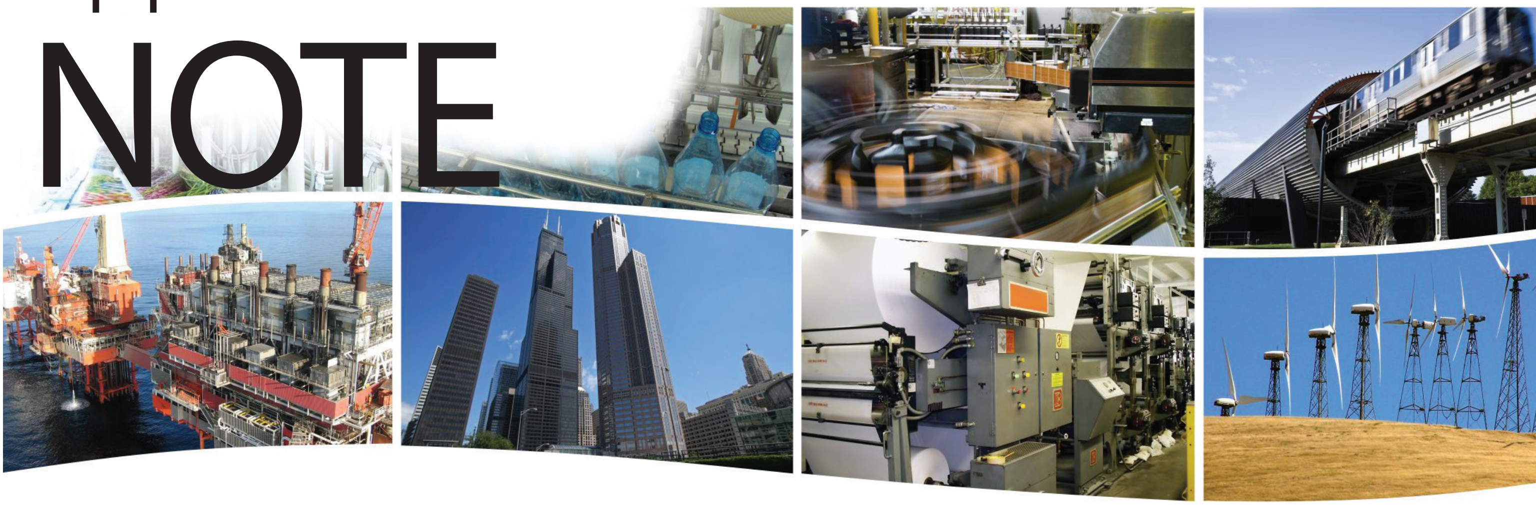
application

NOTE



Sedona 1.2 Component Descriptions

Developed by Tridium Inc., Sedona Framework™ is a software environment designed to make it easy to build smart, networked, embedded devices which are well suited for implementing control applications. The system integrator's role is to create an application by assembling components onto a wire sheet using graphical programming tools such as Niagara Workbench or a third-party Sedona Tool. Applications are then executed by a Sedona Virtual Machine (SVM) resident in Contemporary Controls' BASremote or BAScontrol family of controllers.

Components are deployed in kits which are available from Tridium, Contemporary Controls and other members of the Sedona community. Kits without a company name are from Tridium. Kits with a company name and no product name are from a Sedona community member and these components can be used with other Sedona devices. Kits with both a company name and product name are hardware dependent thereby limiting portability. What follows are both standard and custom components compliant with Sedona release 1.2.28. These components are organized by kit name.

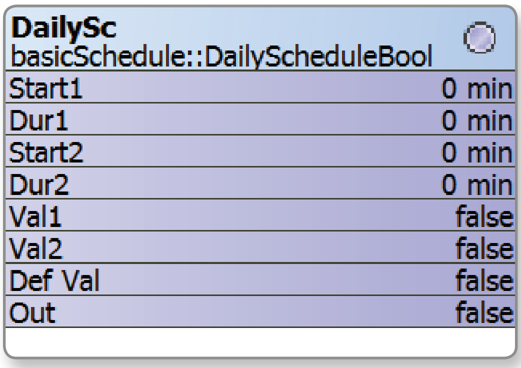
When studying these components keep the following in mind. Boolean variables are assumed if there is a false/true state indication. Integers (32-bit signed integers) are shown as whole numbers while floats (32-bit floating point) are shown with a decimal point. Many of the following components may have been expanded in order to show all component slots in order to display configuration detail. The default view of these components on a wire sheet may not show the same level of detail. The standard Tridium components are shown first and it is Contemporary Controls' policy not to modify Tridium released components.

Index of Kits

Basic Schedule Kit (basicSchedule)

DailySchedule represents a simple daily schedule with up to two active periods. Each active period is defined by a start time and duration. If the duration is zero, the period is disabled. If the periods overlap, then the first period (defined by *Start1* and *Dur1*) takes precedence. If the duration extends past midnight, then the active period will span two separate calendar days. There are two components in the kit — one for Boolean outputs and the other for floats. Both kits rely upon the time being set in the target hardware.

Duration periods — *Dur1* and *Dur2* — are configured in minutes from zero to 1439 minutes.

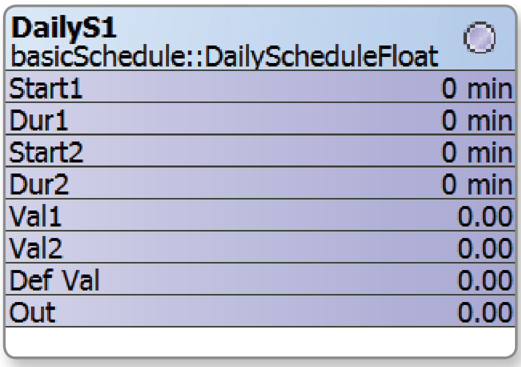


Daily Schedule Boolean — two-period Boolean scheduler. Configure *Def Val* to the intended output value if there are no active periods. Configure *Val1* and *Val2* for the desired output values during period 1 and period 2 respectively.

Out = Def Val if no active periods

Out = Val1 if period 1 is active

Out = Val2 if period 2 is active



Daily Schedule Float — two-period float scheduler.

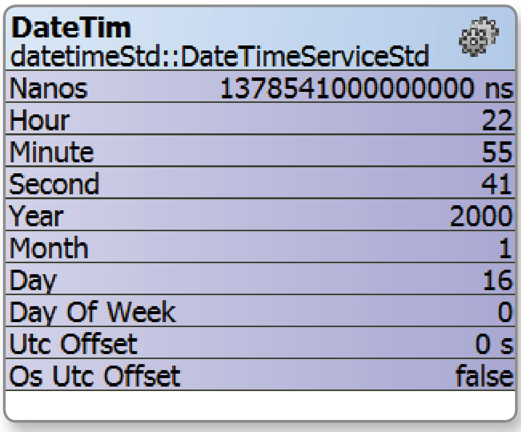
Configure *Def Val* to the intended output value if there are no active periods. Configure *Val1* and *Val2* for the desired output values during period 1 and period 2 respectively.

Out = Def Val if no active periods

Out = Val1 if period 1 is active

Out = Val2 if period 2 is active

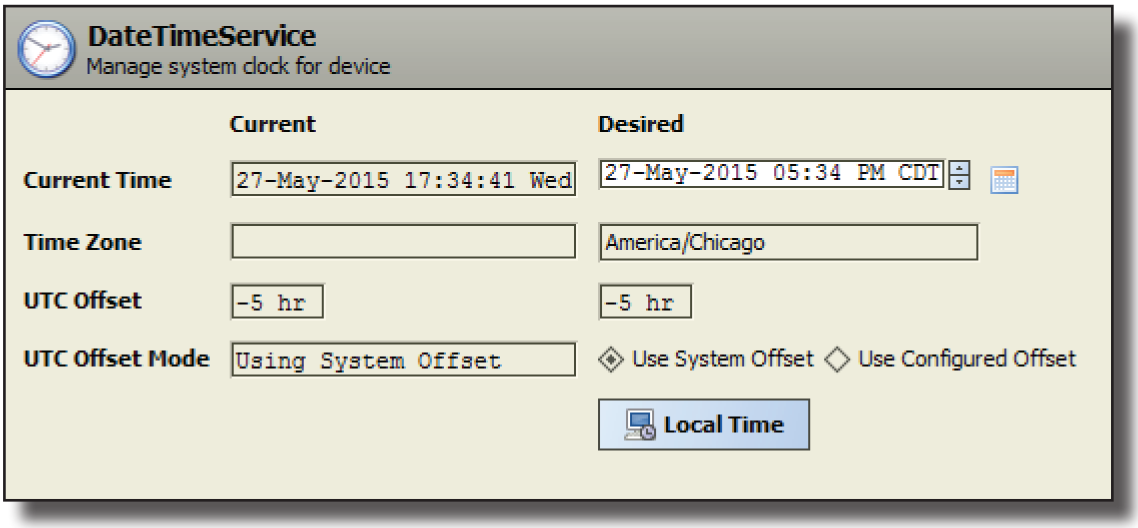
Date Time STD Kit (datetimeStd)



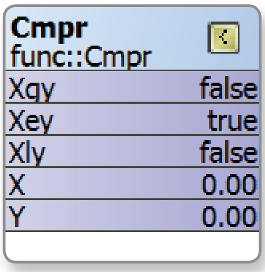
The *DateTim* component is the only component in the Date Time STD Kit. This component relies upon a properly functioning real-time clock implemented in hardware. Once date and time are configured, this component can be dragged onto a worksheet allowing individual integer outputs to be wired to logic if so desired. However, it is not necessary to have the component on the wiresheet at all. If the *DailySchedule* components are to be used, they will function properly without the presence of the *DateTim* component. The start and stop times in the *DailySchedule* key on the daily time generated by the *DatTime* component regardless if this component is on the wiresheet.

