Akton PsychrometriX
Psychrometric Calculator Control

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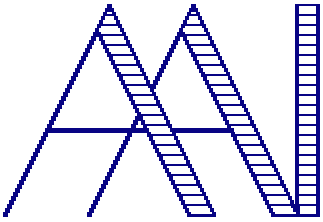

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Table of Contents

Introduction

The Akton Psychrometric Calculator Control

The Psychrometric Calculator Control is a simple implementation of the Akton Psychrometric Function Library as an ActiveX Control. It is designed to provide a quick and convenient means to perform psychrometric calculations from within Visual Basic (and other development environments) programs. The calculator control is meant to be an interface to a single point on a pyschrometric chart, and as with a psychrometric chart, many thermodynamic properties can be determined once any two independent properties are known.

The calculator control is not visible at run time. It provides no graphics, however it does provide a simple and elegant means to perform a considerable number of psychrometric calculations, complete with automatic unit conversions. For a program that is trying to collect a variety of conditions to be piped into another program, it can save a considerable amount of time while providing a great deal of flexibility. This control was created in direct response to a large number of requests for a tool that could be used to cursor through a database of values and calculate related psychrometric properties.

Properties

Psychrometric Properties

This is the list of psychrometric properties. They are ActiveX Control properties as well as physical thermodynamic properties of air water mixtures. Each Thermodynamic Property has two ActiveX control properties: A units property and a value property. Assigning a value to either one can cause the point to be recalculated based on the setting of the *AutoCalc* and *AutoConvert* properties. If *AutoCalc* is turned off, then the container program must call the *calculate* method whenever the point is to be calculated.

Assigning a value to a thermodynamic property can also change the definition of a point. Points are defined using a combination of one pressure property, and any two independent specific properties. By default a point is defined by Barometric Pressure, Humidity Ratio, and Dry Bulb Temperature, when it is created. As different thermodynamic properties are assigned values the definition of the point will change. If a value is assigned to synonymous property, then the older synonymous property ceases to be a defining property, and the newer synonymous property becomes one of the defining properties of the point. If a synonymous property can not be found, then the new property replaces the oldest defining property in the definition of the point.

For a complete definition of each psychometric property see the PFL Reference Manual. Below is an abridged list of the psychrometric properties available for use with the calculator control

Pressure Properties:

PtotUnits	PtotValue	Total pressure
AltUnits	AltValue	Altitude above sea level

Moisture Content Properties:

WUnits	WValue	Humidity ratio
qUnits	qValue	Specific humidity
PairUnits	PairValue	Partial pressure of air
Ph2oUnits	Ph2oValue	Partial pressure of water
naUnits	naValue	Molar fraction of air
nwUnits	nwValue	Molar fraction of water
maUnits	maValue	Mass fraction of air
tdUnits	tdValue	Dew point temperature
hlUnits	hlValue	Specific latent enthalpy / dry air
hlmaUnits	hlmaValue	Specific latent enthalpy / moist air

Standard Temperature Properties:

tUnits	tValue	Dry bulb temperature
PvapUnits	PvapValue	Vapor pressure of water

Specific Volume Properties:

vUnits	vValue	Specific Volume / dry air
vmaUnits	vmaValue	Specific volume / moist air
pUnits	pValue	Density

Specific Enthalpy Properties:

hUnits	hValue	Total specific enthalpy / dry air
twUnits	twUnits	Wet bulb temperature (temperature of adiabatic saturation)
hmaUnits	hmaValue	Total specific enthalpy / moist air

Specific Sensible Enthalpy Properties:

hsUnits	hsValue	Specific sensible enthalpy / dry air
hsmaUnits	hsmaValue	Specific sensible enthalpy / moist air

Relative Saturation Properties:

rhUnits	rhValue	Relative humidity
ASRUnits	ASRValue	Adiabatic saturation ratio

Examples:

```
' sets barometric pressure to standard atmospheric conditions at sea level in kPa
MyCalculatorControlObject.PtotUnits = "kPa"
MyCalculatorControlObject.PtotValue = 101.325

' retrieves current value of humidity ratio into a variable
Dim MyVar As Double
MyVar = MyCalculatorControlObject.WValue
```

Other Calculator Control Properties

AutoCalc
AutoConvert
EnthalpyAlignment
ErrorMode

AutoCalc

AutoCalc = ON (<> 0)
The values for all the thermodynamic properties are recalculated any time a value or units are changed.

