending on which string the block 'picks up' will dictate the numerical value. From the example, if on the Device "AHU-1" the item "Fan Speed" showed "Speed 2" then the numerical output of the block would be "3".

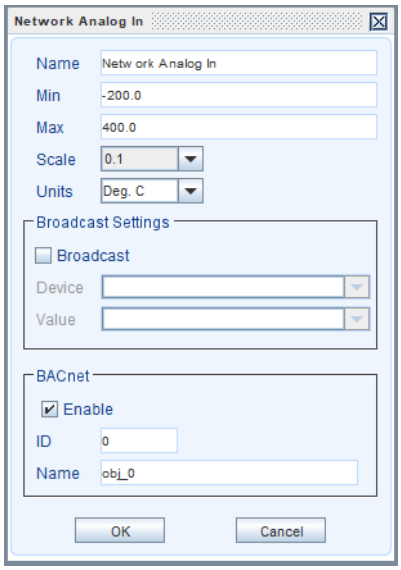
Network Analogue In

Icon	Properties

Network Analogue inputs can be used to receive analogue values sent from a TDB program running on a Data Manager, Intuitive or TouchXL TDB controller sharing the same network.

Output

Refresh Timeout



Output: Outputs the analogue network value at any given time from the network source (Data Manager Data Builder program or another Intuitive/Plant controller).

Refresh Timeout: This Output will go 'on' when communications are lost from the network source and the refresh timeout (see Program Settings) has expired.

Broadcast: Tick this box to configure the input to receive a value from another controller.

Note: Not available on the Mercury platform.

For an example of how to set up the 'Network Analogue Input' block please see the Network Inputs section.

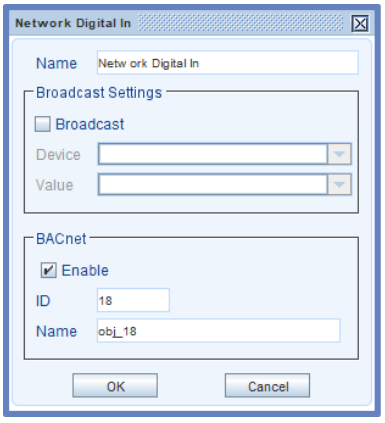
Network Digital In

Icon	Properties

Network Digital Inputs can be used to receive digital values sent from a TDB program running on a Data Manager, Intuitive or TouchXL TDB controller sharing the same network.

Output

Refresh Timeout



Output: Outputs the digital network value at any given time from the network source (Data Manager Data Builder program or another Intuitive/Plant controller).

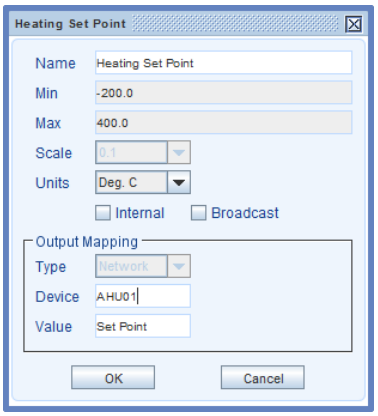
Refresh Timeout: This Output will go 'on' when communications are lost from the network source and the refresh timeout (see Program Settings) has expired.

Broadcast: Tick this box to configure the input to receive a value from another controller.

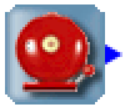
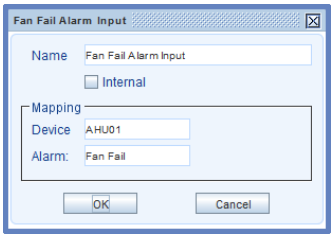
Note: Not available on the Mercury platform.

For an example of how to set up the 'Network Digital Input' block please see the Network Inputs section.

Network Parameter

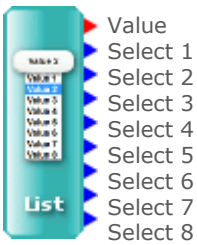
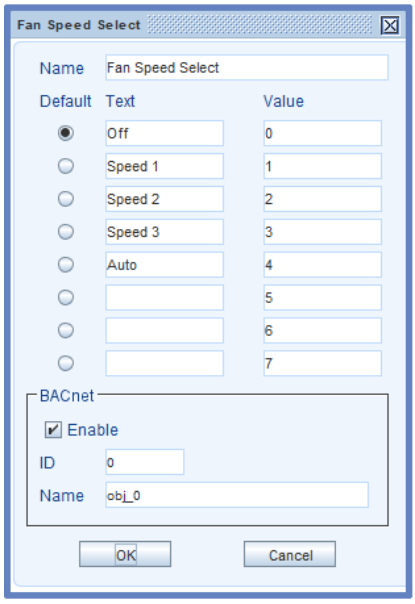
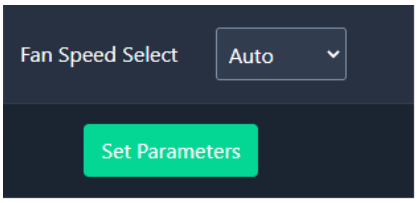
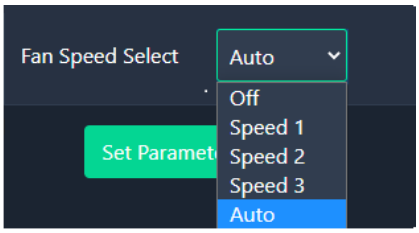
Icon	Properties
	The network parameter block is used to change parameters on a networked device logged onto the Data Manager or a Modbus device logged on to an Intuitive / TouchXL TDB Controller. Please see individual documentation for compatibility and setup. **Device**: Enter the device name as it appears in the Data Manager's list of devices. Or as It appears in the Modbus list of devices within the Intuitive/ TouchXL TDB Controller. **Value**: Enter the parameter name as it appears in the parameter list for the device. Use the analogue input to send the desired value to the networked device. The network parameter block will attempt to change the parameter, once it receives an acknowledgment from the device.  **Note1:** the ability to change parameters on third party devices attached to the Data Manager may be subject to a charge to enable the feature. Contact technical support for further information. **Note2:** the Nw Para 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.

Alarm Input

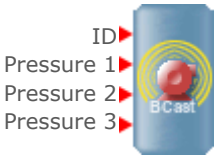
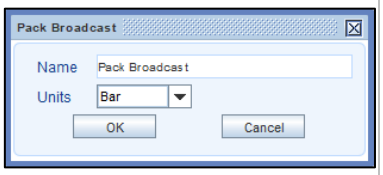
Icon	Properties
	The Alarm Input block allows an alarm being created by a networked device logged onto the Data Manager to be used by the TDB program. **Device**: Enter the device name as it appears in the Data Manager's list of devices. **Alarm**: Enter the alarm name as it appears in the parameter list for the device. **Note**: Only available on DM platform. 

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

Drop List

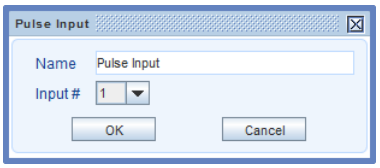
Icon	Properties
	The Drop List block, when used in the program, will appear as a drop-down selection menu within the parameter section of the TDB device. From the settings of the block, the name of the parameter (block) can be given. There are a possible 8 fields that can be used which appear in the 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.  

Pack Broadcast

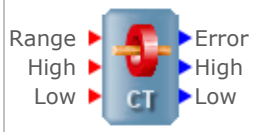
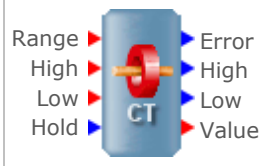
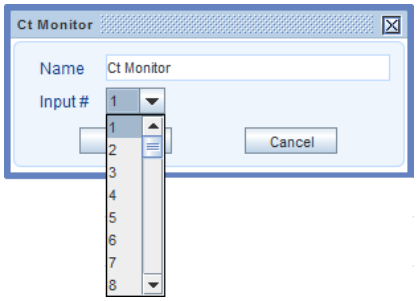
Icon	Properties
	**Note**: Feature PR0655-BCST must be enabled. See RDM Sales for details. The Pack Broadcast block can be used in conjunction with RDM controllers compatible with the pack broadcast feature.  Values can be broadcast across an IP network to devices capable of using them, for example an RDM Mercury Hub or Mercury controller. **Name**: Assign the block a name to identify it in the TDB program. If using more than 1 block they must have unique names. **Units**: Select the units that the values broadcast, will have associated; Bar or Psi. **Inputs** **ID**: The ID must be a unique network ID formed of 3 numbers ranging from 001 – 999. Please note, ID number should be unique across the whole network, not just the TDB program. **Pressure 1, 2 & 3**: This is the numerical value the program will broadcast. Once configured the item(s) will be broadcast in a format the RDM controllers can use. **Cont.** **Example**

	Assign ID '282' Select 'Bar' as the units Input value 0.6 into Pressure 1 Input value 2.5 into Pressure 2 Input value 14.5 into Pressure 3 The block will broadcast from 'Pack282' 'Pack282' will contain; Press1, Press2 & Press3 showing values; 0.6, 2.5 & 14.5 respectively. The packets will be sent over the network at 15 second* intervals. *Dependant on Network condition For more information on picking up the broadcast pressures please consult the relevant documentation for which the values are to be used. These can be found in the resources section of the RDM web site. **Note**: Compatible with Mercury Hub versions 4.1 and above

Pulse Input

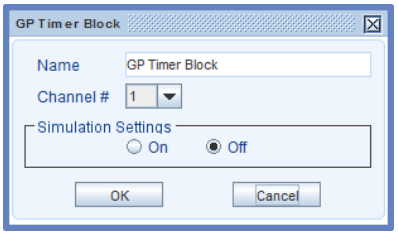
Icon	Properties
	 Pulse Input blocks are used to pick-up pulse counts from a USB pulse reader connected to the TDB device. Select one of the 24 channels and give the block a meaningful name. The red analogue output is the channel count value. The digital Input, when activated resets the channel count to 0. **Note 1:** The pulse value, is periodically saved in the TDB Device's non-volatile memory (not available on Mercury hosts) 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.

CT Monitor/ CT Monitor 2

Icon	Properties
CT Monitor  **CT Monitor 2** 	 For the hardware setup, please refer to the appropriate TDB device user guide. Up to 10 Current Monitors can be attached to the device, 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.

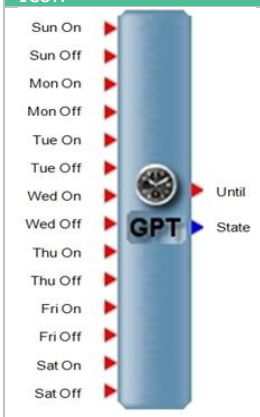
GP Timer Block

Icon	Properties
	On TDB devices (exception of Mercury host), there are 92 general purpose timer channels and 8 "Global" channels. These channels are individually set up on the TDB device itself. The GP timer block allows commands from the GP Timer schedules to be mapped into the TDB program. Channel number is selected from the drop-down menu. **Note:** Block not available on Mercury Platform. 

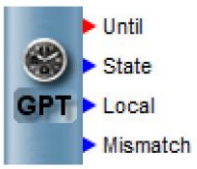
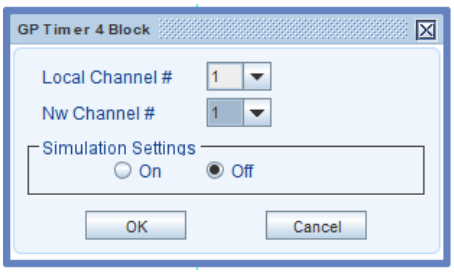
GP Timer 2 Block

Icon	Properties
	**Analogue Output:** This provides the next 'on' time of the currently selected GP timer channel. This output is currently used with the Occupation Block only. **Note:** the time from the analogue output is not relevant for use by the end user. **Digital Output**: This output provides the current status of the GP timer channel to which the block is mapped.  **Local Channel:** On the Intuitive/ TouchXL TDB device there are 92 general purpose timer channels and 8 "Global" Channels. These channels are set up within the device's local menus. **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 DMTouch's GP timer channel. Select the desired channel number from the drop-down list. Configure the appropriate GP timer channel in the Data Manager. Within the DM GP timer setup pages, use "**Transmit**" as the output type. 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, 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. **Note 3:** Block only available on Intuitive and TouchXL TDB Platforms.

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. The Analogue output "Until" can be connected to the "Occupation" input on the Occupation block. **Note:** the time from the analogue output is not relevant for use by the end user.

GP Timer 4 Block

Icon	Properties
	This block allows the user to map a network GP Timer channel to the Intuitive controller and generate a mismatch output if the network timer channel is altered or not the same as the local channel. The user can configure and select a Local channel with the same times setup as the network channel and if either of the channels is changed, the mismatch output on the block is activated. This output and the local output are especially helpful when trying to diagnose a fault.  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 State digital output provides current status of the GP timer channel to which the block is mapped. The Local digital output will come on when the controller is using the local GPTimer channel instead of a remote channel or network communications have been lost. The Mismatch output will be become active if there is a difference between the times set in the Local channel and the Network channel. **Local Channel:** There are 92 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. **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. set up **Note**: Global channels cannot be re-named or be set to child 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.

Defrost Signal

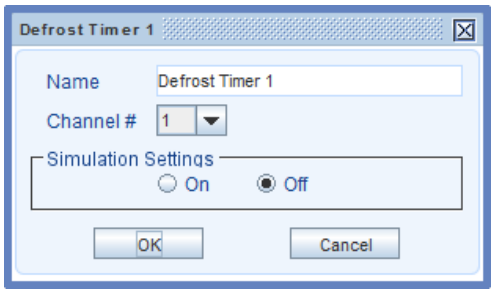
Icon	Properties
	The block allows for commands from the Defrost Timer schedules in a Data Manager to be mapped into the TDB program. Please consult the Data Manager User guide to see how to configure a defrost channel. The output of this block will show the following (please note the command sent to 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 **Note:** Block not available on DM platform. **Note1**: Each Df Signal block must have a unique name given, as set in the properties menu of the block.