Please Note

By double clicking the DateTim component, you will see the setup screen below. When using Contemporary Controls' controllers, make sure that the Use System Offset option is selected as shown. To avoid confusing time settings, do not set the time with this component. Set the time using the Set Time web page on the controller which provides more flexibility. You can set time zone, daylight saving time and in some instances Network Time Protocol support using just the web page. These settings will then set this Sedona component properly.



Function Kit (func)

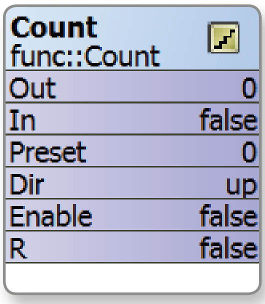


Comparison math — comparison (<=>) of two floats.

If X > Y then Xgy is true

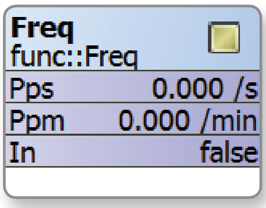
If X = Y then Xey is true

If X < Y then Xly is true



Integer counter — up/down counter with integer output.

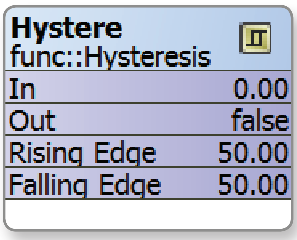
Counts on the false to true transition of *In*. If *Dir* = *true* the counter counts up to the maximum value of the integer. If *Dir* = *false* the counter counts down but not below zero. For counting to occur, *Enable* must be *true*. The counter can be preset. If *R* = *true* and *Enable* = *true*, then Out equals the preset value and will not count.



Pulse frequency — calculates the input pulse frequency.

Pps = number of pulses per second of In

Ppm = number of pulses per minute of In

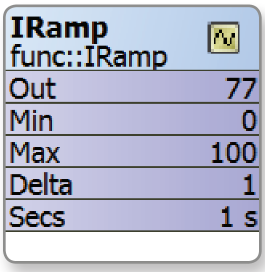


Hysteresis — setting on/off trip points to an input variable.

There are two internal floats called *Rising Edge* and *Falling Edge* which are configurable. If *Rising Edge* is greater than *Falling Edge,* then the following is true.

If In > Rising Edge then Out = true and will remain in that state until In < Falling Edge

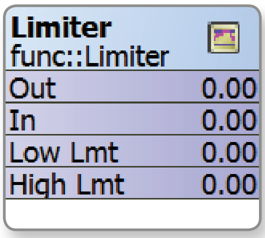
If *Rising Edge* is less than *Falling Edge* then the action is inverted.



IRamp — generates a repeating triangular wave with an integer output.

There are four configurable float parameters — *Min*, *Max, Delta and Secs*. For every scan cycle, the output increments by *Delta* units until the output equals the *Max* value at which time it decrements until *Min* is reached. The result is a triangular wave with limits of *Max* and *Min* and an incremental rate of *Secs* units.

Limiter — Restricts output within upper and lower bounds.

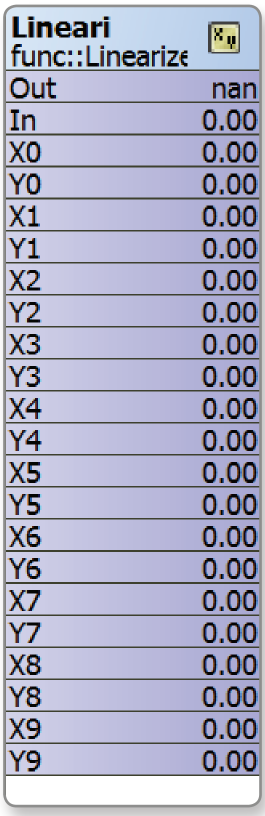


High Lmt and *Low Lmt* are configurable floats.

If In > High Lmt then Out = High Lmt

If In < Low Lmt then Out = Low Lmt

If In < High Lmt and > Low Lmt then Out = In

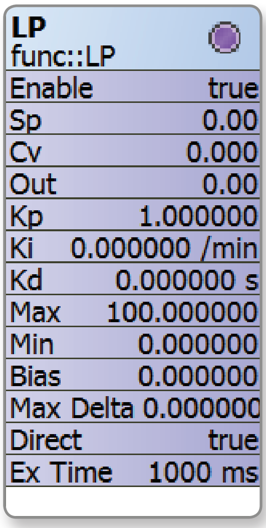


Linearize — piecewise linearization of a float.

For piecewise linearization of a nonlinear input, there are ten pairs of x,y parameters that must be configured into this component. The x,y pairs indicate points along the input curve. For an x value of the input, there should be a corresponding y value of the output. For input values between these points, the component will estimate the output based upon the linear equation:

$$Out = y = y_0 + (y_1 - y_0)\frac{x - x_0}{x_1 - x_0}$$

where y is the value for input value x between coordinates x_0, y_0 and x_1, y_1



LP — proportional, integral, derivative (PID) loop controller.

The LP component is much more complex component requiring an explanation of the numerous configurable parameters. *Sp* is the *setpoint* or the desired outcome. *Cv* is the *controlled variable* which we are trying to make equal to the setpoint. The difference between *Cv* and *Sp* is the *error signal* (*e*) that drives the *output variable Out* used to manipulate the *controlled variable*. There are three gain factors *Kp, Ki, Kd* — called *tuning parameters* — for each of the three modes of the controller: *proportional, integral and derivative*. Setting a gain factor to zero effectively disables that particular mode. Setting *Kp* to zero would completely disable the controller. Typical controller operation is either:

Proportional-only (P)

Proportional plus reset (integral) (PI)

Proportional plus reset plus rate (PID)

In HVAC applications, P and PI are the most common. PID is seldom used.

Enable must be set true if loop action is to occur. If *Enable* is set to false, control action ceases and the output will remain at its last state. However, if *Ki* or *Kd* are non-zero, internal calculations will continue.

If *Direct* is equal to *true,* then the output will increase if the *Cv* becomes greater than *Sp*. If this was a temperature loop, this would be considered being in *cooling mode*. If *Direct* is equal to *false*, then the output will decrease if the *Cv* becomes greater than the *Sp*. If this was a temperature loop, this would be considered being in *heating mode*. Notice that by entering negative gain factors, the action of the controller is reversed.

Max and *Min* are limits on the output's swing and are considered the absolute boundaries to the controller's throttling range (proportional control range). Basically, the *LP* component includes *Limiter* functionality.

Bias sets the output's offset. Sometimes *bias* is called manual reset to correct an output error with a large proportional band. It is usually only used with proportional-only control. The amount of bias is not influenced by the proportional gain *Kp*. Bias is also used on split-range control systems that will be discussed shortly.

Ex Time is the amount of time in milliseconds that the control loop is solved. Typical times are from 100–1000 ms with a default of 1000. Most HVAC loops are slow acting and therefore solving loops faster brings no benefit.

In the following discussion on setting the gain factors, assume we need a temperature controller enabled for direct action and that the output can swing from –50% to +50%. When the output ranges from 0 to 50%, a proportional cooling valve is modulated. When the output ranges from 0 to –50%, a proportional heating valve is modulated. At 0% output no valve is open. This is called a split range control system. *Max* and *Min* are set to –50 and +50 respectively. When we force the controller output from maximum heat to maximum cooling (100% output change), we notice that we can effect a change in our process temperature of 20°. This becomes our throttling range. In the real world, conducting this test might be difficult.

Now we need to set the three tuning parameters. We first begin by setting *Ki* and *Kd* to zero, thereby creating a proportional-only controller. The controller equation therefore becomes:

Out = Kp(e) + Bias   where e = Cv – Sp and Bias equals zero

Our first guess at *Kp* is 5 because we know that a 100% change in output yielded a 20° change in process temperature. This assumes that we can cool with the same efficiency as we can heat which may not be the case. By having a *Kp* of 5, the output will remain linear over this wide range. Notice that if there is no error signal (*Cv-Sp* is equal to zero), the output will then equal the *bias*, but in this case the bias is zero. The value 5 is entered into *Kp* and a disturbance is introduced into the process such as a step change in the setpoint. If the process continues to oscillate between heating and cooling and never settles down, then we must reduce our proportional gain *Kp* which increases our proportional band (1/*Kp* times 100% is the proportional band). Assume we achieve a stable system with *Kp* at 5 (proportional band at 20%) but based on the load on the system we notice that the output reached 70%. Our setpoint is at 70°, but our controlled temperature is 74°. Temperature is stable, but we have a 4° offset. This is the inherent difficulty with proportional-only control, there is an offset depending upon the value of the output. We have two choices. We can increase the proportional gain to 10 because we do not need a 20° range in input, but we risk oscillation. The second approach is to "reset the output manually" by increasing the bias. Approach one will never solve the problem but will minimize it, and there is a better method to approach two and that is called *automatic reset* — or adding reset action by adding a *Ki* term. The new controller equation becomes:

$Out = Kp(e + Ki\int e\,dt)$ (Bias is disabled when Ki is non-zero.)

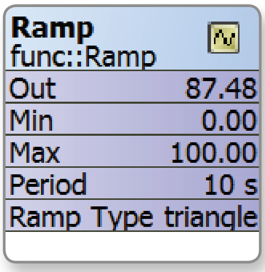
If there remains an error signal ($e \neq 0$), then the integral of the error over time will continue to drive the output until the error is driven to zero. The amount of action is determined by the *Ki* term. Notice that the integral term in the equation is also multiplied by the proportional gain before being applied to the output. The *Ki* coefficient is defined in units of repeats per minute. Too large a value can cause overshoot while too small a value will make the control system sluggish. The final setting *Kp* and *Ki* is done in the field based upon system response.

The third parameter is the rate parameter *Kd* which acts upon the rate of change of the error signal. Adding this term changes the controller equation as follows:

$$Out = Kp(e + Ki\int e\,dt + Kd\,de/dt)$$

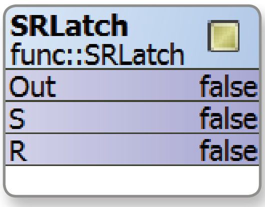
For processes with extremely long reaction times, derivative control could be helpful in reducing overshoot. *Kd* is entered in seconds. As mentioned before, it is seldom used because tuning a control loop with three parameters can be challenging.