AutoCalc = OFF (= 0)
The values for the properties are not recalculated automatically when values or units are changed. In this case the container must explicitly call Calculate in order for the point to be updated.

AutoConvert

AutoConvert = ON (<> 0)
If new units are set or selected for a property, then the value for that property is converted to the new units before any other calculations or updates take place.

AutoConvert = OFF (= 0)
If new units are set or selected for property, the value for the property is not converted to the new units. Calculations and updates take place normally applying the new units to the existing value.

EnthalpyAlignment

EnthalpyAliginment = Metric (= 0)
The temperature of zero for enthalpy and energy properties is set to 273 K for both water and air. This way the enthalpy and energy values line up with those that can be read from a standard metric psychrometric chart.

EnthalpyAliginment = English (= 1)
The temperature of zero form enthalpy and energy properties is set to 273 K (32 F) for water, and 255.2 K (0 F) for air. This is the convention employed by most published English psychrometric charts. This way the enthalpy and energy value will line up with those that can be read from standard English psychrometric charts.

ErrorMode

Error handling can be set to one of three different modes. The ErrorMode property can be changed during program execution if different error handling is desired during different program operations.

ErrorMode = RUNTIME (=0)
A runtime error is generated, and the container must trap for the error or the program will be terminated. This is the default mode.

ErrorMode = EVENT (=1)
An event is fired whenever an error occurs. A container can provide error handling, by responding to the OnAPXerror event generated by the control. If the event is not handled then error handling is effectively shut off.

ErrorMode = MSGBOX (=2)
A system modal message box pops up whenever an error occurs, and display an error message. The user can then click OK and the program will continue.

Methods

AboutBox

This method invokes a typical "About Box" that describes the control and displays Akton's copyright. The about box also provide a user interface with which view and move the license.

Calculate

This method causes the control to recalculate all of the values for the psychrometric point based on current settings.

ConfigurePFL

Invokes PFL configuration dialog. These constants can be changed, but they are not persistent. A container program must explicitly set them every time a new object is created, if values other than the defaults are to be used. The one exception is the temperature of zero for enthalpy. This property is persistent when manipulated using the EnthalpyAlignment property.

ConfigureUnits

Invokes the units configuration utility. Allows unit conversion additions and modifications, using the same dialog as in Psychrometric Chart Program. Unit conversions are mapped in a single file and are common to all Akton modules.

FillUnitsCombo

This method takes a handle to a combo-box (combination drop list, edit box) and fills it with all the available units for a property, also works for list boxes. The first parameter is the handle , the second parameter is a string containing the property descriptor.

Syntax:
FillUnitsCombo ComboBox as OLE_HANDEL, Property as string

Example:
I have a form with a Psychrometric Calculator Control named "MyCalculatorControlObject" and a list box named "MyListBox." I can initialize the list box with all the available units for the humidity ratio property by including the following line in the form's Load Method.

MyCalculatorControlObject.FillUnitsCombo MyListBox.hWnd, "w"

LicenseLevel

This method takes no parameters and returns an integer indicating the degree of licensing.
0 = Demonstration (unlicensed, pressure set to approximately 10000 ft elevation)
1 = Educational (pressure set to elevation 0, sea level)
2 = Fully licensed (any pressure can be specified by the user)

VBA Example:
Dim nLevel as Integer
nLevel = MyCalculatorObject.LicenseLevel

LicenseStatus

This method takes no parameters and returns an integer indicating the status of the license.
0 Fully licensed
<0 The program is not licensed or an error occurred trying to access the license
>0 The program is licensed, but it is a network license and the number of users has been exceeded