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 1:** Block only available on Intuitive/ TouchXL TDB Platforms. **Note 2**: A maximum of three Pack/ Rack Optimisation blocks can be used per program when used with Intuitive/ TouchXL software version 3.6.0 and above.

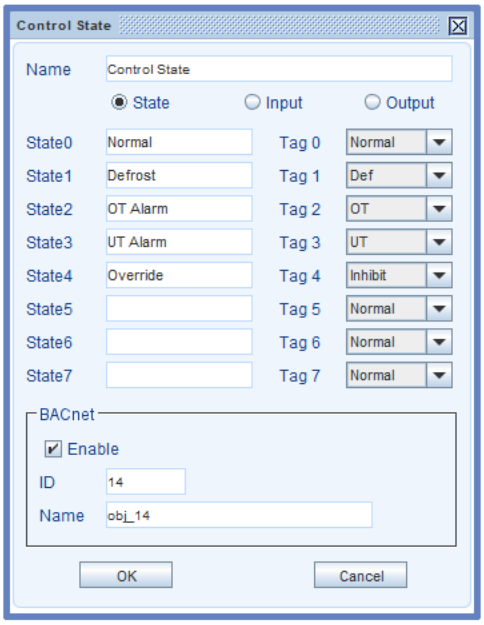
Defrost Timer Block

Icon	Properties
	The block allows for commands from the Defrost Timer schedules in a Data Manager to be mapped into the TDB program. **Channel#:** This is the defrost timer channel in the Data Manager that the block will obtain it's ON/OFF signal from, 100 channels are available. It is advisable to configure a local schedule in the TDB program in the event of a communication loss between the Plant controller and the Data Manager. **Note:** Block only available on the Data Manager platform.



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

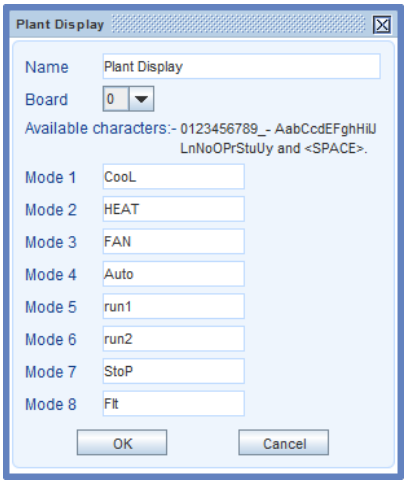
State Block

Icon	Properties
	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 Plant TDB controller is in "Defrost" or "Alarm" etc.  **Enable:** Option to enable or disable BACnet point in list of values. **ID:** Allows you to specify BACnet Object ID. **Name:** Allows you to specify BACnet Object Name. **Note**: Each Control State block added requires a unique name to be given.

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;

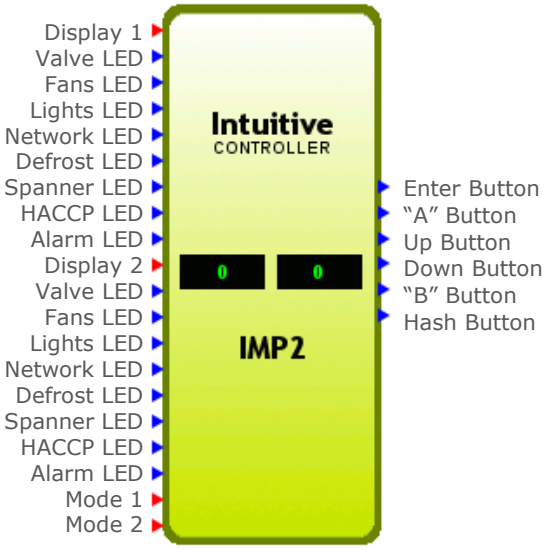
Value '0' – shows the value that Display 1/2 Input currently has
Value '1' – shows the character set within 'Mode 1' field
Value '2' – shows the character set within 'Mode 2' field
:
Value '7' – shows the character set within 'Mode 7' field
Value '8' – shows the character set within 'Mode 8' field

Clock Mode

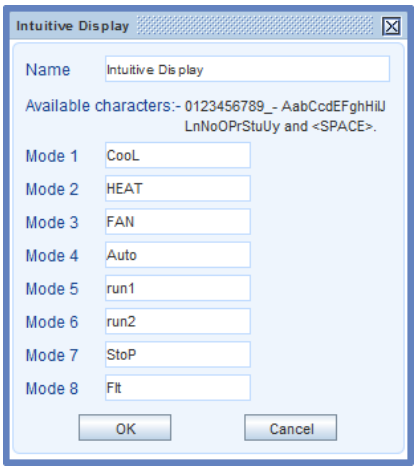
The LCD display can format a minute's value (entered into either 'Display 1' or '2') into the format **00:00** by entering "-1" into the corresponding Mode input. E.g., Where Mode 1/2 is set to '-1', by entering the 'minutes' value 780 into Display 1/2, it would be translated to 13:00 on the display.

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;

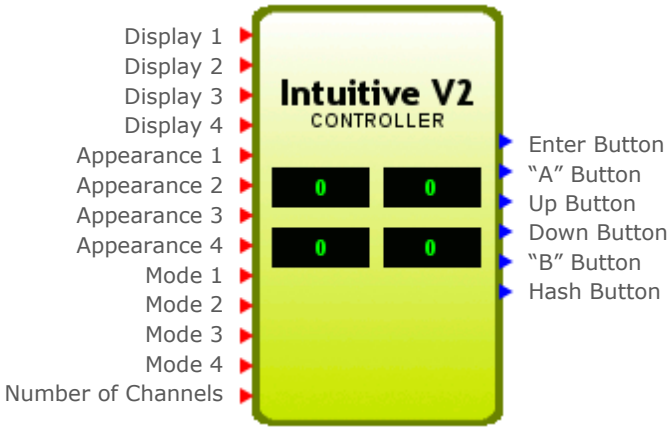
Value '0' – shows the value that Display 1/2 Input currently has
Value '1' – shows the character set within 'Mode 1' field
Value '2' – shows the character set within 'Mode 2' field
:
Value '7' – shows the character set within 'Mode 7' field
Value '8' – shows the character set within 'Mode 8' field

Clock Mode

The LCD display can format a minute's 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)

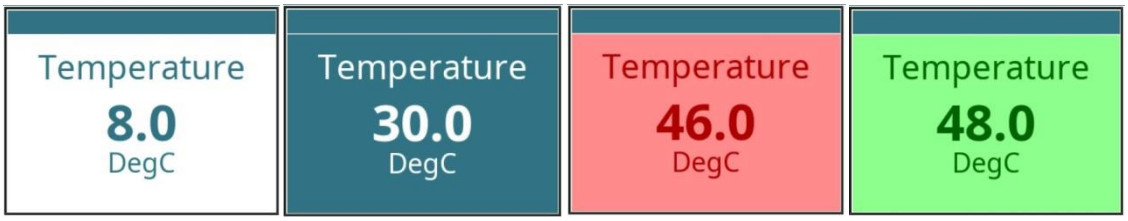


The inputs are as follows;

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;

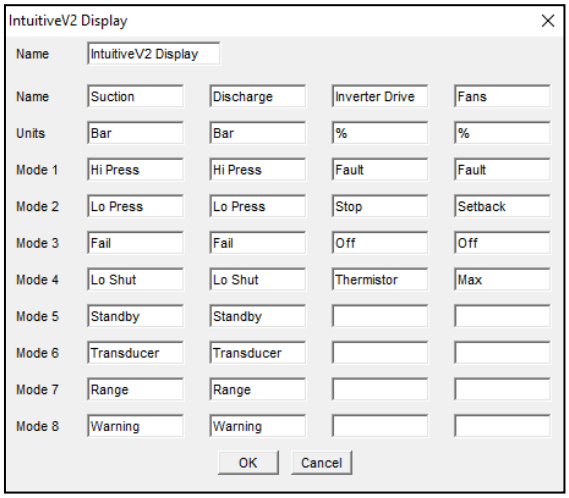
Value '0' – shows the analogue value currently present on the display 1-4 inputs, "16.6 Bar" for example.

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

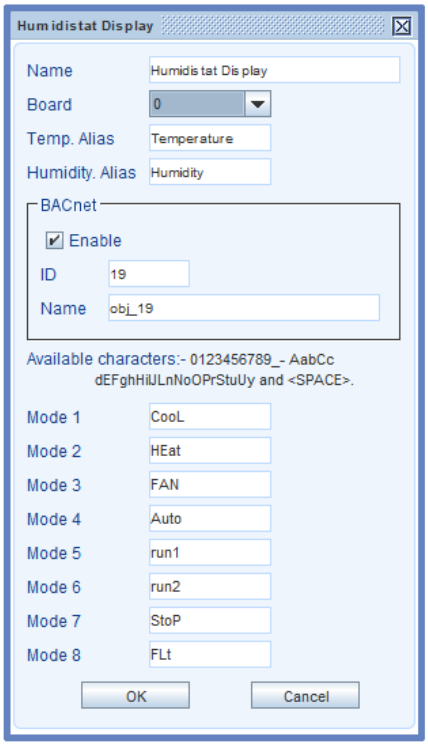


Enter Button, "A" Button, Up Button, Down Button, "B" Button, and Hash Button.
These represent the six pushbuttons on the display. When any of the buttons are pressed the corresponding digital output on the block will switch ON, these digital outputs can then be used in the TDB program to carry out operations.

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.

Enable: Option to enable or disable BACnet point in list of values.

ID: Allows you to specify BACnet Object ID.

Name: Allows you to specify BACnet Object Name.

Clock Mode

The LCD display can format a minute's 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.

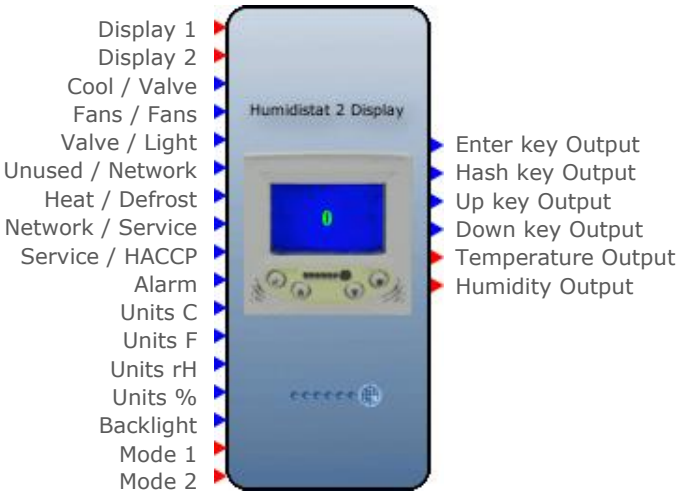
Note 1: The Display block must always be configured (right click) within the TDB program before it will activate.

Note 2: The text fields are not available in the Mercury host.

Humidistat 2 Display

HVAC / Fridge

RDM Part Number PR0445-LCD

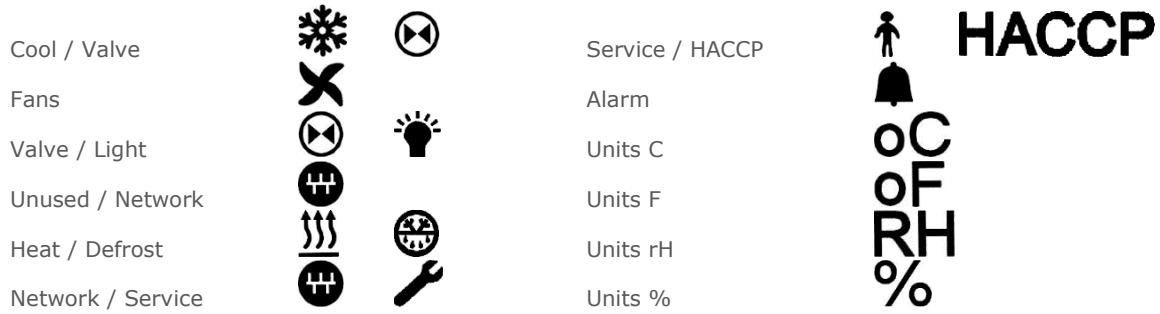


The Humidistat 2 display comes in two different hardware variants; **Fridge** or **HVAC**. Therefore within the display block properties (below), the user must define which 'Type' is being used. If the hardware and the selected type is mismatched, the functions will not work. **Note**: changing the type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

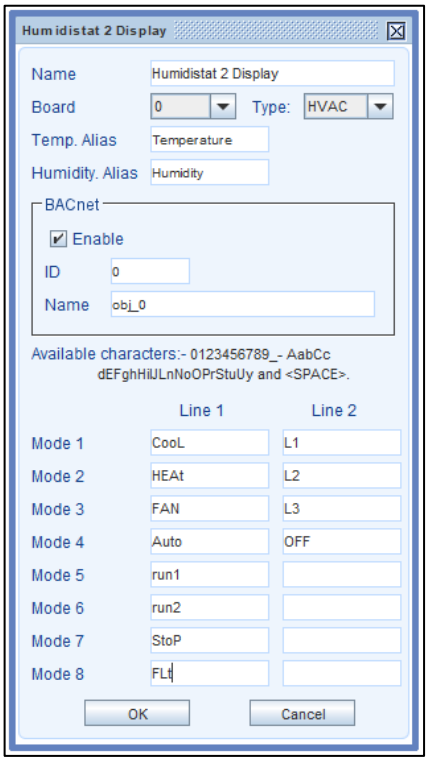
Digital Inputs: Each digital input can be used to enable individual icons / symbols within the LCD. Depending on the hardware/ type set, will alter the associated symbols.