There is one more parameter called *Max Delta*. This value limits the output slew rate by restricting the output change each time the control loop is recalculated by the amount entered. This parameter will dramatically reduce the response time of the control loop.



Ramp — generates a repeating triangular or sawtooth wave with a float output.

There are four configurable float parameters — *Min*, *Max*, *Period* and *Ramp Type*. For every scan cycle, the output increments by one unit until the output equals the *Max* value at which time it decrements until *Min* is reached. The result is a triangular wave with limits of *Max* and *Min* if *Ramp Type* is set for triangle. If *Ramp Type* is set for sawtooth, then the output will immediately drop to *Min* when *Max* is reached. The *Period* of the ramp is adjustable.



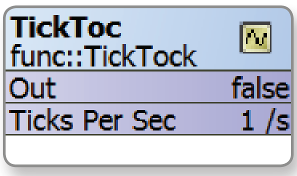
Set/Reset Latch — single-bit edge-triggered data storage.

The following logic applies on the false-to-true transition of S or R:

If S goes true and R does not change, then Out = true and remains true.

If R goes true and S does not change, then Out = false and remains false.

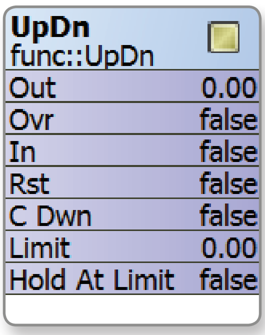
If both S and R go true on the same scan, then Out = false and remains false.



Ticking clock — an astable oscillator used as a time base.

There is one configurable float parameter — *Ticks Per Sec* — which can range from a low of 1 to a high of 10 pulses per sec.

Out = a periodic wave between 1 and 10 Hz



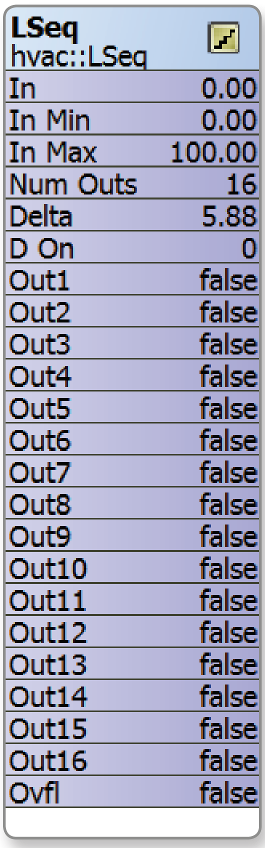
Float counter — up/down counter with float output.

The counter range is between zero and a value that can be set with configurable parameter *Limit*. To cease counting at the limit set the configurable parameter *Hold at Limit* to true. To count down instead of up, set *C Dwn* to true. To reset the counter to zero set *Rst* to true. *Ovr* is the overflow indicator. *In* is the Boolean count input.

Out = the current count

If Out ≥ Limit then Ovr is true

HVAC Kit (hvac)



Linear Sequencer — bar graph representation of input value.

There are two internally configurable floats called *In Min* and *In Max* that set the range of input values. An internal configurable integer — called *Num Outs* — specifies the intended number of active outputs. By dividing the input range by one more than the number of active outputs, the *Delta* between outputs is determined. Outputs will turn on sequentially from *Out1* to *Out16* within the input range as a function of increasing input value.

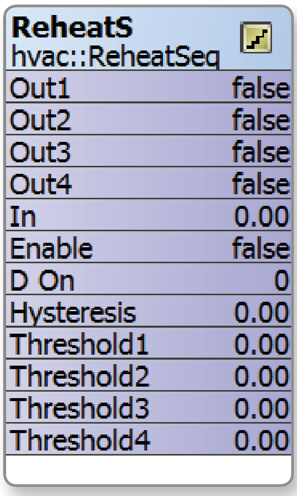
For example: *In Min* is set to 0, *In Max* to 100, and *Num Outs* is set to 9. This would give a *Delta* of 10. The following is true for increasing values of the input:

If In = 9 then Out1–16 are false and D On is zero.

If In = 70 then Out1–7 are true and Out8–16 are false. D On is 7.

If In = 101 then Out1–9 are true and Out10–16 are false. D On is 9 and Ovfl is true.

Note that for decreasing values of the input, the outputs will change by a value of Delta/2 below the input values stated above.



Reheat Sequence — linear sequence up to four outputs.

There are four configurable threshold points — *Threshold1* through *Threshold4* — that determine when a corresponding output will become true as follows:

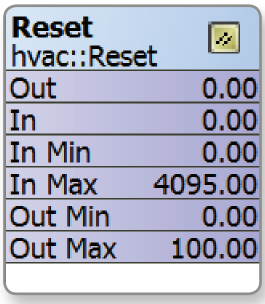
Out1 = true when In ≥ Threshold1

Out2 = true when In ≥ Threshold2

Out3 = true when In ≥ Threshold3

Out4 = true when In ≥ Threshold4

These outputs will remain true until the input value falls below the corresponding threshold value by an amount greater than the configurable parameter *Hysteresis*. Output signal *D On* indicates how many outputs are true. Configurable parameter *Enable* must be true otherwise all outputs will be false.



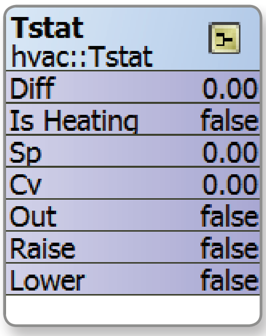
Reset — output scales an input range between two limits.

There are four configurable float parameters — *In Max*, *In Min*, *Out Max* and *Out Min* — which determine the input and output ranges respectively of the input and output. The output of this component will scale linearly with the value of the input if the input is within the input range. The input range (IR) is determined by *In Max-In Min* while the output range (OR) is determined by *Out Max-Out Min*. If the input is within the input range then the following is true:

Out = (In + In Min)(OR/IR) + Out Min

If the input exceeds, *In Max* then *Out = Out Max.*

If the input is less than, *In Min* then *Out = Out Min*



Thermostat — on/off temperature controller.

The configurable float parameter — *Diff* — provides hysteresis and deadband. Another configurable parameter — *Is Heating* — indicates a heating application. *Sp* is the *setpoint* input and *Cv* is the *controlled variable* input. *Raise* and *lower* are outputs.

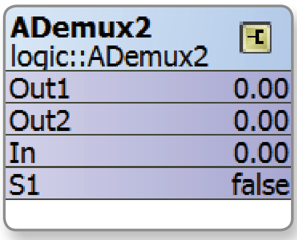
If *Cv* > *(Sp + Diff/2)* then *Lower* is true and will remain true until *Cv* < *Sp*

If *Cv* < *(Sp – Diff/2)* then *Raise* is true and will remain true until *Cv* > *Sp*

If *Is Heating* is true then *Out* = *Lower*

If *is Heating* is false then *Out* = *Raise*

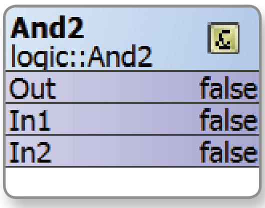
Logic Kit (logic)



Analog Demux — Single-input, two-output analog de-multiplexer.

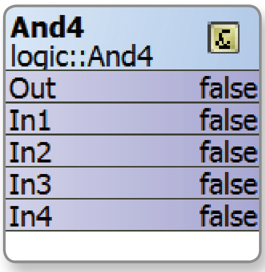
If S1 is false then Out1 = In while Out2 = the last value of In just before S1 changed.

If S1 is true then Out2 = In while Out1 = the last value of In just before S1 changed.



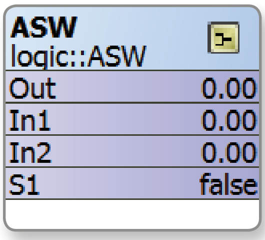
Two-input Boolean product — two-input AND gate.

Out = In1 • In2



Four-input Boolean product — four-input AND gate.

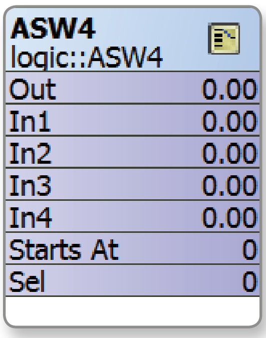
Out = In1 • In2 • In3 • In4



Analog switch — selection between two float variables.

If S1 is false then Out = In1

If S1 is true then Out = In2



Analog switch — selection between four floats.

Configurable integer parameter *Starts At* sets the base selection.

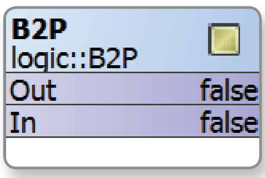
If integer Sel <= Starts At then Out = In1

If integer Sel = Starts At + 1 then Out = In2

If integer Sel = Starts At + 2 then Out = In3

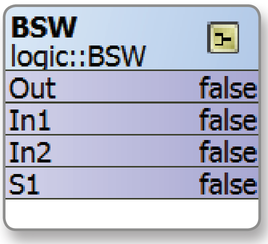
If integer Sel = Starts At + 3 then Out = In4

For all values of Sel that are 4 greater than Starts At then Out = In4



Binary to pulse — simple mono-stable oscillator (single-shot).

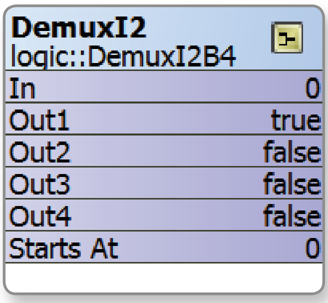
Out = true for one scan on the raising edge of In



Boolean Switch — selection between two Boolean variables.

