VIESSMANN

KW Electronic Service Inc.

VITOTALK

KW Electronic Service Inc. and Viessmann, partners in heating technology. Controls newsletter, August 2003, Issue 5

Summer Issue: Heat's Off!

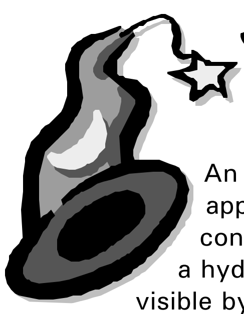
Welcome to our summertime issue of Vitotalk. Our last issue was chuck full of technical information about Vitodens and its interconnection to mixing valves. As with most things technical, it is sometimes possible to get lost in the details. An "unconventional" connection method was omitted in Vitotalk 4. However, sometimes it takes unconventional methods to solve conventional issues.

Follow Up Information:
To clarify connections made between the HK1 and 300MV Control, terminals 23 and 24 of the RIKO plug are connected to the 141 plug, terminals 1 and 3 respectively in the 300MV Control.

If a 141 communications cable is cut in half it can be used instead of the RIKO plug adapter. By cutting the 141 cable, you end up with two Dekamatik style plugs. They can be used for connecting the Vitodens and 300MV Control to the HK1 communications board. Connect the blue wire from the HK1, 141A plug, to the Vitodens X5.3 terminal in the Rast-5 plug. The brown wire is then connected to the X5.4 in the Vitodens boiler.

The remaining communication connections between the HK1 and 300MV Control are as follows: terminate the blue wire into terminal 1 of the 300MV Control. The brown wire then will be connected to the number 3 terminal of the 141 plug. **V**

Please continue reading for more valuable information!!



Tips 'N' Tricks

An installers appreciation of how a control functions within a hydronic system is visible by the variables that have been set within the controls. All of the adjustments can influence the operation, as well as efficiency of the system. There is no finer example of this than the adjustment of the boiler differential setting.

As we all know, the heating curve is the fundamental control setting to compensate for a structure's heat loss. However, a little known adjustable setting is the boiler differential. The differential works with the heating curve by adding an additional number of degrees to the calculated set point. The end result is a slightly elevated boiler water temperature than that of heating curve adjustment.

This elevated temperature helps to keep the boiler just hot enough to make up for any fluctuations within the structure. Like having a little load on hand for quick DHW demands, the boiler must be hot enough to compensate for any zone valve calls or any heat demands.

With systems that rely on unmixed boiler water temperature to satisfy heat loads, the differential setting does not necessarily play a big role. However, if the system has a single valve or multiple valves, this setting can influence the operation of the mixing valve zone as well as the valve itself.

By design, the valve is to operate in a manner such that outlet temperature fluctuations are kept to a minimum. The valve should be able to keep the supply temperature to the zone within 1 or 2 degrees C of the set point. By providing enough temperature into the supply connection of the valve, the operation of the valve should float around the 50% position. This allows the valve to move either more open or closed to help compensate for any system demands or fluctuations.

If the boiler water, that is supplying the valve, is hotter than it needs to be, the mixing valve will operate more "closed" than it needs to. The valve will open just enough to satisfy the supply sensor and the valve will modulate closed.

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Summer's Here!
Tips 'N' Tricks
Waterfall of Information: Cascade Control Part 1

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More Tips 'N' Tricks

Secondary to having the valve operating in a more “closed” position, the flow through the boiler is decreased. The decreased flow will also affect the boiler, by possibly maintaining a higher boiler water temperature and tripping the AHL.

A lower differential setting may cause the boiler water to be ***just*** hot enough to satisfy the heat load. The valve will operate in a more “open” position. This will allow for a greater flow rate through the valve and boiler. However, the boiler water may not be able to compensate for any increased fluctuations caused by calls from zone valves or fan coils. The end result could be decrease zone comfort for the occupants.

In general, a factory default of 6 to 8 degrees C is programmed into the controls. Depending on the control, the differential adjustment can be done with the push of a button or a simple coding adjustment. Refer to the installation manual of the specific control you are working with.

Remember, a simple adjustment can greatly impact how the boiler and valves function within a hydronic system.

Sensor Failures

From time to time, it is necessary to replace a sensor that has failed. The type of failure can vary from open, shorted to intermittent operation.

If the sensor has opened or shorted, try exchanging it with a known good sensor. As an example, if the customers Vitodens Low Loss Header sensor has failed, exchange it with the DHW sensor. This will enable you to determine whether it is either the specific sensor or a wiring issue. When making this interchange, the fault code that is displayed will change from the LLH sensor to DHW sensor. As well, if

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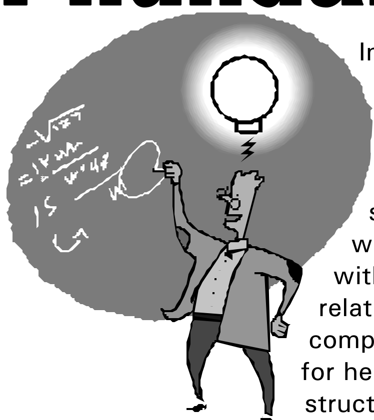


In the last issue of Vitotalk, the topic of room sensing was dealt with in relation to compensating for heat loss in a structure. The underlying physical property was that of heat transfer from a point of high temperature to low temperature. Remember we don’t gain cold, we lose heat. Not being able to compensate for the heat loss makes the area/body cold.