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: Select the either main board or an attached expansion board the display is attached to.
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.

Enable: Option to enable or disable BACnet point in list of values.

ID: Allows you to specify BACnet Object ID.

Name: Allows you to specify BACnet Object Name.

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

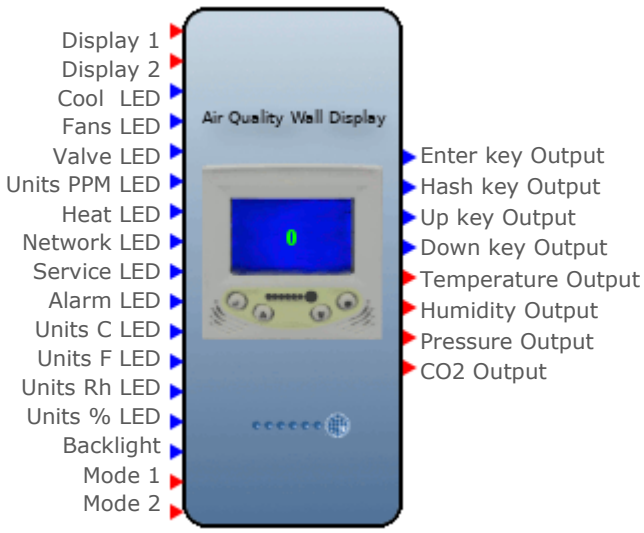
The lower line on the LCD can also be manipulated to left justify and remove the decimal point of the display 2 input.

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

Note 2: The text fields are not available in the Mercury host.

Air Quality Wall Display



The inputs are as follows;

Display 1/ 2 Input: 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		Fans		Valve	
Unit PPM	ppm	Heat		Network	
Service		Alarm		Units C	oC
Units F	oF	Units rH	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.

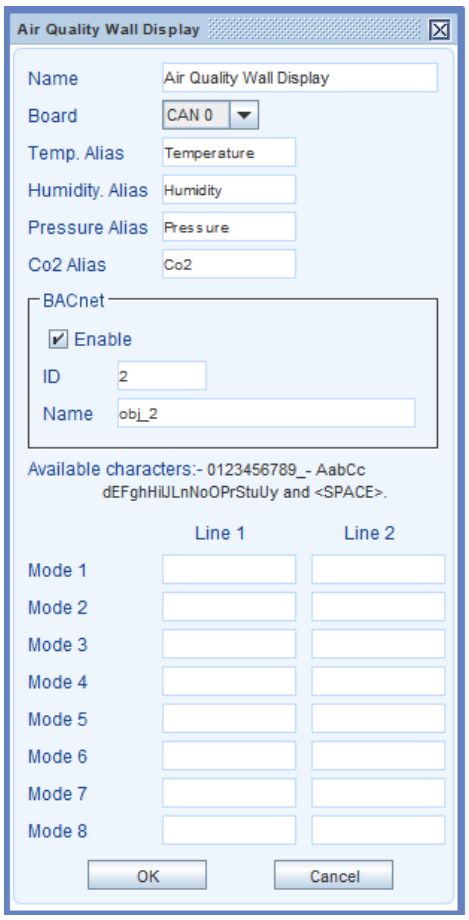
Mode: Accepts an analogue integer value from -1 to 8 to display pre-set characters on the screen (see below).Right clicking on the box will bring the properties screen up like the screen above.

Button Outputs:- Pressing on either the hash, enter, up or down button of the display will activate the corresponding output.

Sensor Outputs:- These outputs will show the current readings of Temperature, Humidity, Pressure and CO2.

(Cont.)

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



Board: Set the board the Air Quality 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 Air Quality Sensors documentation. **Note**: The maximum number of displays connected via CANbus is 15.

Aliases: The display monitors both Temperature and Humidity, these 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 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 – 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

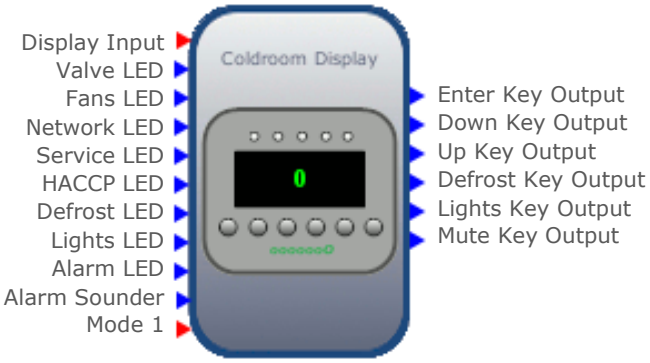
The lower line on the LCD can also be manipulated to left justify and remove the decimal point of the display 2 input.

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.

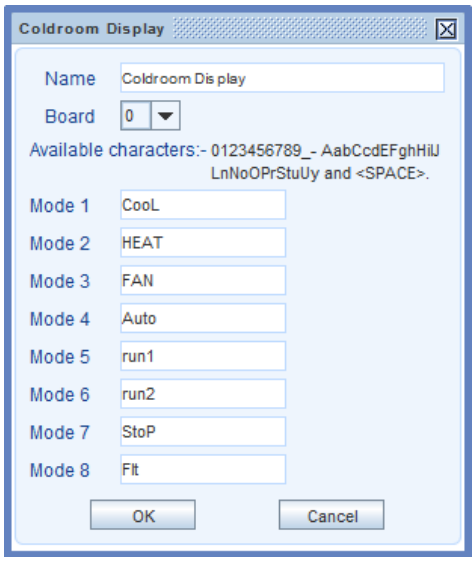
Note: The Display block must always be configured (right click) within the TDB program before it will activate.

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 minute's 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

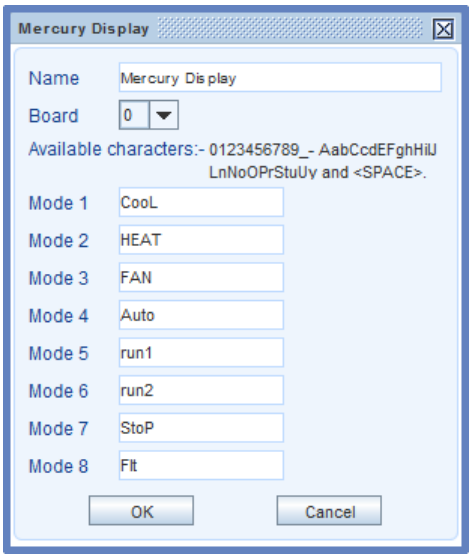
The inputs are

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.

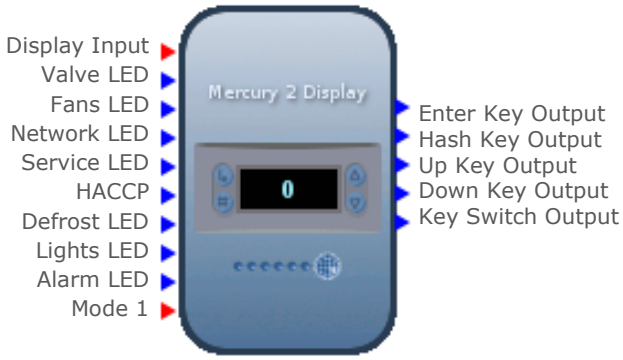
Clock Mode

The LCD display can format a minute's 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

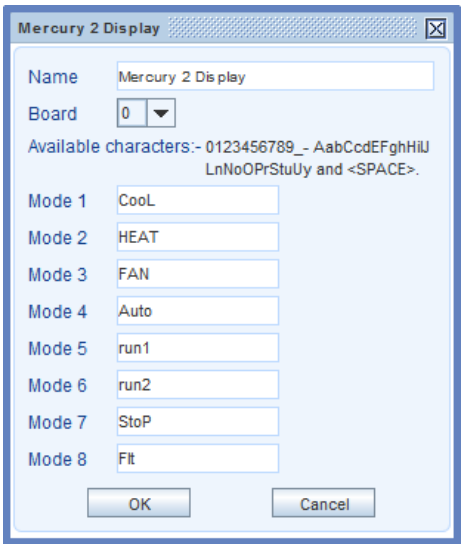


The inputs are as follows;

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

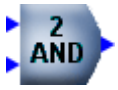
The LCD display can format a minute's value (entered into 'Display input') into the format **00:00** by entering "-1" into the Mode input. E.g., Where Mode 1 is set to '-1', by entering the 'minutes' value 780 into 'Display input', it would be translated to 13:00 on the display.

Note 1: The Display block must always be configured (right click) within the TDB program before it will activate.

Note 2: The text fields are not available in the Mercury host.

Logic Blocks

And blocks

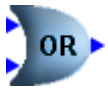


A	B	Output
Off	Off	Off
Off	On	Off
On	Off	Off
On	On	On

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

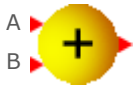
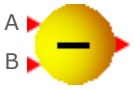
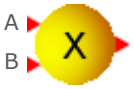
A	Output
Off	On
On	Off

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

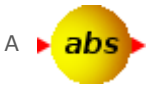
Please ensure all power is switched off before installing or maintaining this product.

Mathematical Blocks

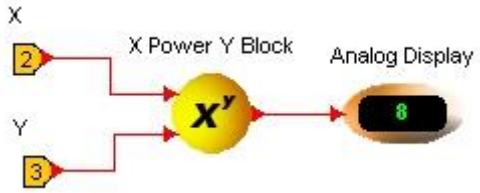
(+, - , x, ÷ blocks)

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

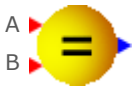
Absolute (abs) Block

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.

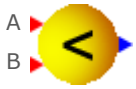
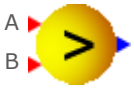
X to the Power of Y (x^y)

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 number of times. In the example below, 2 to the power of 3 (or 2 cubed) equals 8. 

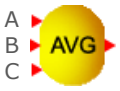
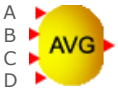
Min, Max, Equals blocks

		
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

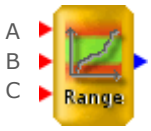
<, >, ≤, ≥ blocks

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

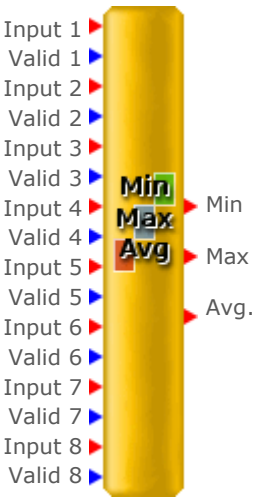
Average & Limit blocks

			
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

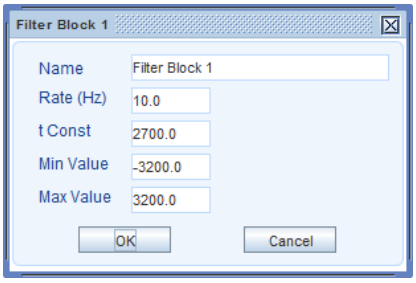
Icon	Properties
	**Input A**: Analogue Value **Input B**: Max Limit **Input C**: Min Limit Digital output goes off when the Analogue value is out with the Max and Min limits.

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.

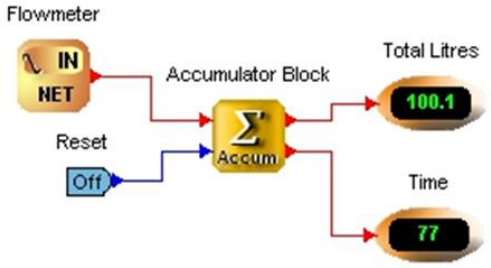
Filter

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): Cont… With an increasing input, it calculates the rate of change for the value X to

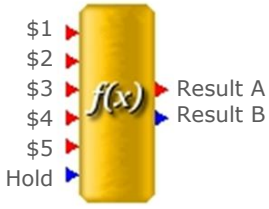
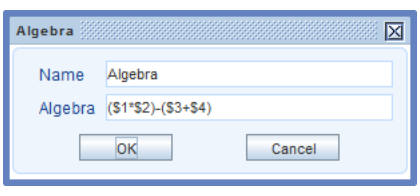
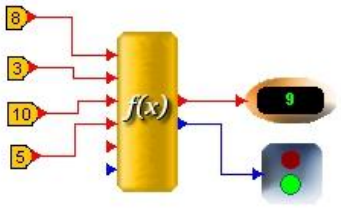


	reach 63.2% of its current value over the 2700 seconds. If the t-Const is increased (from 2700), you are lengthening the time for it to get to the 63.2% point. Thus, increasing the dampening factor. With a decreasing input, it works the same as above, only calculates the rate of change to reach 32.8% 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. **Note:** When using block within Mercury Host, it is advised to keep generic names given as host not capable of holding aliased name after saving to controller.

Accumulator Block

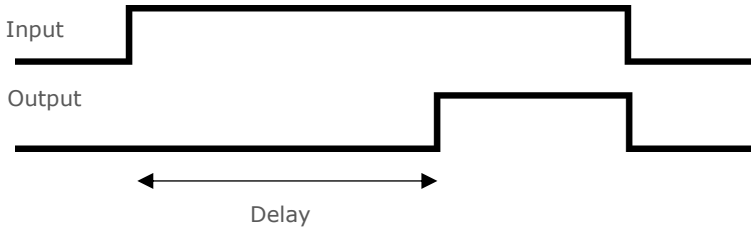
Icon	Properties
	**Input:** The accumulator block samples the value at the input and adds it to the running total count, this sample/calculation is fixed and is carried out every second. **Total:** This is the running total. The accumulation process will start as soon as the TDB program is running. **Time:** 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 (not available on Mercury hosts) on the hour and half past the hour. **Note 1:** Each Accumulator Block added requires to be given a unique name, which can be set in the properties of the block. **Note 2**: When using block within Mercury Host, it is advised to keep generic names given as host not capable of holding aliased name after saving to controller.