If S1 is false then Out = In1

If S1 is true then Out = In2



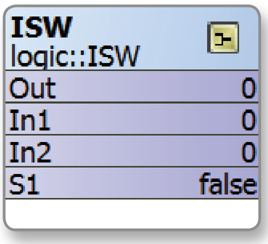
Four-output Demux — integer to Boolean de-multiplexer.

If In = StartAt + 0 then Out1 is true, else false

If In = StartAt + 1 then Out2 is true, else false

If In = StartAt + 2 then Out3 is true, else false

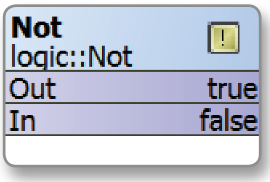
If In = StartAt + 3 then Out4 is true, else false



Integer switch — selection between two integer variables.

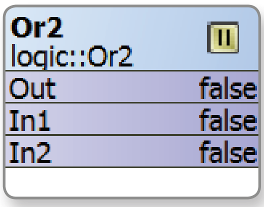
If S1 is false then Out = In1

If S1 is true then Out = In2



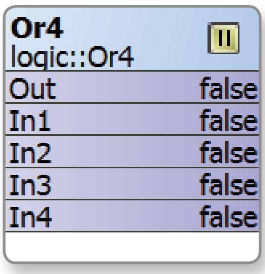
Not — inverts the state of a Boolean.

$Out = \overline{In}$



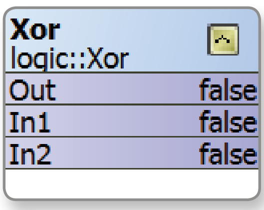
Two-input Boolean sum — two-input OR gate.

Out = In1 | In2



Four-input Boolean sum — four-input OR gate.

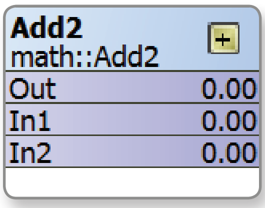
Out = In1 | In2 | In3 | In4



Two-input exclusive Boolean sum — two-input XOR gate.

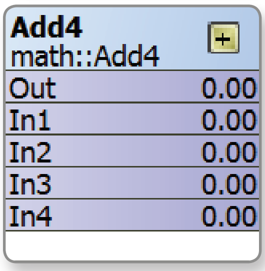
$Out = In1 \oplus In2 = \overline{In1} \cdot \overline{In2} \,|\, In1 \cdot In2$

Math Kit (math)



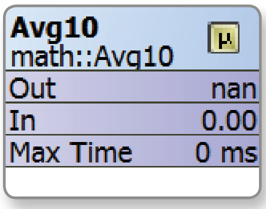
Two-input addition — results in the addition of two floats.

Out = In1 + In2



Four-input addition — results in the addition of four floats.

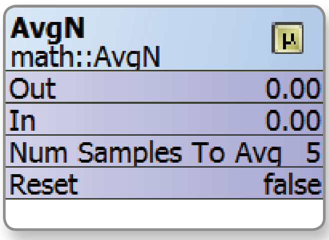
Out = In1 + In2 + In3 + In4



Average of 10 — sums the last ten floats while dividing by ten thereby providing a running average.

Out = (sum of the last ten values)/ten

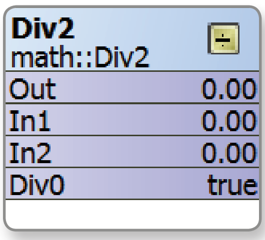
The float input *In* is sampled once every scan and stored. If the input does not change in value on the next scan, it is not sampled again — unless sufficient time passes that exceeds the internal integer *Max Time* with units of milliseconds. In this instance the input is sampled and treated as another value. Once ten readings occur, the average reading is outputted.



Average of N — sums the last N floats while dividing by N thereby providing a running average.

Out = (sum of the last N values)/N

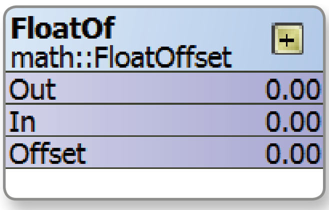
The float input *In* is sampled once every scan and stored regardless whether or not the value changes. Once *Num Samples to Avg* readings occur, the average reading is outputted.



Divide two — results in the division of two floats.

Out = In1/In2

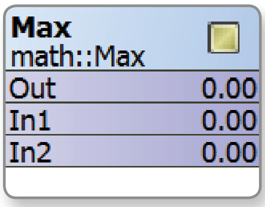
Div0 = true if In2 is equal to zero



Float offset — float shifted by a fixed amount.

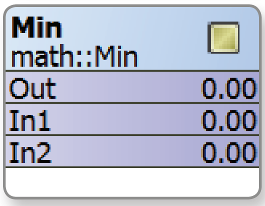
Out = In + Offset

Offset is a configurable float.



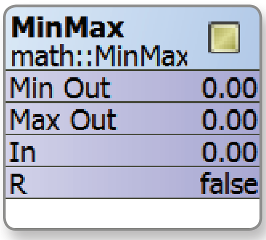
Maximum selector — selects the greater of two inputs.

Out = Max [In1, In2] where Out, In1 and In2 are floats



Minimum selector — selects the lesser of two inputs.

Out = Min [In1, In2] where Out, In1 and In2 are floats



Min/Max detector — records both the maximum and minimum values of a float.

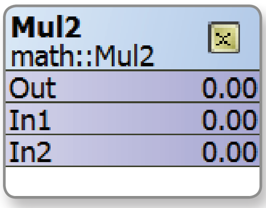
Min Out = Max [In] if R is false

Max Out = Min [In] if R is false

If R is true then Min Out and Max Out = In

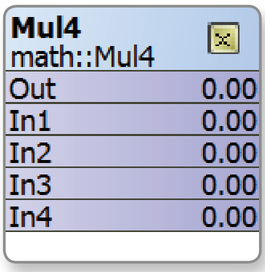
Both *Min Out* and *Max Out* are floats — as is *In.*

It may be necessary to reset the component after connecting links to the component.



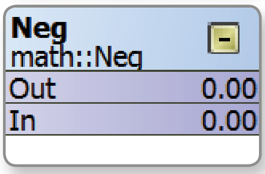
Multiply two — results in the multiplication of two floats.

*Out = In1 * In2*



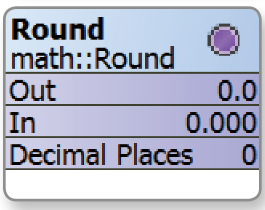
Multiply four — results in the multiplication of four floats.

*Out = In1 * In2 * In3 * In4*



Negate — changes the sign of a float.

Out = – In



Round — rounds a float to the nearest N places.

For N = -1, Out = In rounded to the nearest tens

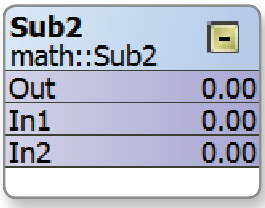
For N = 0, Out = In rounded to the nearest units

For N = 1, Out = In rounded to the nearest tenth's

For N = 2, Out = In rounded to the nearest hundredths

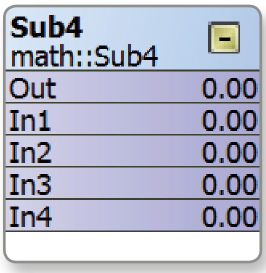
For N = 3, Out = In rounded to the nearest thousandths

For positive input values, the output will round up (more positive).
For negative input values, the output will round down (more negative).



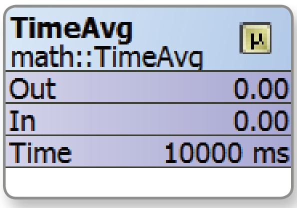
Subtract two — results in the subtraction of two floats.

Out = In1 – In2



Subtract four — results in the subtraction of four floats.

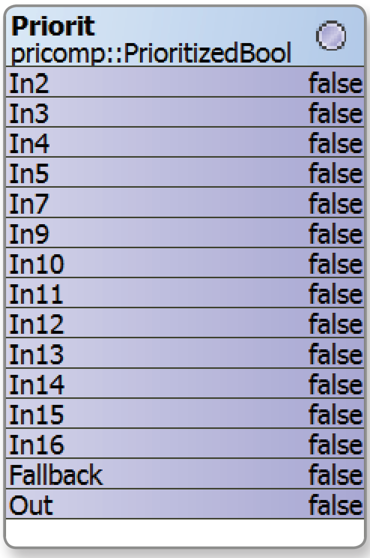
Out = In1 – In2 – In3 – In4

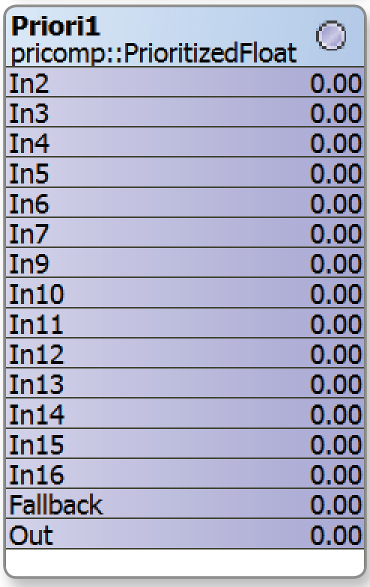


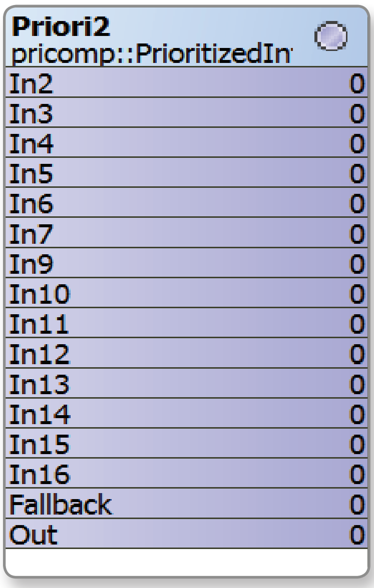
Time Average — the average of a float over a determined time.