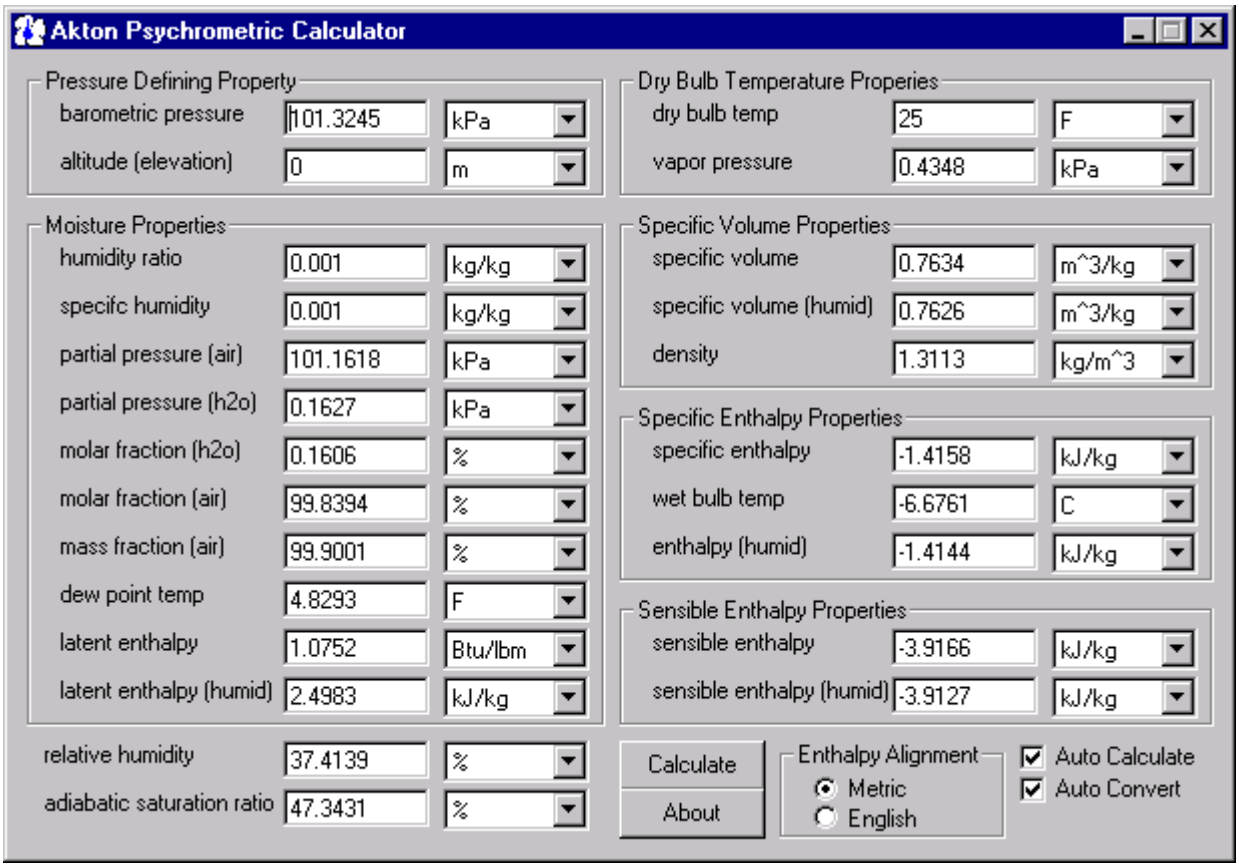
In the event of a value greater than zero, it is a floating network license and the number of specified users has been exceeded. The returned value indicates the number of users that must quit before a license is available. This method can be put in a loop that prompts the user to try again, or to proceed regardless. If a program proceeds regardless of the license status, and the value is greater than zero, the calculator control will be limited to a pressure corresponding to approximately 10000 feet elevation.

VBA Example:
Dim nStatus as Integer
nStatus = MyCalculatorObject.LicenseStatus

Examples

Calculator Control Example

There is a Visual Basic 6 example that is placed on the start menu during the normal setup of The Akton PsychrometriX controls. It is labeled "Calculator Control Example" on the start menu. All of the code and project files for this example is placed in a directory named Examples\X1_VB6 , as a subdirectory of the "Installation directory" directory.



This is a simple calculator that demonstrates most of the features of the calculator control. All of the Psychrometric Properties are displayed to the user. The user can change values and/or units for any of the psychrometric properties and have the remaining properties calculated. The AutoCalc and AutoConvert properties can be turned on and off so as to observe how they effect the control's behavior.

Access 97 VBA Example

There has been a number of requests for a simple means to cursor through a database of values and calculate related psychrometric properties. This was the primary objective in the design of this control. There is a small Access 97 Database by the name of aktonx.mdb with a few tables and forms that demonstrate some uses of the Akton PsychrometriX controls. The form named "UpdateATable" gives a simple demonstration of cursing through a database table and updating values.