Algebra

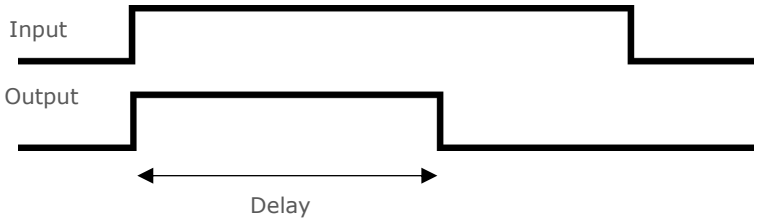
Icon	Properties
 Digital Output 'Result B' will go 'high' for a non 0 result.	This block has 5 variable analogue inputs and will perform advanced calculations. The digital 'Hold' input, when on, will hold the result regardless of the values updating on the analogue inputs. Calculation can be up to 255 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.

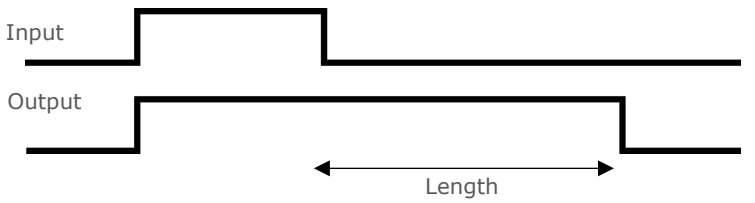
Pulse Timer

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.

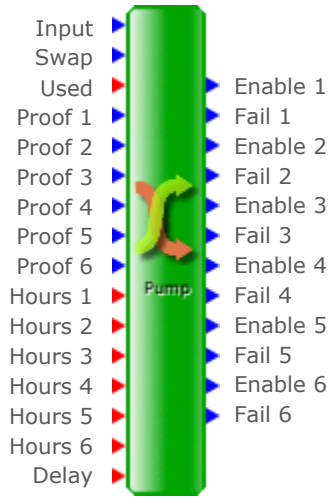
Run Hours Block

Icon	Properties
 Input A: Input Input B: Reset	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 hour count is stored in the device's memory on the hour and half past the hour. The maximum hour count is 596,680 (which equates to 68 years). **Note**: The Hour Count is periodically saved in the TDB device's non-volatile memory (not available on Mercury hosts) on the hour and half past the hour. **Note 1**: Each Run Hours block placed requires being given a unique name, which can be set in the properties menu of the block.

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.

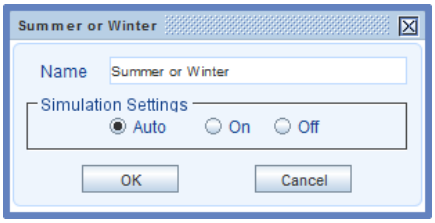
Match Date

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.

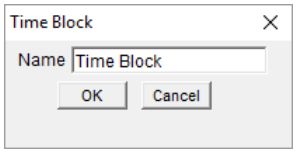
Summer or winter

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 added to the morning on time for the Daytime and Twilight outputs. A positive offset will advance the Daytime and Twilight on time. A negative offset will delay the Daytime and Twilight on time. **Evening Offset:** Allows for a positive or negative offset to be added to the evening off time for the Daytime and Twilight outputs. A positive offset will delay the Daytime and Twilight off time. A negative offset will advance the Daytime and Twilight off time. **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. 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.

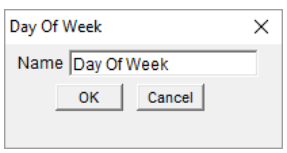
Time Block

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 assigned by editing the properties box. **Note**: An index of '1' will only alarm locally and not be sent over the network if setup. **Note1**: Each alarm block should be given a unique name

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

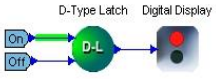
Value Switch Start-up Value 	Initially the output is at the start-up value. Analogue values can be stored by turning the switch on then off, the output retains the input value at the time the switch is turned off. Click the "Non-Volatile" option (not available in Mercury hosts) to save the output value 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. **Note 1**: When using block within Mercury Host, it is advised to keep generic names given as host not capable of holding aliased name after saving to controller.

Pulse Counter

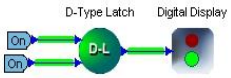
Count Up Count Down Reset 	The output increments and decrements in accordance with the up and down inputs. The output will go to zero when the reset input is active (On). **Note 1**: The current count is periodically saved in the TDB's non-volatile memory (not available in Mercury hosts) on the hour 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. **Note 3**: When using block within Mercury Host, it is advised to keep generic names given as host not capable of holding aliased name after saving to controller.

D-Latch

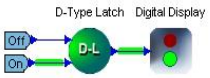
'D' Input Clock D-L	The "D" digital input value is clocked through to the output on each rising edge of the clock input B.



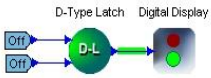
Input (A) is on.



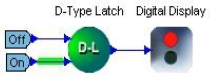
Input (A) is switched through to the output when the clock signal (B) is switched on



Input (A) is removed, output stays on.



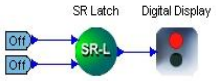
Clock (B) is removed, output stays on.



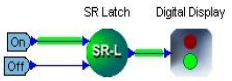
Clock (B) is switched on, Input (A), which is off, is "clocked" through to the output which now goes off.

SR-Latch

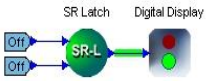
Set Reset SR-L	The output goes on when the "Set" input goes on, and goes off when the Reset input goes on.



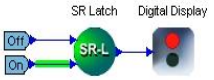
Input (A) and reset (B) are both off.



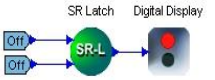
Input (A) is switched on and goes straight through to the output.



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

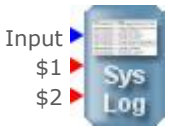
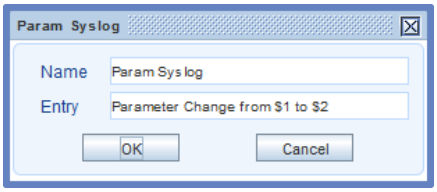
Signal Edge Edge Rising Falling	For each Rising Edge of the input signal the Edge and Rising Outputs will pulse high for 0.1 seconds For each Falling Edge of the Input signal the Edge and Falling Outputs will pulse high for 0.1 seconds.

Analogue Edge Block

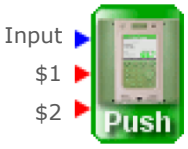
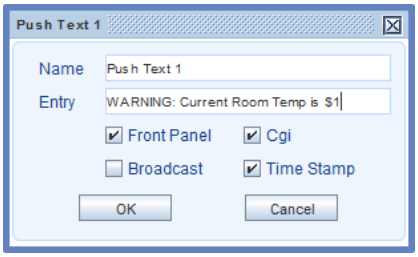
Signal Edge Edge Rising Falling	For each Rising Edge of the input signal the Edge and Rising Outputs will pulse high for 0.1 seconds. For each Falling Edge of the Input signal the Edge and Falling Outputs will pulse high for 0.1 seconds.

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

Syslog

Icon	Properties
	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 allows for analogue values to be included in the system log entry. In the above example when the digital input is activated the values currently fed into $1 & $2 will be included in the system log entry. e.g., "Parameter Change from 10.1 to 5.6" for when $1 = 10.1 & $2 = 5.6. Note the controller will save a maximum of 300 entries in the system log. **Note**: Only available on the Intuitive/ TouchXL TDB platform.

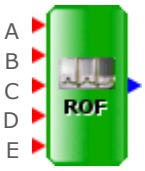
Push Text

Icon	Properties
	This block allows a scrolling text message to appear on the following devices; DMTouch Front End Panel Connected TouchXL Orbits PC screens Intuitive TDB Connected TouchXL displays PC screens TouchXL TDB Controller TouchXL screen Connected TouchXL displays PC Screens  Operation When the Input is activated, the text message in the Entry field will appear on the selected interface. If the values $1 and $2 are included in the text message then the analogue values connected to the $1 and $2 inputs will be displayed in the text message. **Front Panel**: If ticked, then the message will appear on the DMTouch front screen. **Note:** checkbox will not appear on intuitive or TouchXL platforms. **Cgi**: If ticked, the message will be displayed on the computer-generated interface, such as a PC or mobile device. **Broadcast**: Broadcasts to another Data Manager, Intuitive or TouchXL TDB on the network. **Time Stamp**: The message will appear with the date and time shown first.

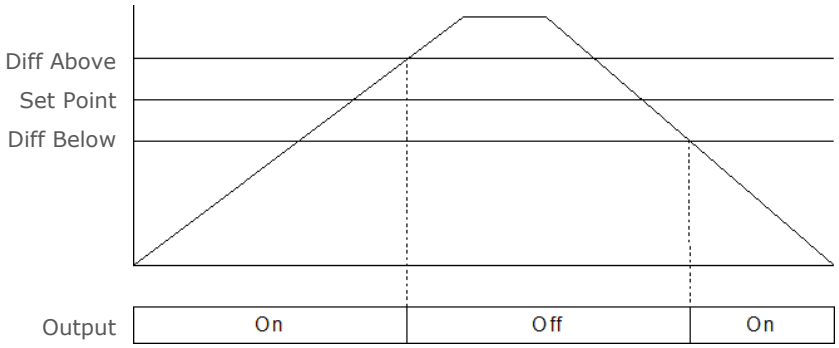
Reverse On/Off / Reverse On/Off 2

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".

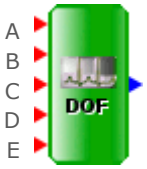
As shown in the above graph, when the system is initially switched on the temperature is below the set point minus the diff below, this would cause the output (heating) to be switched on. As the room heats up, the temperature rises above the set point, when the temperature reaches the set point plus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

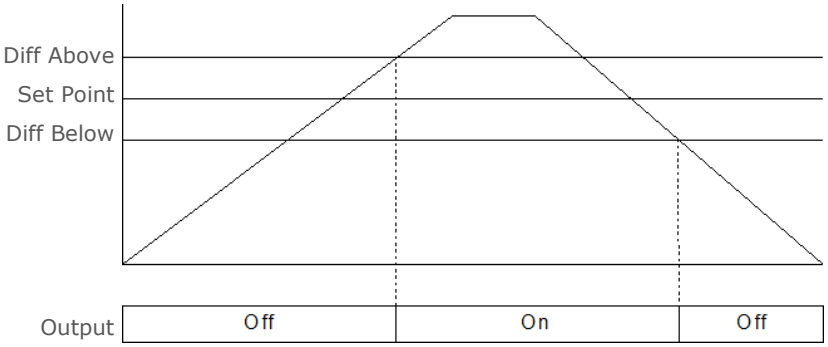
Direct On/Off / Direct On/Off 2

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

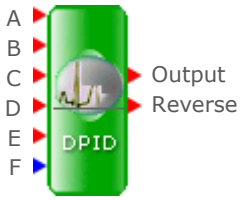


A Direct On/Off block works in the opposite manner to a Reverse On/Off block and would typically be used to control a cooling function.

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.

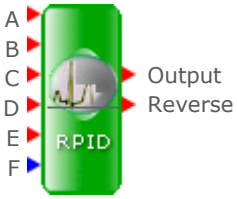
The Proportional constant, Integral and Derivative settings determine how quickly and by how much the output varies in relation to the input. These values require fine tuning and should be used with care.

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

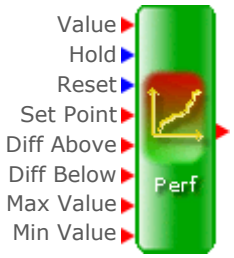


Input A: Analogue input
Input B: Set Point
Input C: Proportional constant
Input D: Integral
Input E: Derivative
Input F: Hold

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.

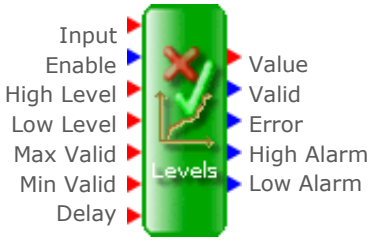
A score of 1 equates to a good performance, a score of 10 equates to a poor performance.

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.

Note: Not available in the Mercury Platform

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.

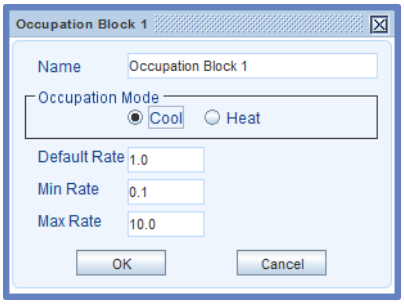
Occupation: Connect the analogue output of the GP2/GP3 block here.

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**.

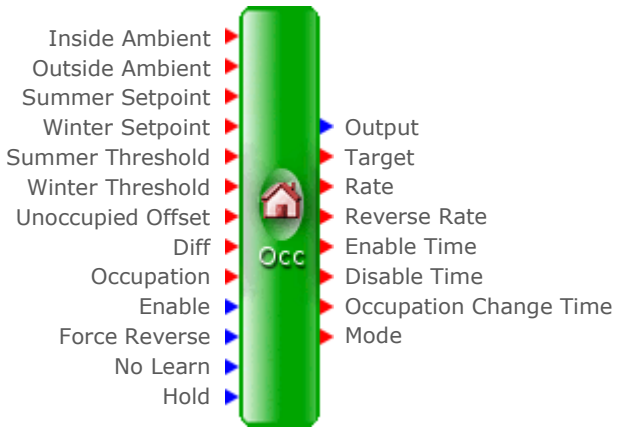
The Occupancy Optimisation block calculates the degree per hour change in room temperature when the heating/cooling plant is on. This allows the block to determine when to enable the output. The default rate is 1Deg per hour and is used until a current rate is calculated.