Out = Avg[In] over the integer time in milliseconds.

Priority Kit (pricomp)



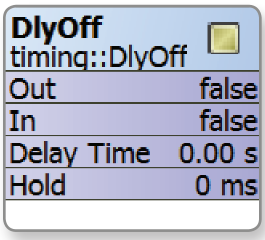




Priority array (Priorit) components exist for Boolean, float and integer variables. Up to 16 levels of priority from In1 to In16 can be assigned. In1 has the highest priority and In16 the lowest. With few exceptions, all can be pinned out. If a priority level is not assigned, it is marked as a Null and therefore ignored. If a Null is inputted to the priority array, the priority array will ignore it and choose the next input in line. The Boolean version of the array has two timer settings — one for minimum active time and one for minimum inactive time. If the highest priority device changes from false to true and then back to false, the priority component will maintain the event for the configured times.

There is a Fallback setting in each array that can be specified. If no valid priority input exists, the Fallback value is transferred to the output.

Timing Kit (timing)

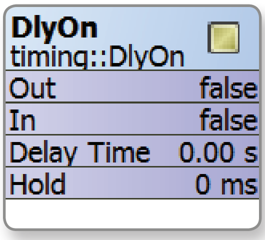


Off delay timer — time delay from a true to false transition of the input.

For input transitions from false to true, Out = true.

For input transitions from true to false that exceed the Delay Time, Out = false after the delay time.

Hold is a read-only integer that counts down the time. *Delay time* is in seconds.

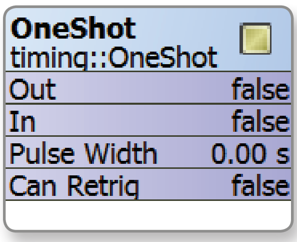


On delay timer — time delay from a false to true transition of the input.

For input transitions from true to false, Out = false.

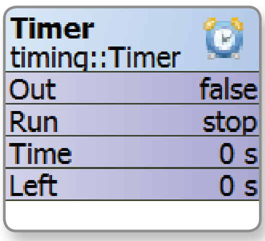
For input transitions from false to true that exceed the Delay Time, Out = true after the delay time.

Hold is a read-only integer that counts down the time. *Delay Time* is in seconds.



Single Shot — provides an adjustable pulse width to an input transition.

Upon the input transitioning to true, the output will pulse true for the amount of time set in the configurable parameter *Pulse Width*. Time is in seconds. If the configurable parameter *Can Retrig* is set to true, the component will repeat its action on every positive transition of the input. For example in retrigger mode, a one-second *TickToc* connected to a *OneShot* with a 2 second pulse width setting will have the *OneShot* output in a continuous true state due to constant retriggering at a rate faster than the *OneShot* pulse width.

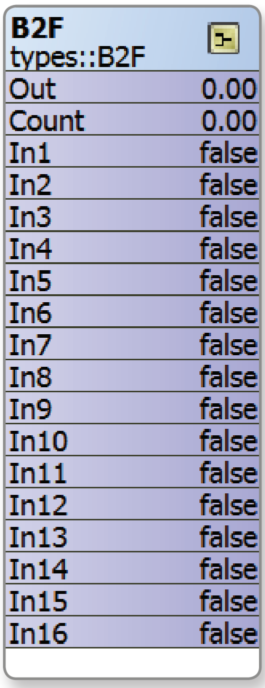


Timed pulse — predefined pulse output.

Out becomes true for a predetermined time when Run transitions from false to true. If Run returns to false, then Out becomes false.

Time determines the amount of time the output will be on in seconds.

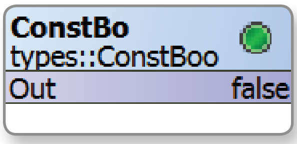
Types Kit (types)



Binary to float encoder — 16-bit binary to float conversion.

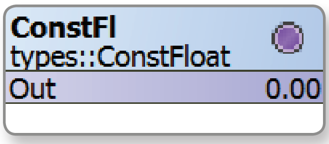
Out = encoded value of binary input with In16 being the MSB and In1 being the LSB

Count = sum of the number of active inputs



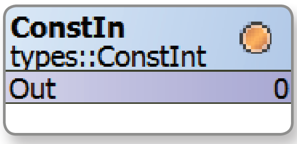
Boolean Constant — a predefined Boolean value.

Out = a Boolean value that is internally configurable



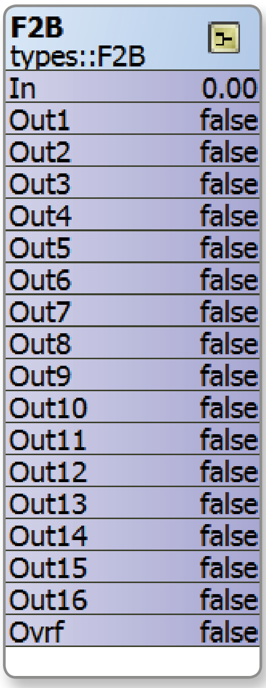
Float Constant — a predefined float value.

Out = a float value that is internally configurable



Integer Constant — a predefined integer value.

Out = an integer value that is internally configurable

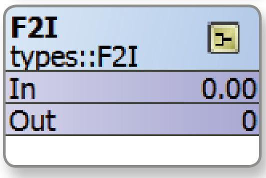


Float to binary decoder — float to 16-bit binary conversion.

Out1 to Out16 = the 16-bit decoded value of In — with Out16 representing the MSB and Out1 representing the LSB

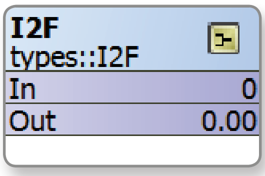
Ovrf = true when In > 65535

Although the input requires a float, fractional amounts are ignored during the conversion.



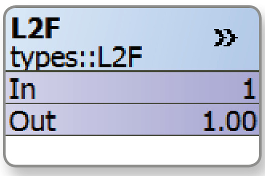
Float to integer — float to integer conversion.
Out = In except that the output will be a whole number

The fractional amount of the float input will be truncated at the output.

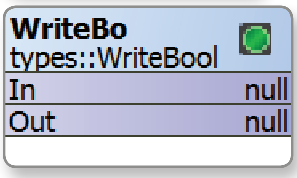


Integer to Float — integer to float conversion.

Out = In except that the output will become a float



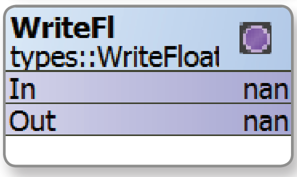
Long to Float — 64-bit signed integer to float conversion.
Out = In except that the output will become a float from a 64-bit signed integer



Write Boolean — setting a writable Boolean value.

Out = In

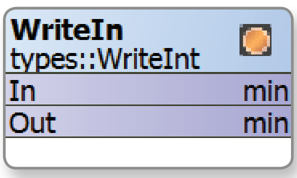
Unlike *ConstBo*, this component has an input. Could be helpful when transferring a variable between two wire sheets.



Write Float — setting a writable float value.

Out = In

Unlike *ConstFl*, this component has an input. Could be helpful when transferring a variable between two wire sheets.



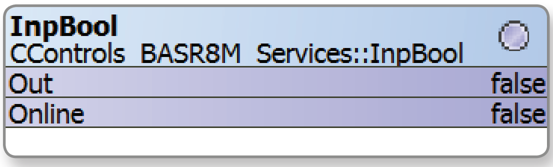
Write Integer — setting an integer value.

Out = In

Unlike *ConstIn*, this component has an input. Could be helpful when transferring a variable between two wire sheets..

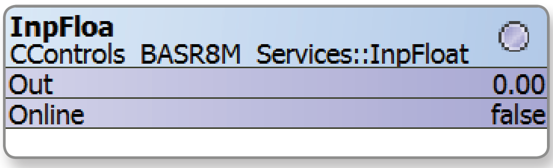
BASremote Service Kit (CControls_BASR8M_Services)

The BASremote service kit allows Sedona application to tie into real world inputs and outputs after object instance configuration. For the BASremote master, object instance assignments must match the I/O channel assignment. For configuring expansion module and virtual points, consult the BASremote User Manual for details. For the online status to revert to true, the point must be properly configured, must be actively scanned by the hardware and not be in a forced state.



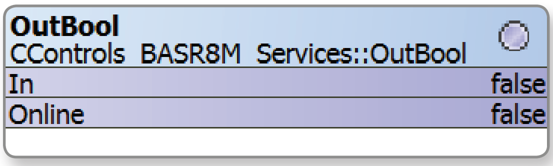
Input Boolean — BASremote binary input.

Out = value of the real world binary input



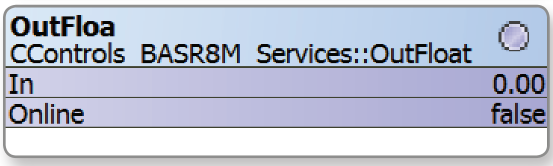
Input Float — BASremote analog input or value.

Out = value of the real world analog input



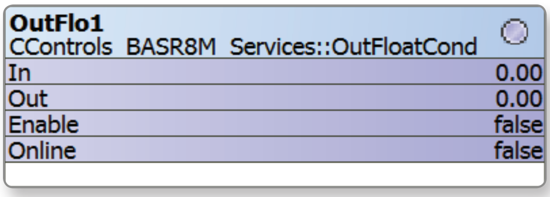
Output Boolean — BASremote binary output.

In = Boolean variable to be written to a real world output



Output Float — BASremote analog output.

In = Float variable to be written to a real world output



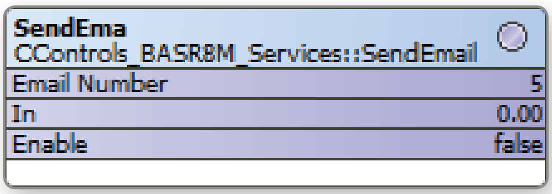
Output Float Conditional — BASremote conditional analog output.

In = Float variable to be written to a real world output.