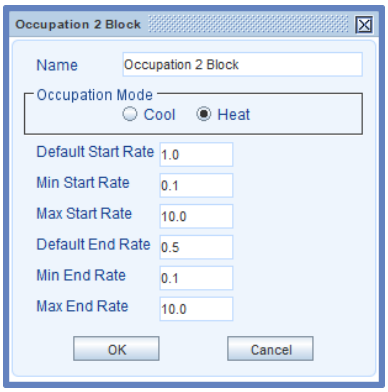
The rate is continuously calculated by the block.

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;

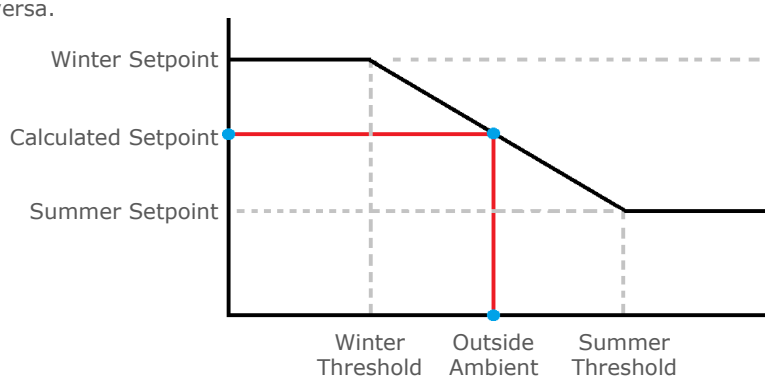
0: Initial State
1: Out with time bands from GP Timer. i.e. off state.
2: Inside of 'Enable' window
3: Enabled, but not learning
4: Enabled and learning
5: Reached target/ occupation time, finished learning
6: Reached target/ occupation time, not learning

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.



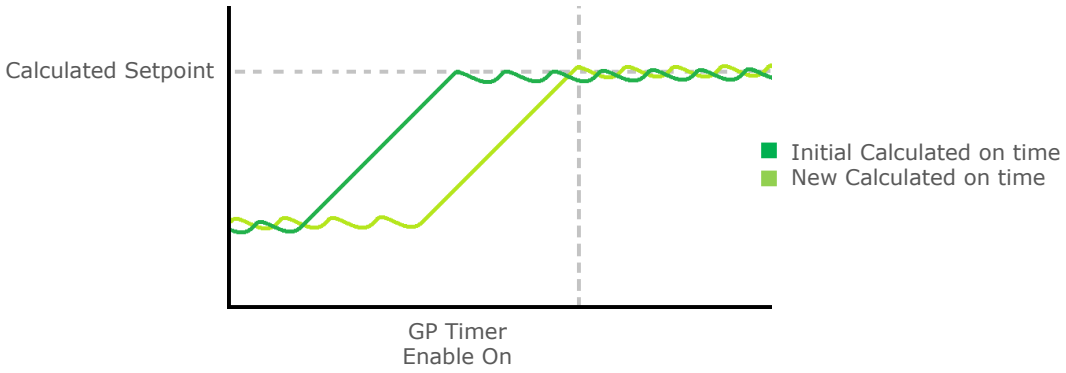
Start Rate

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.

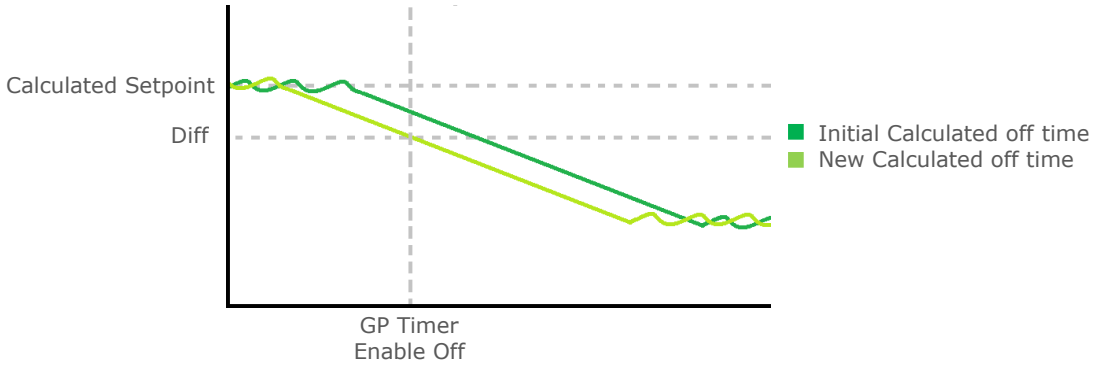


Reverse (End) Rate

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.

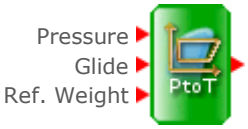
In the heating example below, it again shows two temperature lines. The block uses the initial 'default' end rate of change to calculate when to switch the heating plant off. The target temperature for the 'GP Timer Off' (or the end of occupied time) will be the current target setpoint minus the dif. 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

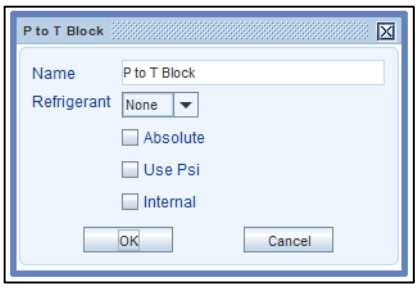


Current Supported Refrigerants;

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.
**Not available in P2T1

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.

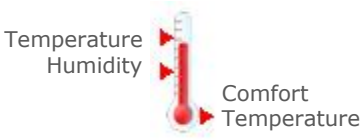
Absolute: Tick to use Absolute pressure, leave un-ticked for Gauge pressure.

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.

Note: When using block within Mercury Host, it is advised to keep generic names given as host not capable of holding aliased name after saving to controller.

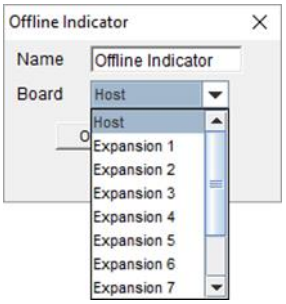
Comfort Block



This block can use both the Temperature analogue input and the humidity to calculate the apparent temperature using the comfort index shown in appendix 4.

Offline Block

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



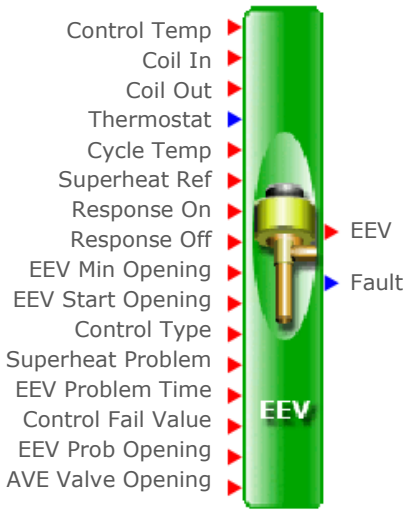
Block Name can be changed.

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.

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

EEV Block



The block gives an EEV output which displays the percentage value that the valve has opened to and also a Fault output if the fault has gone into a fault state.

The EEV block is used to control an Electronic Expansion Valve (EEV)

Control Temp – This is the temperature that the controller will try to maintain around the cycle temperature.

Coil In/Out - Evaporator temperatures used to work out the superheat.

Thermostat - Turns the valve operation on and off

Cycle Temp – Temperature at which the valve will energise

Superheat Ref – The superheat temperature that will try to be maintained**.**

Response On / Off – Allows the speeding up and slowing down of the EEV opening and closing speed. This has a value of 0-60 (60 being the quickest)

EEV Min Opening - Sets the minimum valve opening level, during normal operation the valve will not go below this level.

EEV Start Opening - Sets the initial valve opening % which is used when there is a demand for cooling or when the device is first powered on.

Control Type - Allows the user to select the following options :-
0 - EEV uses the superheat as its main reference with the cabinet temperature as a secondary control.
1 - EET uses the cabinet temperature as its main reference.
2 - EEV/EET uses cabinet temperature as the main control until the SH gets close to the SH reference point, then it switches to EEV control, it switches back to EET control when the SH reference is satisfied.

Superheat Problem - Sets the point at which the algorithm will go to the "EEV Problem" state due to the superheat temperature.

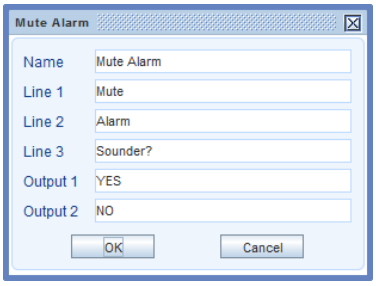
EEV Problem Time - Sets the time the algorithm stays in the "Superheat EEV Problem" state

Control Fail Value - This value is used in the event of a control probe fail; In the EEV control algorithm the valve will remain at this opening until the probe fault has been cleared

EEV Prob Opening - Sets the valve open position when entering the "Superheat EEV Problem" state.

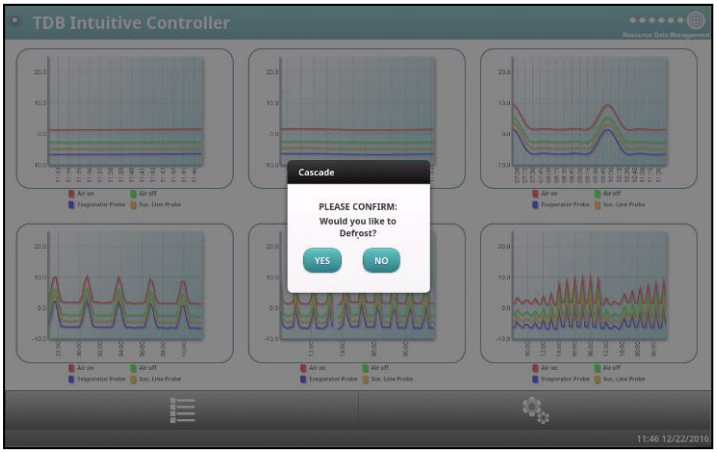
AVE Valve Opening - Normally the valve during recovery will open to the last average position. This setting allows for that value to be reduced by said percentage.

Display Cascade Block



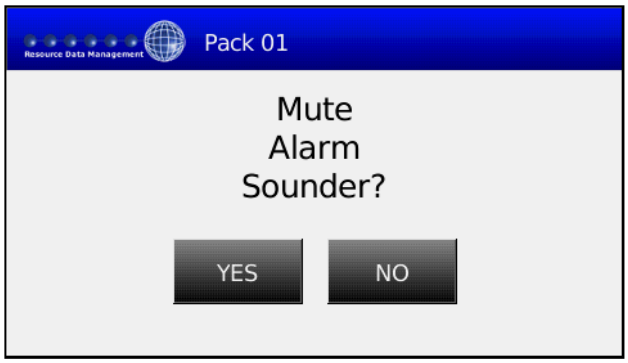
The Display Cascade Block can be used in conjunction with the TouchXL TDB Controller, TouchXL Display or the Plant Touchscreen Display.

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'.

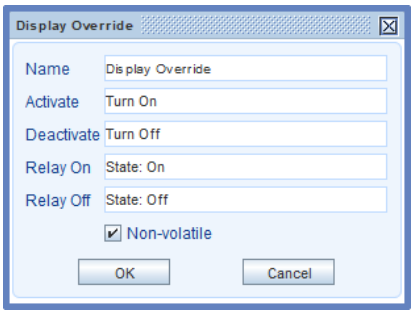


If the left-hand response button ('YES') is pressed then the 'Yes Button' output is momentarily activated. If the right-hand response button ('NO') is pressed then the 'No Button' output is momentarily activated.

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 layout 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.

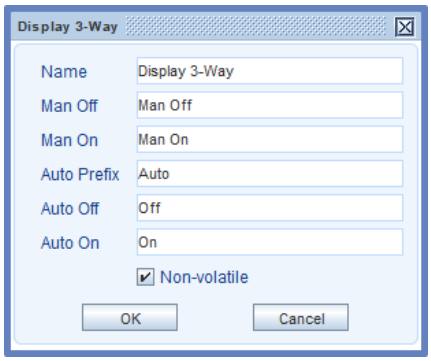
Non-Volatile Option
With this option 'unchecked', if the device receives a reset, the block will resort to its default state. When the option is 'checked' and the device is reset, it will return to the state it was in. **Note**: when implementing a strategy, take into considerations any settings/ logic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

Layout Setup
When the Display Override block is used in conjunction with the Layout setup, it will look similar to the image below. This will be on both the web interface and the TouchXL display (if fitted). Please see the relevant documentation 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.

Note: Each Display Override block should be given a unique name, which can be entered in the properties menu.

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

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.

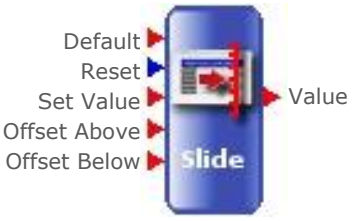
Non-Volatile Option
The block has the option of saving the last override activation in non-volatile memory. With this option 'unchecked', if the device receives a reset, the block will resort to its default state. When the option is 'checked' and the device is reset, it will return to the state it was 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.

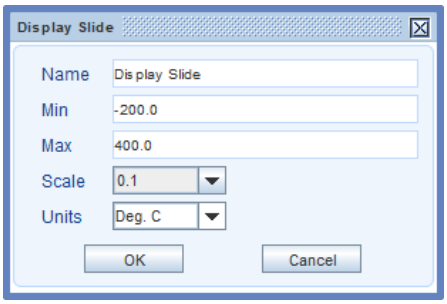
Layout Setup
When the Display 3-Way Override block is used in conjunction with the Layout setup, it will look similar to the image to the right. Please see Layout Setup section in the respective device for details of configuration. In the layout, all three buttons (representing the 3 states) will be 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.