Out = Float value currently written to real world output.

Enable = Boolean which indicates whether a write should occur. True will allow the write to occur and False will inhibit any writes.

Sedona will, normally, write the outputs from its logic every cycle. This can be an issue for some Modbus registers controlled by the BASremote. The writes to these registers can be controlled via the enable signal. If enable is false the Modbus register associated with this component will not be written.



Send Email — BASremote email alert.

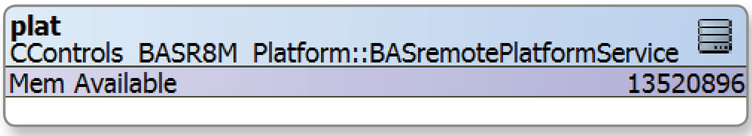
In = Float value to be included in email.

Enable = Boolean used to indicate when to send an email.

Email Number = which email to send (it must match the web configuration).

The BASremote can send an email using this component when the *Enable* signal is true. The email must be configured in the configuration webpage of the BASremote. When the email is sent, the text of the email will contain the current input float value. One Email will be sent on the false-to-true transition of the *Enable* signal.

BASremote Platform Kit (CControls_BASR8M_Platform)



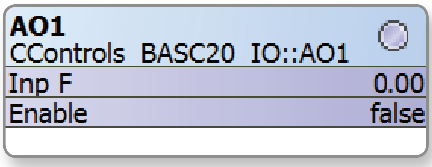
The BASremote platform kit has one component that advises the programmer how much usable memory is available for application programming. With a Linux platform, memory is seldom an issue.

The platform kit is found in the service folder.

BAScontrol20/22 I/O Kit (CControls_BASC20_IO) (CControls_BASC22_IO)

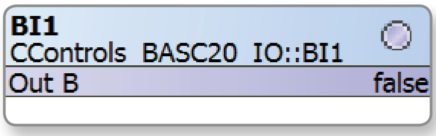
The BAScontrol20 IO kit provides several components necessary to interface Sedona logic to real world inputs and outputs on the BAScontrol20. In addition to 20 real I/O points, the BAScontrol20 accommodates 24 virtual points that can be treated as either inputs or outputs. Universal inputs and virtual points require configuration via a web browser. Other components are included in this kit that are BAScontrol20 hardware dependent.

AO1 – AO4	Analog Output	analog voltage output points
BI1 – BI4	Binary Input	binary input points
BO1 – BO6	Binary Output	binary output points (B01-B04 with the CControls_BASC20_IO)
UI1 – UI4	Universal Input	binary, analog voltage, thermistor, resistance or accumulator
UI5 – UI8	Universal Input	binary, analog voltage, thermistor or resistance
UC1 – UC4	Retentive Counters	up/down retentive universal counters
VT01 – VT24	Virtual Points	share data with BACnet/IP clients - first eight componenets are retentive
ScanTim	Scan Timer	monitors the time to execute Sedona logic



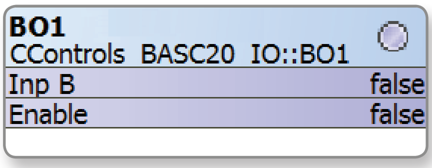
AO1 – AO4 Analog Output — analog voltage output point.

Inp F = float value from 0–10 of respective point which translates to 0–10VDC output if Enable is true. If Enable is false, then output is controlled by a BACnet client.



BI1 – BI4 Binary Input — binary input point.

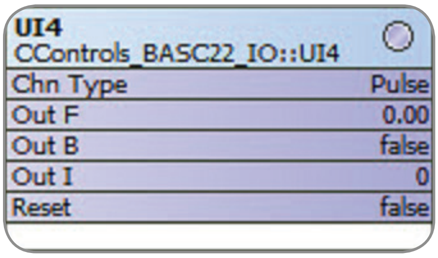
Out B is true if input point is asserted to common; otherwise Out B is false.



BO1 – BO6 Binary Output — binary output point. (BO1-BO4 on BASC20)

Inp B = Boolean value of respective point which will translate to either a contact closure or triac output (on triac models).

If Inp B and Enable are true, the contact closure is made or the triac is turned on. If Enable is false, then output is controlled by a BACnet client.



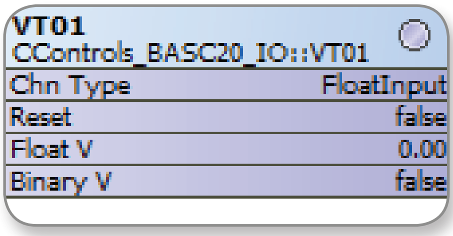
UI1 – UI8 Universal Input — binary, analog voltage, thermistor, resistance or accumulator point (UI1-UI4 can be accumulators).

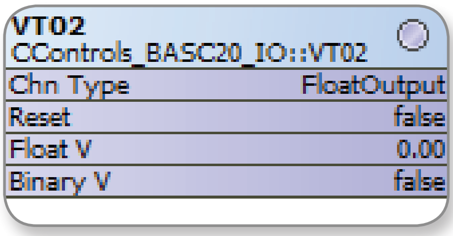
Out F = float value of respective point if configured for analog input, thermistor, resistance or pulse accumulator.

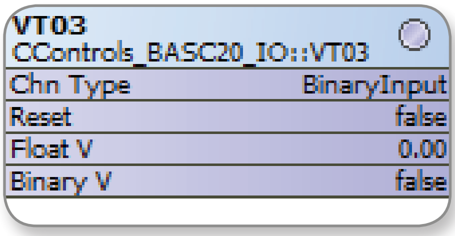
If point is configured as a thermistor, or resistance, and an out-of-range condition is detected, Out F = the configured Out of Bounds value and Out B = true (thermistor or resistance fault)

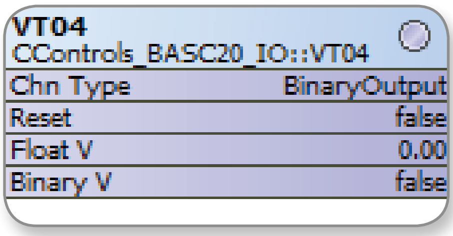
Out B = Boolean value if configured for binary input.
Out B is true if input point is asserted to common; otherwise Out B is false.
If in Pulse mode and Reset =true, then Out F = 0.
Out I = the integer representation of the float value.

VT01 – VT24 Virtual Points — wire sheet read or wire sheet write.









Virtual points are used to share wire sheet data with a BACnet/IP client. A BACnet/IP client can "read" wire sheet data such as a calculated value or it can "write" to the wire sheet with a set-point or command. Virtual points are first configured from a web page to be a BACnet binary value (BV) or BACnet analog value (AV). The BACnet description field and units of measure can be set as well as the BACnet name which must be unique within the device. Next go to Workbench to change the wire sheet Read or Write directions. The title of the virtual point on the web page will change to Wire Sheet Write or Wire Sheet Read accordingly. The four possibilities are shown on the left labelled as VT01 through VT04.

VT01 is configured as analog variable, wire sheet write, which results in the component being a *FloatInput*.

VT02 is configured as analog variable, wire sheet read, which results in the component being a *FloatOutput*.

VT03 is configured as binary variable, wire sheet write, which results in the component being a *BinaryInput*.

VT04 is configured as binary variable, wire sheet read, which results in the component being a *BinaryOutput*.

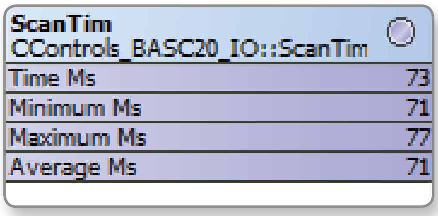
If configured as a *FloatInput,* then *Float V* represents the value written by the BACnet/IP client which can be used by other wire sheet components

If configured as a *FloatOutput,* then *Float V r*epresents a value from a wire sheet component that can be read by the BACnet/IP client

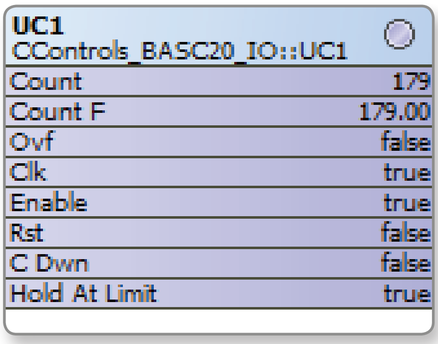
If configured as a *BinaryInput,* then *Binary V* represents the value written by the BACnet/IP client which can be used by other wire sheet components

If configured as a *BinaryOut,* then *Binary V* represents a value from a wire sheet component that can be read by the BACnet/IP client

Asserting *Reset* will clear the component. It is usually kept in the *False* state.

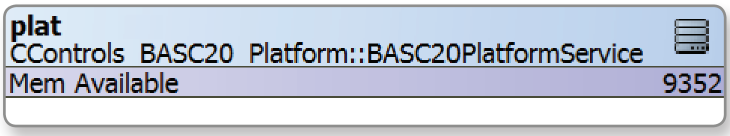


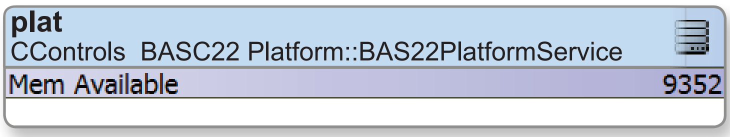
ScanTimer – monitors the execution time of Sedona logic.
The scan timer monitors the current, minimum, maximum and average time it takes to execute a single scan of Sedona logic. All outputs are integers. The average time is based upon the last ten samples. The result of which becomes the first value in the next ten samples. The component can be reset by right-clicking the component and invoking an Action.