Note: Each Display 3-Way block should be given a unique name, which can be entered in the properties menu.

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

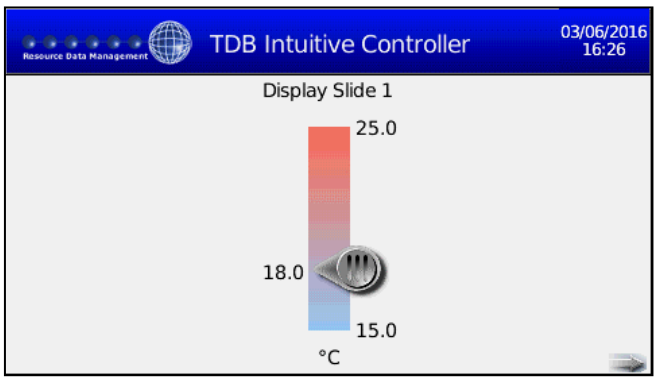
Display Slide Block





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.

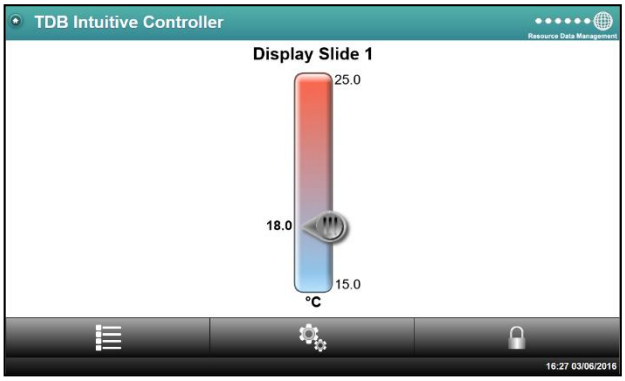


Default	This is the default analogue value that the block will use when the 'reset' is activated.
Reset	When this is activated the block will return to its default setting.
Set Value	The base value to which the 'above' and 'below' offsets are referenced.
Offset Above	The highest value above the 'set 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 in the respective device for details of configuration. It will work in the same way as detailed above, with the Plant USB touch display.

Note: Each Display Slide block should be given a unique name, which can be entered in the properties menu.



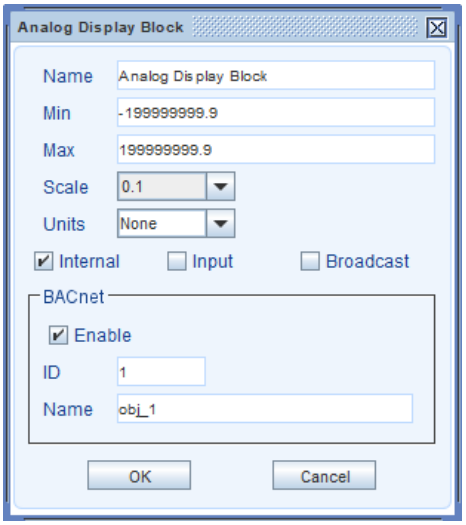
Please ensure all power is switched off before installing or maintaining this product.

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).



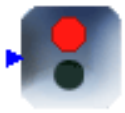
Internal If the Internal option is ticked then this value will remain within TDB program. If un-ticked, the Analogue display will appear as a value in the output section of the device "Control Summary" and will require being given a unique name.

Input If the Input option is ticked the Analogue display will appear as a value in the input section of the IO list.

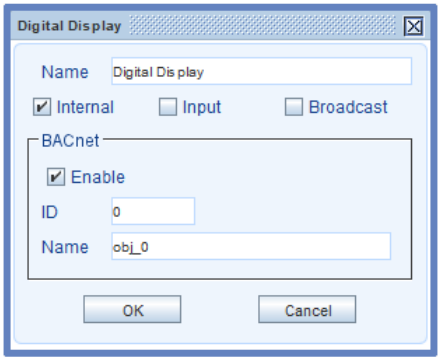
Broadcast Check the broadcast box for the value in the block to be 'broadcast' over the IP network to which the device is on. The value can be picked up from another TDB device set to receive it. For more information see Peer to Peer section.

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" and will require a unique name to be given.

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.

Enable: Option to enable or disable BACnet point in list of values.

ID: Allows you to specify BACnet Object ID.

Name: Allows you to specify BACnet Object Name.

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.

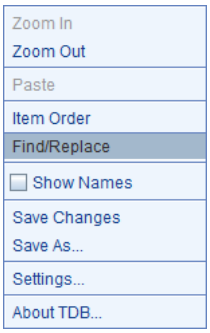
Show Names

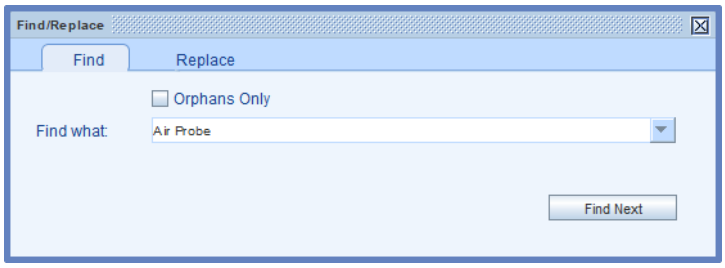
Right click on the workspace and from the sub-menu select "Show Names". All TDB blocks will have their names shown above them.

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".

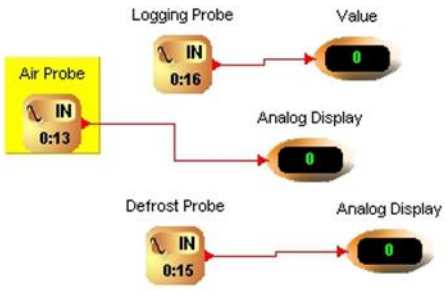




Enter the name of the item you want to find, ("Air Probe" in the example) and click "Find Now".

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.

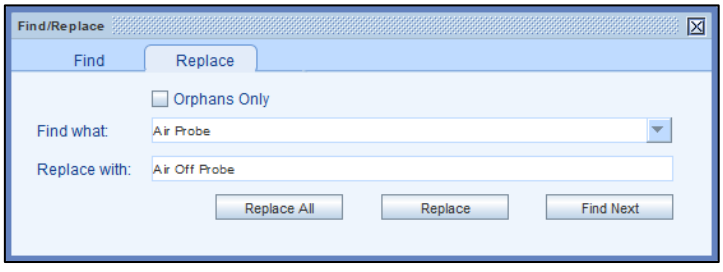


Replacing an Item

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.

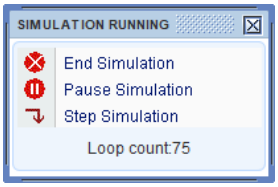
If there are several items with the same name you can replace them all with another name by selecting the "Replace All" button.



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.



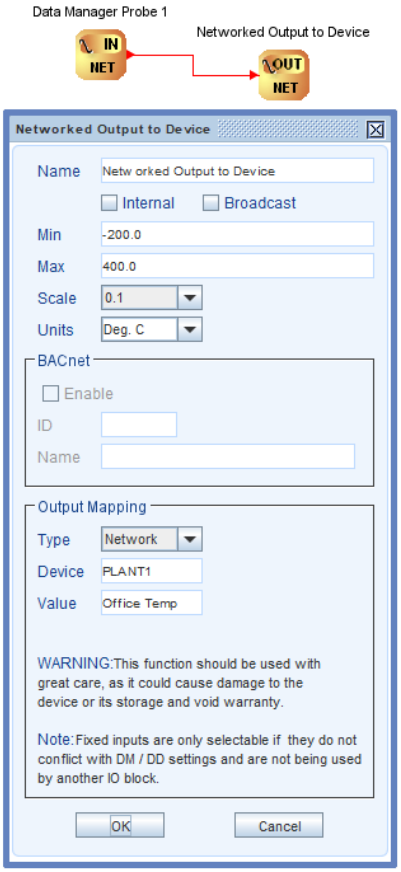
Hovering the mouse pointer over outputs and inputs will show the value. Diagnostic analogue or digital displays are also a useful way to observe data flow through the application.

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

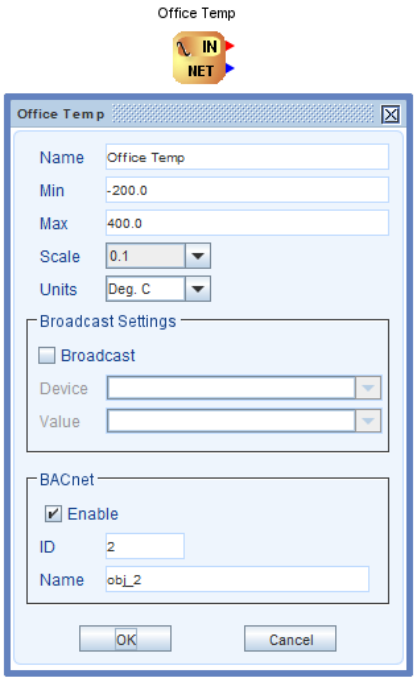
Network Input Blocks

TDB Device Receiving Analogue Values from a Data Manager TDB Program

Data Manager TDB



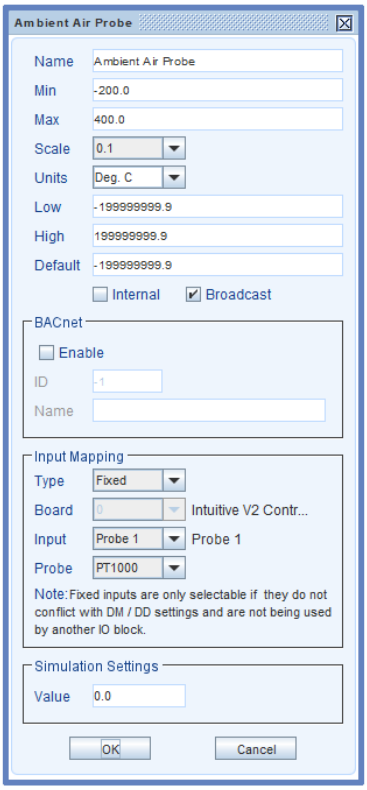
Intuitive/ TouchXL/ Mercury TDB Device

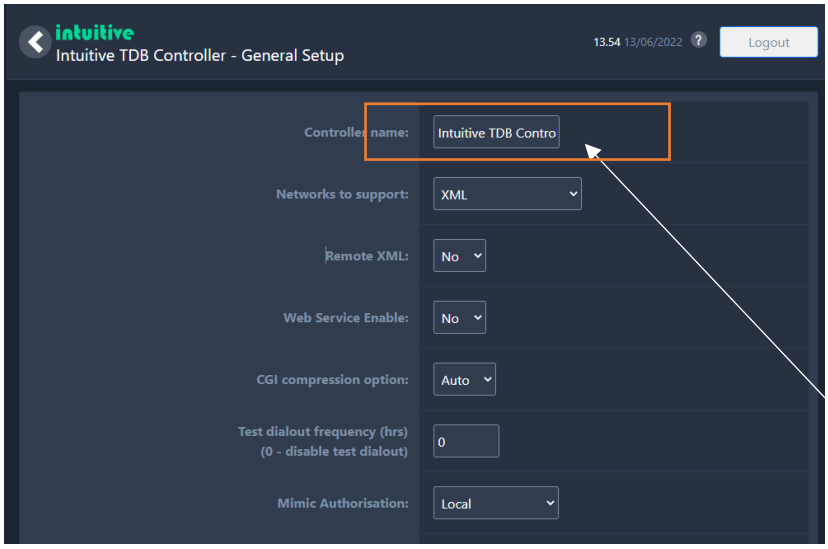


The above example shows the DM TDB program (on the left) sending its value to the TDB program with the device name 'PLANT1'. Network Digital values are set up in a similar way.

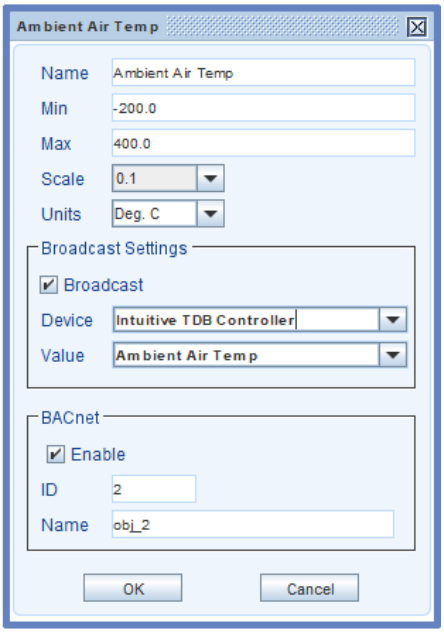
Peer to Peer

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 Site Setup 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., Intuitive TDB 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.

Note: A similar process should be followed for digital inputs and setting blocks

Enable: Option to enable or disable BACnet point in list of values.

ID: Allows you to specify BACnet Object ID.

Name: Allows you to specify BACnet Object Name.

Data Manager Peer to Peer

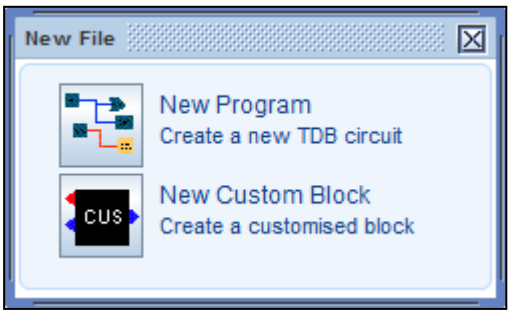
If the peer-to-peer value requires to be received from a Data Manager, then the 'Device' field on the Network Input block should simply be the Device 'name' the running program has on the 'Device List' within the DM.