UC1 – UC4 — retentive up/down universal counters.
Counts on the false to true transition of *Clk* if *Enable* is *true*. If *C Dwn* is *true*, counting is down until zero is reached. If *C Dwn is false*, counting is up to the limit of the counter (2147483647) before it rolls over to zero. If *Hold At Limit* is set to true, the counter will stop counting at the value set in the *Limit* slot on the property page. The *Ovf* flag is set *true* when the value of status equals or exceeds the limit value. The output *count* value can be displayed as an integer (*Count*) or a float (*Count F*). *Rst* set to *true* clears the counter and prevents further counting.

BAScontrol20/22 Platform Kit (CControls_BASC20_Platform) (CControls_BASC22_Platform)



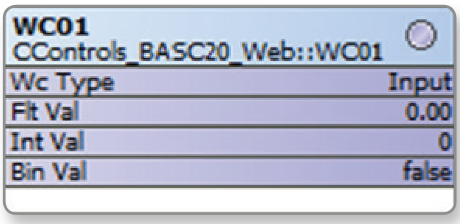


The BAScontrol20/22 platform kit has only one component that advises the programmer how much usable memory is available for application programming. It is recommended that the usable memory not fall below 8,192 bytes. It can be found in the services folder and can be copied onto the wire sheet. The output type of this component is a *Long*.

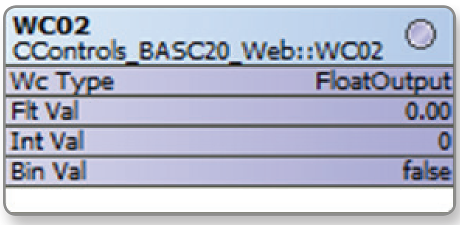
BAScontrol20 Web Kit (CControls_BASC20_Web)

WC01 – WC48 Web Components — share data with BAScontrol20 web pages.

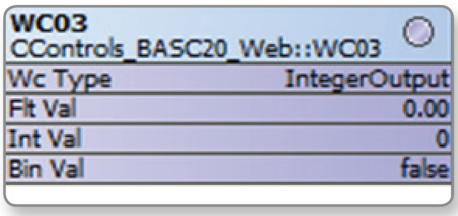
Web components provide a convenient method of sharing data between web pages and the wire sheet without the need of the Workbench tool. In this kit there are 48 web components that must be first configured via web pages. Web components can be configured to read wire sheet data or can write wire sheet data. The four possibilities are shown on the left labeled as WC01 through WC04.



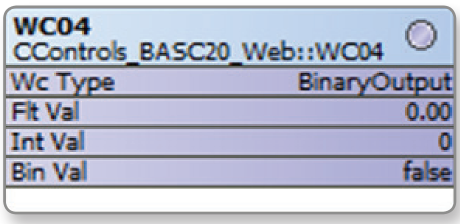
WC01 is configured as an input which results in the component being an *Input*.



WC02 is configured as an output float which results in the component being a *FloatOutput*.



WC03 is configured as output integer which results in the component being an *IntegerOutput*.



WC04 is configured as an output binary which results in the component being a *BinaryOutput*.

If configured as an Input then Flt Val, Int Val, and BinVal represents the value written by a web page which can be used by other wire sheet components

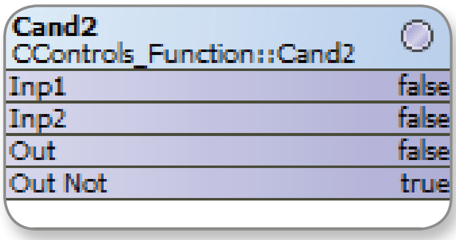
If configured as a FloatOutput, then Flt Val represents a value from a wire sheet component that can be read by a web page

If configured as an IntegerOutput, then Int Val represents a value from a wire sheet component that can be read by a web page

If configured as a BinaryOutput, then Bin Val represents a value from a wire sheet component that can be read by a web page

Contemporary Controls Function Kit (CControls_Function)

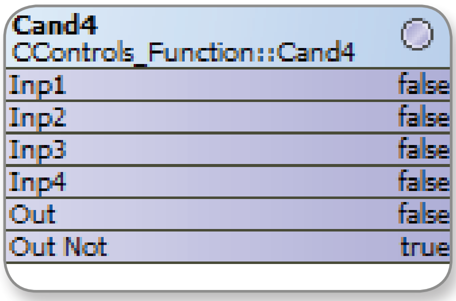
These components apply to any Sedona Virtual Machine (SVM).



Two-input Boolean product – two-input AND/NAND gate.

Out = In1 • In2

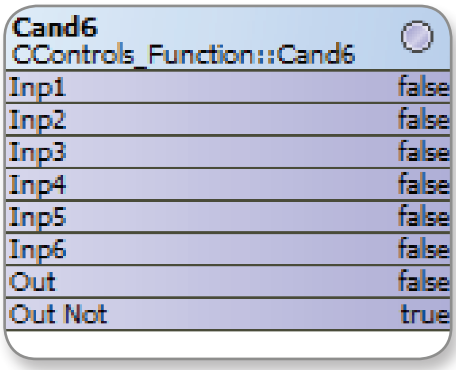
Out Not = $\overline{Out}$



Four-input Boolean product – four-input AND/NAND gate.

Out = In1 • In2 • In3 • In4

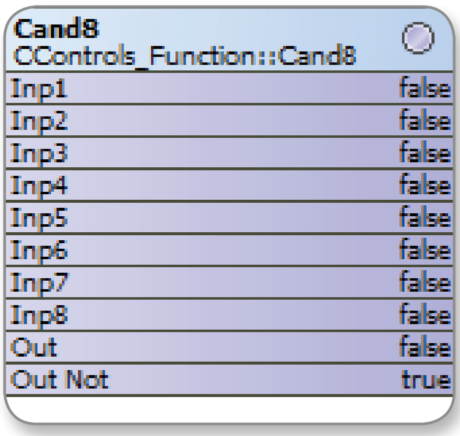
Out Not = $\overline{Out}$



Six-input Boolean product – six-input AND/NAND gate.

Out = In1 • In2 • In3 • In4 • In5 • In6

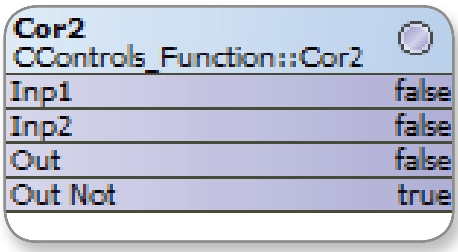
Out Not = $\overline{Out}$



Eight-input Boolean product – eight-input AND/NAND gate.

Out = In1 • In2 • In3 • In4 • In5 • In6 • In7 • In8

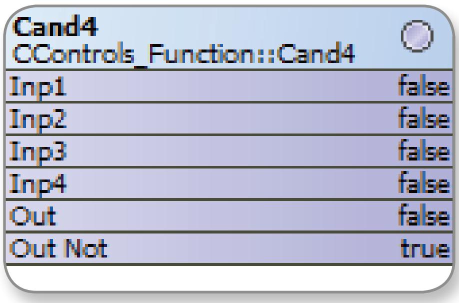
Out Not = $\overline{Out}$



Two-input Boolean sum – two-input OR/NOR gate

Out = In1 | In2

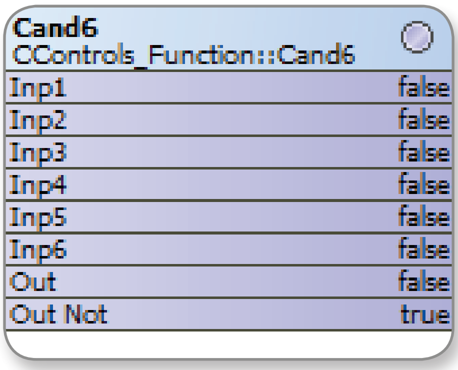
Out Not = $\overline{Out}$



Four-input Boolean sum – four-input OR/NOR gate

Out = In1 | In2 | In3 | In4

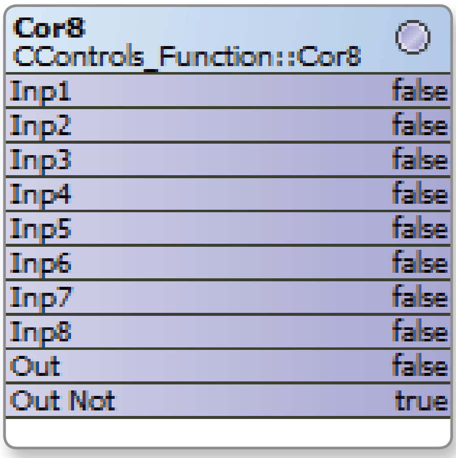
Out Not = $\overline{Out}$



Six-input Boolean sum – six-input OR/NOR gate

Out = In1 | In2 | In3 | In4 | In5 | In6

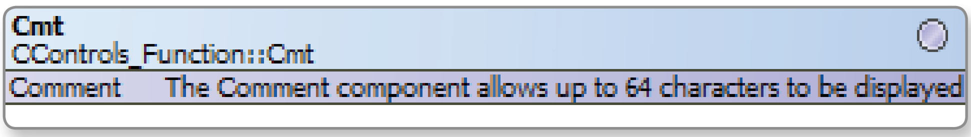
Out Not = $\overline{Out}$



Eight-input Boolean sum – eight-input OR/NOR gate

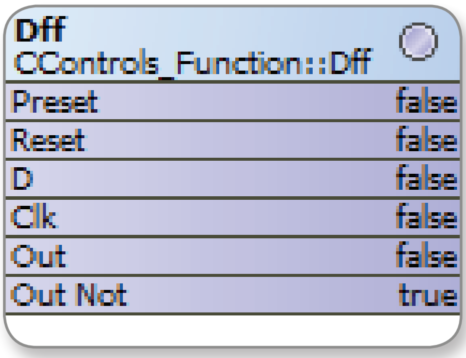
Out = In1 | In2 | In3 | In4 | In5 | In6 | In7 | In8

Out Not = $\overline{Out}$



Comment

A comment field from 1-64 characters used for documentation purposes.