Custom Blocks

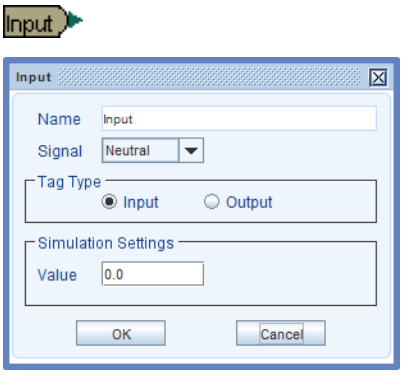
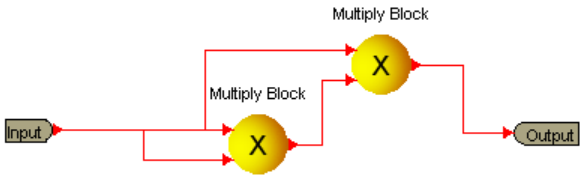
Custom blocks can be introduced to either create functions which are not available in the standard TDB toolbox or simplify the circuit diagram. **Note:** not all custom blocks will be suitable for all platforms. The blocks used within the custom block needs to be available on the platform intended.

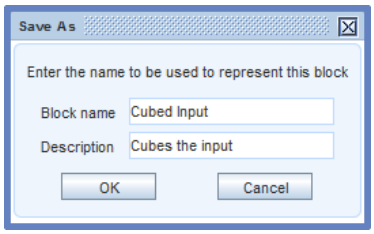
Creating a new Custom Block

To begin creating a new custom block, open the Editor and click on 'New'. The following options box will be shown;



Clicking on 'New Custom Block' will open an 'untitled' tab and offer a blank canvas to begin. From here use the available blocks to create the required custom block. To create inputs and outputs to the block the user must use the 'Tag Block';

Icon	Properties
	The tag block is used to create Inputs and Outputs going to and from the customised block. When selected, clicking on the canvas will place the block. The properties are shown on the right. **Name**: The name given to the Input / Output to the block. **Signal**: Must be either Analogue or digital. **Note**: the colour of the tags wire will change accordingly. **Tag Type**: Select whether it is to be an input or output to the customised block.  **Simulation settings**: The value the I/O will hold during the simulation.  When the block is complete. It must be saved before it can be used in other applications. Therefor click on 'Save As' within the editor. The following screen will be shown;

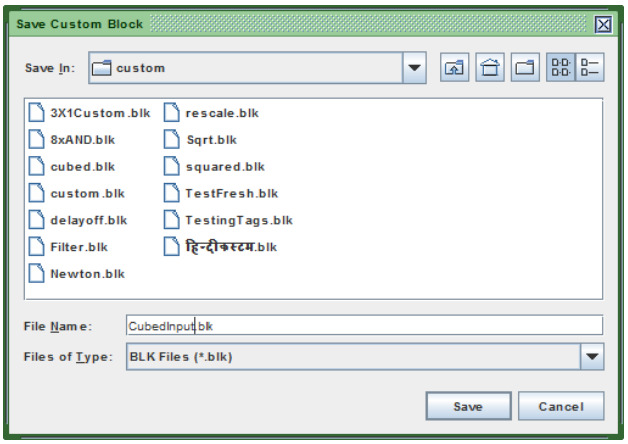


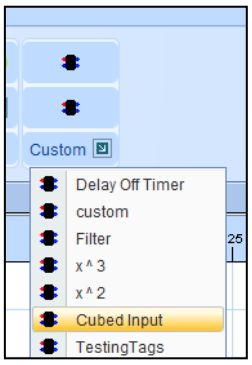
The boxes will give you the option to give the block a name and associate a description to it.

The next stage is to save the block in a location. For it to be selectable within the Editor the block **must** be saved in the 'custom' folder where the application is installed.

The type of file must be kept as ".blk".

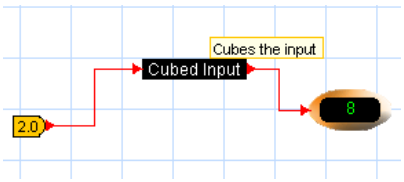
Give the file a name and click save.





Now, after it has been saved, if the user was to now click on a new program to create a TDB application, within the 'Custom' drop down menu, the newly created block will be visible

Once in use the block will work in whichever application it is placed.



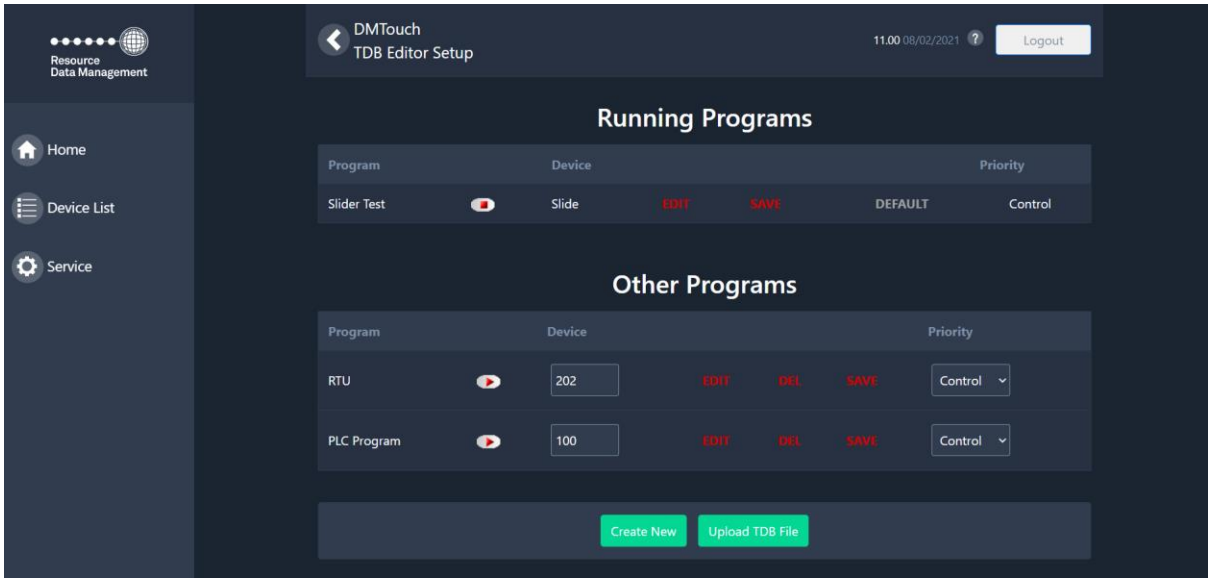
Please ensure all power is switched off before installing or maintaining this product.

Appendix 1 – Uploading a TDB to a Data Manager

Once a TDB application has been created, the program can be uploaded to a Data Manager, for it to be run, through one of 2 methods. Either via the DM's web pages or USB memory stick. **Note**: TDB has to be enabled on the DM for programs to run.

Uploading via the DM's web pages

Navigate to the TDB editor Setup page (within Service menu then devices) to show the following screen;



From here, click on the 'Upload TDB File'. It will then allow you to open the file location where the saved TDB is. Follow the onscreen options which will lead you to uploading the TDB file.

Once uploaded, the name of the program will appear in the 'Other Programs' section (as above). Type in the 'device name' (as it will appear on the device list) and click the 'play' button. This will begin the program.

Note: For more information, please refer to the Data Manager's TDB user guide.

Uploading via the DM's USB

Firstly, save the TDB program on a USB memory stick in the root directory (i.e., not within a folder). Place the memory stick into the Data Manager and navigate to Service, Devices, TDB Editor.

From the DM's page click on Upload TDB file. It will give you the options to select the file and upload it. From there, assign the 'child' name to the controller and press the 'play' button. The TDB will start.

Appendix 2 – Uploading a TDB to an Intuitive or TouchXL TDB Controller

Intuitive/ TouchXL TDB upload through web interface

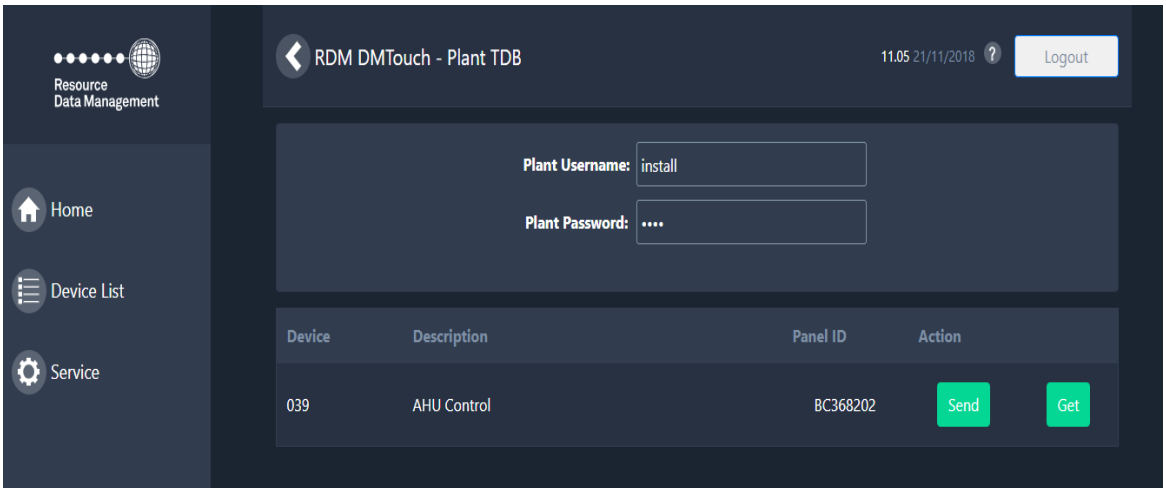
To upload the TDB program to an Intuitive or TouchXL TDB controller simply navigate to the device's web pages.

Log in with the user's name and password, then navigate to TDB and select 'Send to Controller'. From the options, choose the file from the directory on your PC then click 'Upload'. The program will begin automatically.

Note: For more information, please refer to the Intuitive/ TouchXL TDB user guide.

Intuitive TDB upload through Data Manager

If the Intuitive/ TouchXL device is already logged on a Data Manager then the program can be uploaded directly through the Data Manager's web interface. Simply navigate to Service, Devices and click on 'Plant TDB Upload'.



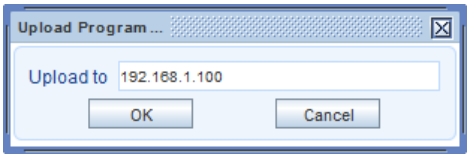
The screen above will show. Insert the Intuitive or TouchXL's user name and password and click send. It will provide the option of selecting the file from your PC. Click Upload.

Note: For more information, please refer to the Data Manager's TDB user guide.

Appendix 3 – Uploading a TDB to an Intuitive Mercury Controller

Intuitive Mercury TDB upload through Desktop Editor

In order to upload to a Mercury controller directly, the device must be on the same network as the PC running the Editor. Therefore, while running the TDB desktop editor, with the program to go on the platform open (already saved), click on the 'Upload' Button. The pop-up box will appear;

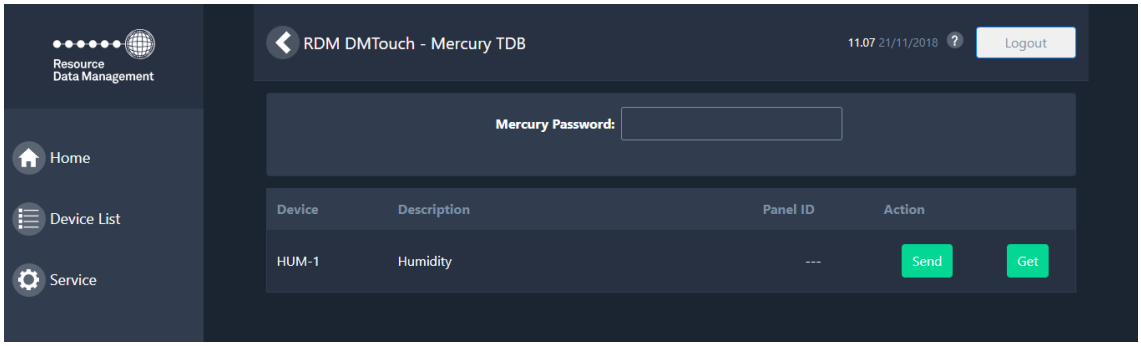


Enter the IP address of the Intuitive Mercury platform and click OK. Once uploaded a 'success' message will appear or it will give a reason to why it failed (e.g., incorrect IP, wrong platform etc.)

Note: For more information, please refer to the Intuitive Mercury TDB user guide.

Intuitive Mercury TDB upload through Data Manager

If the Intuitive Mercury TDB device is already logged on a Data Manager, then the program can be uploaded directly through the Data Manager's web interface. Simply navigate to Service, Devices and click on 'Mercury TDB Upload'.



The screen to the right will show. Click send. It will provide the option of selecting the file from your PC. Click Upload.

Note 1: When uploading a Mercury TDB program through the Data Manager the program must be saved as a ".btdb" (binary TDB).

Note 2: For more information, please refer to the Data Manager's TDB user guide.

Appendix 4 – 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

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

Appendix 5 – Stepper Rate

When configuring the Rate (Hz) for a Stepper output the following table applies.

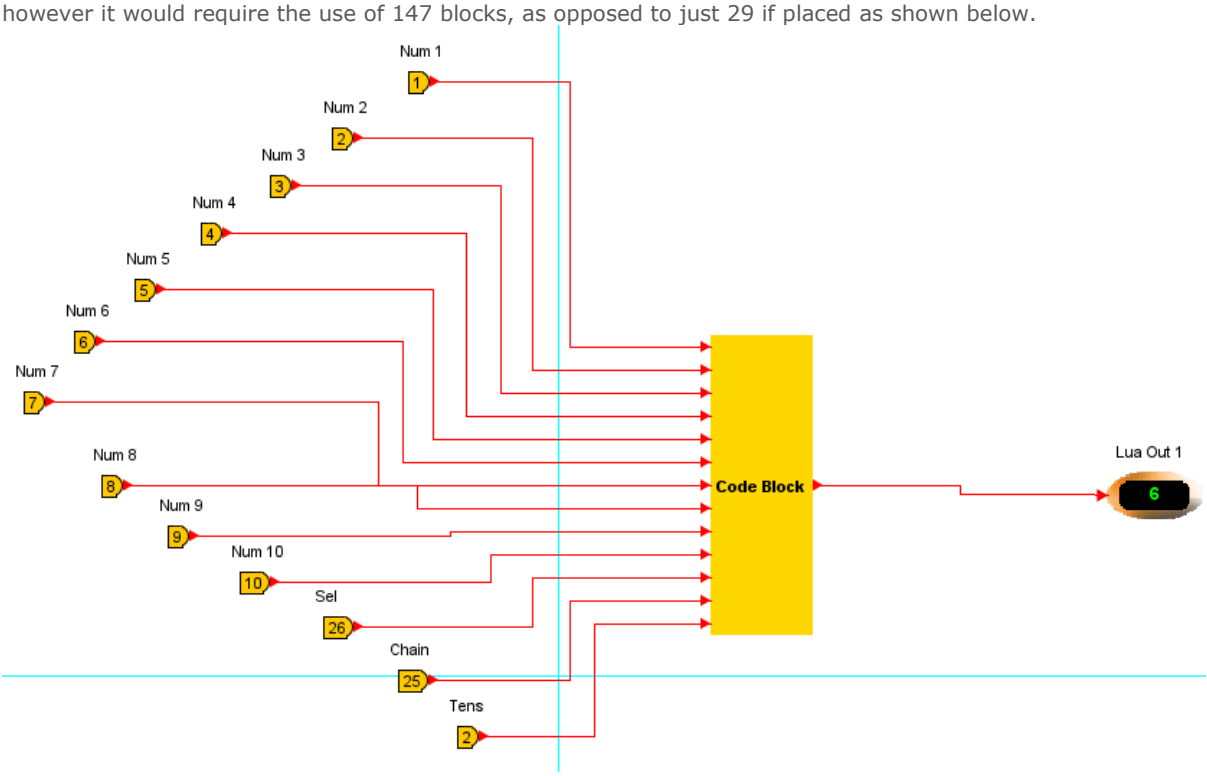
Rate Entered	Speed Set (Hz)		Rate Entered	Speed Set (Hz)
500 and above	500		86 to 90	90
251 to 333	333		81 to 85	85
201 to 250	250		76 to 80	80
167 to 200	200		71 to 75	75
144 to 166	166		66 to 70	70
126 to 143	143		61 to 65	65
112 to 125	125		56 to 60	60
101 to 111	111		51 to 55	55
96 to 100	100		50 and below	50
91 to 95	95			

Please confirm with the Stepper valve manufacturer datasheets to select the correct step frequency. Note currently the hardware will not provide a holding current. In a small number of applications this may be required to ensure the correct operation.

Appendix 6 – Code Block Use

In addition to the Code Block section above, this part of the User Guide provides a more complex example of how the code block can be used and further information on its functionality.

As stated previously, the main use of the block is to help reduce the number of blocks used within a program, by allowing the user to perform processes that would previously need to be carried out multiple times within the program, to be done within a single block. In the example below, the code block is used to take 10 Analog inputs and either returns one of them or the value within "Chain", depending on the "Sel" and "Tens" values. A similar, albeit not exact same, piece of logic can be created utilising other blocks within the TDB Editor, however it would require the use of 147 blocks, as opposed to just 29 if placed as shown below.



The code block has been set up with 13 inputs:

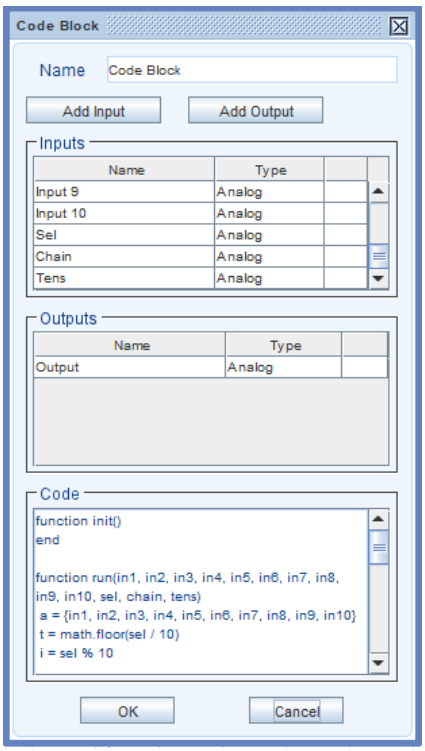
"Input 1" through to "Input 10" which will create a list of inputs from which the block can use as an output.

"Sel" which acts as an input selector for the block, i.e., this value is the starting point for the logic to choose the output. Depending on what this value is, will determine which input from the first 10 will be given to the output.

"Chain" could be used to daisy chain blocks. For example, another could block could be setup similar to above but with different values for the 10 inputs and therefore providing a different output which could then be fed into this block.

"Tens" is used via the code block's mathematical capabilities in order to allow multiples of ten to be used in the input selector.

It has also been given 1 Output.
Note: Currently, there is a maximum of 16 inputs and 16 outputs that can be added to a single Code block.



Each Input has then been connected to a setting block as shown and an Analog display block connected to the output.

Setting Up a Run Function

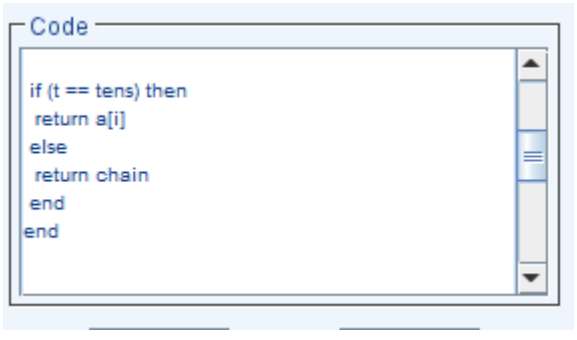
In the image to the right is the function used in order to carry out the desired action as described above.

In the first line of the "run" function, the parameters for the function are set out by listing the inputs that are being used.

In the second line, this is defining a parameter "a" as a list of those ten inputs to be used later in the function.

The third line is carrying out a mathematical equation. The function of math. Floor is to return the largest integer smaller than or equal to x in the equation "math.floor (x)". Therefore, this part of the function is identifying that "t" should equal the largest integer smaller than or equal to the value represented by "sel" when divided by 10. In this example, the result would be 2.

The fourth line defines that "i" will equal the value "sel" modulo 10. In this example, this would be 6, as 26 divided by 10 has a quotient of 2 and a remainder of 6.



The rest of the function is performing an if statement using the parameters set out beforehand, in order to determine what the output will be.

Therefore, in this example, it will be saying if the value "t" is equal to the value in the input "tens", then the output will return "i" from the variables set up in "a". This is because in LUA, square brackets are used to index a table or list. So, in the example, "a[i]" will return 6 as it is being asked to return the sixth entry "[i]" from the list "a" which happens to be the value 6 for the purposes of the example.

The second part of the if statement, advises that if the first part is not true, i.e. "t" does not equal the value "tens", then the output should return the value represented by "chain" which in the example would be 25.

As seen above, the function has returned the value in Input 6 as "t" had a value of 2 which was equal to the value of "tens" which was also 2. For the use of the tens to work properly in this example, the tens would need to match the multiple of ten entered into the input select. I.e., to get an output of 6 with the "sel" set to 36, tens would need to be 3.

The function must always have "end" in order to signify the end of the run function, but it must be used to show the end of if statements etc also. As shown in the example above, two ends are used to denote the end of the if statement and then also the function itself.

Init Function

When using the init function, anything here should be added into the body of the function to then be used in the run function. This is to allow variables to be used that are not inputs to the block. So, for example, if the value of 5 and 14 were needed for calculations within the run function but were not inputs, they could be added to the init function as so:

```
Function init()
a = 5
b = 14
end
```

These could then be used in the run function by calling for either "a" or "b".

Programming

The use of loops within a function should be used with caution as these could cause problems with block functionality and could stop the function within the code block from running. This would be statements such as "While true do".

There is a maximum of 16 Code Blocks that can be added to a program, however performance of the controller may be affected dependent on the functionality within each block.

Care should be taken when programming this block as currently, there is no simulation mode available to test functionality, although the Online Mode can be used to aid in programming. Therefore, a knowledge of LUA is advisable in order to be aware of the basic functions. As advised previously, the manual can be found at https://www.lua.org/manual/5.1/manual.html and there are also videos that can be found online in order to aid understanding of how to use LUA effectively.

Disclaimer

The specifications of the product detailed in this document may change without notice. RDM Ltd shall not be liable for errors or omissions, for incidental or consequential damages, directly or indirectly, in connection with the furnishing, performance or misuse of this product or document.

Change History

Date	Revision	Update No	Changes
01/10/2014	V2.00	01	New Release.
05/03/2015	V2.01	01	Addition of new 'Analogue Device Input' block.
01/12/2015	V2.1	01	New pages feature.
		02	Addition of individual block help.
		03	Block counts.
		04	Language Select option.
		05	General Enhancements.
05/01/2015	V2.1a	01	Description of maximum number of blocks per host added.
		02	Note added to pages concerning Binary TDBs.
01/10/2016	V2.1.25	01	New CT monitor block.
		02	New Drop list.
		03	New Pump block.
		04	Updated Push text to work with intuitive.
		05	Updated Display blocks to include text and time formats.
		06	Updated state block to select IO.
13/03/2017	V2.1.26	01	New string block.
		02	New Humidistat 2 block.
		03	TouchXL TDB compatibility added.
01/06/2017	V2.1.27	01	Permission to use the '#' character in alarm blocks.
14/07/2017	V2.1.27a	01	Updated some block descriptions.
19/12/2017	V2.2.0	01	Support added for Mini IO board: 4xRelays, 4xAnalogue I/O.
		02	Update to Analogue Input Block Custom Define: Added "Auto" and "Clear" buttons.
		03	New Light sensor probe type option in Analogue Input.
		04	New Analogue Input Sensor Block.

		05	New CT Monitor 2 block.
		06	New DOF2/ ROF2 blocks.
		07	New Occupation 2 block.
		08	New P to T 2 Block.
		09	Added option to Pump Block where it can be set to ignore run-proof.
		10	New RPID2/ PID2 blocks.
		11	Analogue In block Min/Max Limits with default values.
23/02/2018	V2.2.1	01	Image added for Intuitive V2.
		02	Option permitted to have either read or write passwords on. Blks.
		03	PtoT2 block updated.
13/02/2018	V2.2.2	01	Update to copy/paste network input blocks.
		02	Update to renaming items within network analogue inputs.
03/04/2018	V2.2.3	01	Update to mercury host units.
12/06/2018	V2.2.4	01	Advanced find and replace feature.
03/07/2018	V2.2.5	01	Intuitive Mini host added.
		02	Support for V2 expansion boards with PWM.
27/07/2018	V2.2.6	01	Enhanced Find for Orphan blocks.
04/12/2018	V2.2.7	01	Support added for new Mini IO expansion board.
		02	Support added for new Stepper IO Auto-close expansion board.
		04	Update to RDM USA group address details.
		05	Block aliases of Occupancy and Optimisation updated.
16/09/2019	V2.3.0	01	Intuitive Mercury 3 Host added.
		02	Online mode for Intuitive hosts.
		03	Updated program Settings to select Intuitive daughter boards.
03/10/2019	V2.3.1	01	Enhancements to analogue sensor block.
17/03/2020	V2.3.4	01	Support added for MAC's.
		02	New Pack Broadcast block.
09/03/2021	V2.3.6	01	New Code block.
		02	Update to viewing Algebra block.
		03	Warning for naming clashes added.
		04	Refrigerant type names changed to match ASHRAE.
		05	Documentation updated to reflect refrigerant types available in each P to T block.
		06	Update to Override Display Block and Slide Display Block updating in simulation mode.
		07	Default language added.
13/06/2022	V2.4.4	01	Support added to specify any BACnet Object ID and BACnet Object Name.
		02	Option added to Disable or Enable a specific BACnet point in list of values.
		03	Added Mercury 3 to physical view and print layout.
		04	Added all expansion modules to physical view and print layout.
27/03/2022	2.4.8	01	Support added for Air Quality Sensor.
		02	GPTimer 4 Block added.
		03	GP Timer blocks now support up to 100 GP Timer Channels.
		04	Improvements made to the cut and paste functionality.
19/06/2023	2.4.9	01	Enabled GP Timer 2 block for DM / miniDM
		02	Update to German translation file.
18/01/2024	2.4.10	01	Option added to toggle BACnet enable inside the list by clicking on checkbox column.
		02	Improvements made to PtoT and PtoT2 blocks when set to internal.
		03	Improvements made to Drop list block when using Simulation.
		04	BACnet option removed from Occupancy Optimisation, Occupancy Optimisation 2, P to T and P to T 2 blocks as not BACnet configurable
22/03/2024	2.5.0	01	Ability to toggle all BACnet items on and off though item order added.
05/04/2024	2.5.1	01	EEV block added.

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