"D" Flip-Flop – D-style Edge-triggered Single-bit Storage

If Preset = True and Reset = False then Out = True

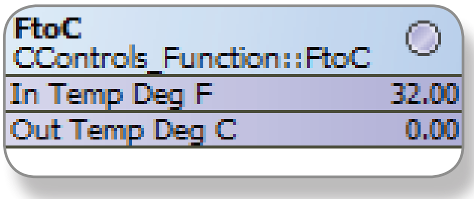
If Reset = True then Out = False regardless of all other inputs

On the rising edge of Clk with Preset = False and Reset = False;

If D = false then Out = false

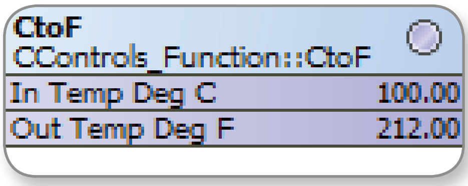
If D= true then Out = true

Out Not = $\overline{Out}$



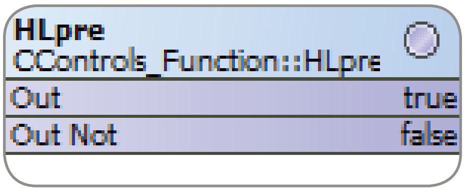
°F to °C – Fahrenheit to Celsius Temperature Conversion

*Out = 9/5 * In + 32*



°C to °F – Celsius to Fahrenheit Temperature Conversion

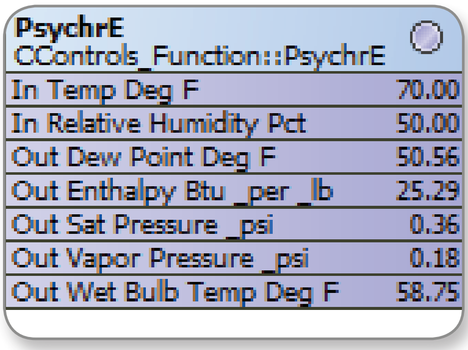
*Out = 5/9 * (In – 32)*



High – Low Preset – defined logical true and false states

Out = true

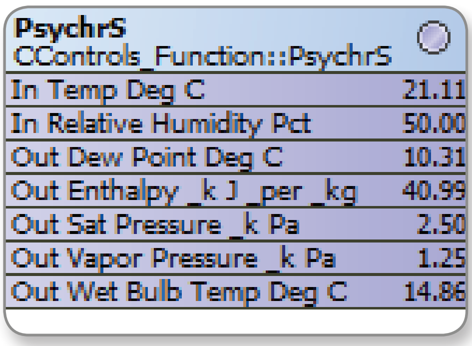
Out Not = false



Psychrometric Calculator – English Units

Inputs are Dry-bulb temperature (°F) and Relative Humidity (%) Outputs are Dew Point (°F), Enthalpy (Btu/lb), Saturation Pressure (psi), Vapor Pressure (psi) and Wet-bulb temperature (°F)

Input temperature range 32-120°F; Input relative humidity range 10-100%

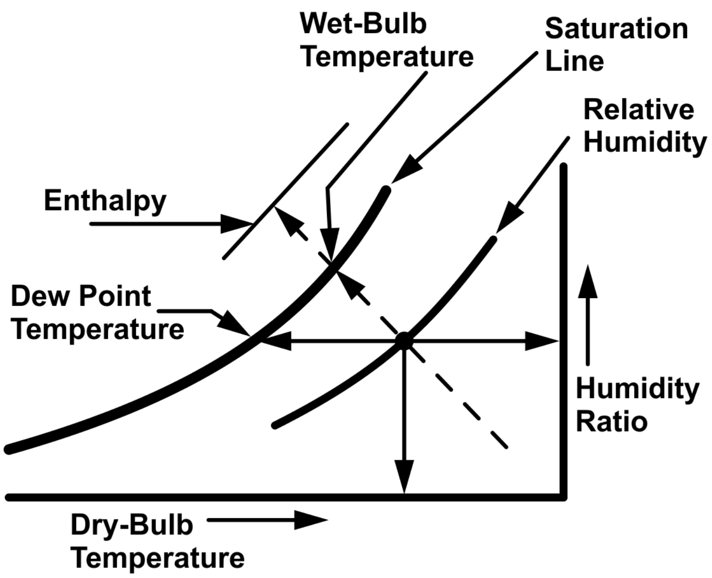


Psychrometric Calculator – SI Units

Inputs are Dry-bulb temperature (°C) and Relative Humidity (%) Outputs are Dew Point (°C), Enthalpy (kJ/kg), Saturation Pressure (kPa), Vapor Pressure (kPa) and Wet-bulb temperature (°C)

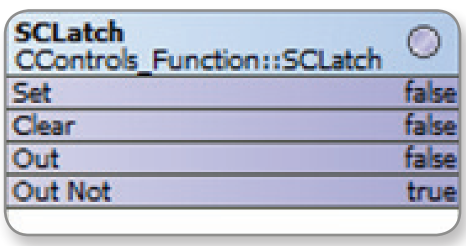
Input temperature range 0-48.8 °C; Input relative humidity range 10-100%

Simplified Psychrometric Chart



A simplified psychrometric chart greatly removes the detail of a professional chart. On the X-axis is the dry-bulb temperature with a typical range from 32°F to 120°F. This is the same temperature you measure with a thermometer or wall-mounted thermostat. Lines of constant dry-bulb temperature are for all practical purposes vertical. On the Y-axis is the humidity ratio (lbw/lba) in lbs-water vapor to lbs-air ranging from zero to over 0.028. Lines of constant humidity ratio are horizontal. The left curved heavy line is called the saturation line indicating 100% saturation of water vapor or 100% relative humidity. Curves of lesser relative humidity would exist to the right of the saturation line. Along the saturation line you can determine both dew point temperature and wet-bulb temperature although their lines of constant temperature are different. For dew point, the lines are horizontal while the lines of constant wet-bulb are diagonal and almost parallel with lines of constant enthalpy.

Looking at the PsychrE component and the simplified chart we can study one example. Notice in the component that the two inputs are 70°F dry-bulb and 50% relative humidity. With these two values a single point on the psychrometic chart can be located. If you follow the horizontal line to the left you can determine the dew point temperature and to the right the humidity ratio. If you follow the diagonal line to the upper-left you can learn the wet-bulb and enthalpy values. We still have not determined the saturation pressure or the vapor pressure but these values can be derived with help from the humidity ratio. The PsychrE can make the calculations in the English system and the PsychrS can make the calculations in the SI system. Although simple conversions can be made between the two systems or to reflect the output values in different units of measure, be careful when working with enthalpy. With the English system, the change in enthalpy is referenced to a 0°F while in the SI system the reference is 0°C so a straight forward conversion between the two systems is not possible. Also note the limited range of the two psychrometric components. Both components are limited to an equivalent input range of 0-120°F dry-bulb and 10-100% relative humidity.



Set/Clear Latch – single-bit level-triggered single-bit data storage

The following logic applies to the state of Set or Clear:

If Set is true and Clear is false, then Out = true

If Clear is true, then Out = false regardless of the state of Set

Out Not = $\overline{\text{Out}}$

Component–Kit Association

Component	Sedona Palette Folder
Add2	math
Add4	math
ADemux2	logic
And2	logic
And4	logic
AO1–AO4	CControls_BASC20_IO, CControls_BASC22_IO
ASW	logic
ASW4	logic
Avg10	math
AvgN	math
B2F	types
B2P	logic
BI1–BI4	CControls_BASC20_IO, CControls_BASC22_IO
BO1–BO6 (BO1-BO4 on BASC20)	CControls_BASC20_IO, CControls_BASC22_IO
BASC20PlatformService	CControls_BASC20_Platform
BASC22PlatformService	CControls_BASC22_Platform
BASremotePlatformService	CControls_BASR8M_Platform
BSW	logic
Cand2	CControls_Function
Cand4	CControls_Function
Cand6	CControls_Function
Cand8	CControls_Function
Cmpr	func
Cmt	CControls_Function
ConstBool	types
ConstFloa	types
Cor2	CControls_Function
Cor8	CControls_Function
Count	func
CtoF	CControls_Function
DailyScheduleBool	basicSchedule
DailyScheduleFloat	basicSchedule
DateTimeService	datetime
DemuxI2B4	logic
Dff	CControls_Function
Div2	math
DlyOff	timing
DlyOn	timing
F2B	types
F2I	types
FloatOffset	math
Freq	func
FtoC	CControls_Function
HLpre	CControls_Function
Hysteresis	func
I2F	types
InpBool	CControls_BASR8M_Services
InpFloat	CControls_BASR8M_Services

Component–Kit Association

Component	Sedona Palette Folder
ISW	logic
IRamp	func
L2F	types
Limiter	func
Linearize	func
LP	func
LSeq	hvac
Max	math
Min	math
MinMax	math
Mul2	math
Mul4	math
Neg	math
Not	logic
OneShot	timing
Or2	logic
Or4	logic
OutBool	CControls_BASR8M_Services
OutFloat	CControls_BASR8M_Services
OutFloatCond	CControls_BASR8M_Services
PrioritizedBool	pricomp
PrioritizedFloat	pricomp
PrioritizedInt	pricomp
PsychrE	CControls_Function
PsychrS	CControls_Function
Ramp	func
ReheatSeq	hvac
Reset	hvac
Round	math
ScanTim	CControls_BASC20_IO, CControls_BASC22_IO
SCLatch	CControls_Function
SendEmail	CControls_BASR8M_Services
SRLatch	func
Sub2	math
Sub4	math
TickTock	func
TimeAvg	math
Timer	timing
Tstat	hvac
UC1–UC4	CControls_BASC20_IO, CControls_BASC22_IO
UI1–UI8	CControls_BASC20_IO, CControls_BASC22_IO
UpDn	func
VT0–VT24	CControls_BASC20_IO, CControls_BASC22_IO
WC01–WC48	CControls_BASC20_Web, CControls_BASC22_Web
WriteBool	types
WriteFloat	types
WriteInt	types
Xor	logic

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