Choosing materials that keep the heat transfer to a minimum allow a structures heat loss to be kept to a minimum. The same is also true with respect to wiring. However we are not necessarily concerned with heat transfer but rather noise infiltration and induced current/voltages

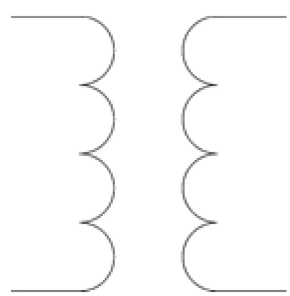
Definition:
noise *\noun* electromagnetic radiation (as light or radio waves) that is composed of several frequencies and that involves random changes in frequency or amplitude.

When current flows through a conductor, an electromagnetic field is generated around the wire. The size of the field is determined by amount of current flowing through the wire, the size of the conductor and the number of wires used to conduct the current.

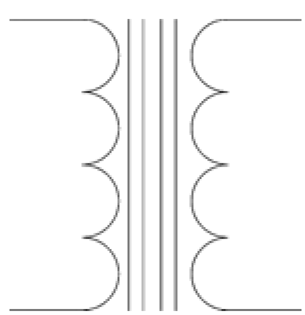
A simple experiment that you may have done when in school was to place iron filings around a current carrying wire. You will notice that the filings form a circle around the wire. The filings are giving you a visual indicator of the electromagnetic field. While this experiment is primarily done with DC current, AC current also has the same effect.

In AC current, the field around the wire fluctuates with the frequency of the voltage.

If a second wire is placed parallel to the current carrying conductor, a current will be induced in the adjacent wire from the surrounding field building and collapsing. The induced current, on the adjacent wire, will generate a potential AC voltage. This voltage can then be read with an AC multimeter. Depending on a number of factors, this voltage can vary greatly in strength.



Picture: Transformer with air core between windings



Picture: Transformer with iron core between windings

Fundamentally, this is how many of the products we use everyday function. Products such as door bells, speakers, transformers, alternators, generators and so on.

The best example of the issue we are discussing here is the basic isolation transformer: two wires having a mechanical separation from another. However, instead of using air as the medium between the two wires, other materials such as ferrite help to conduct the electromagnetic field. Of course transformers are not made up of single conductor wires, but rather multiple windings on the primary side and the secondary side. We will discuss the in’s and out’s of transformers in future issues of Vitotalk.

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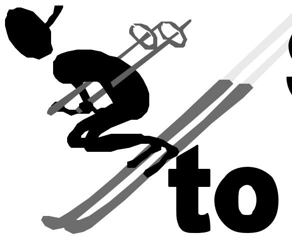
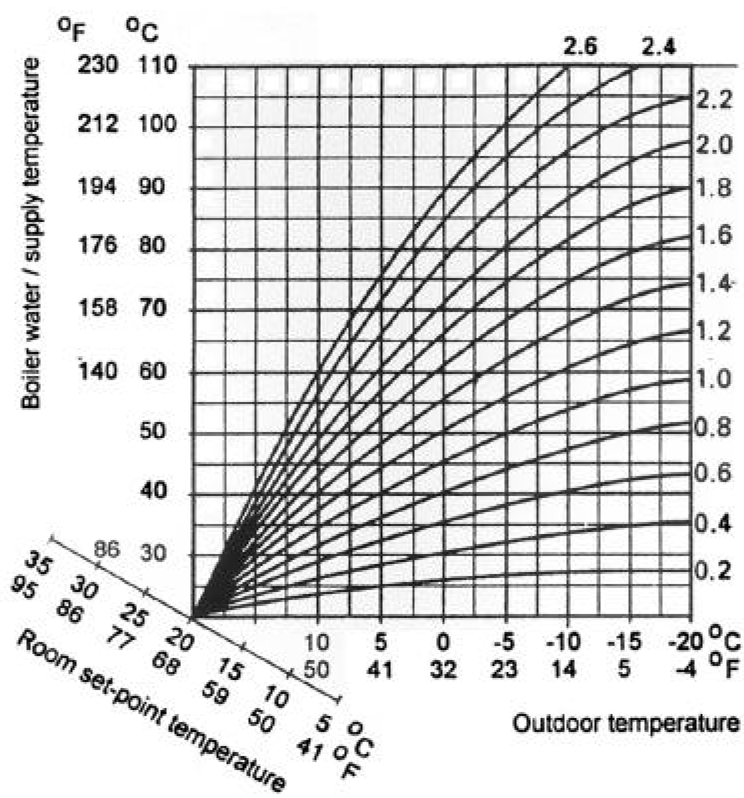


Slippery Slope to WWSD Point

The second issue of Vitotalk discussed the differences between heating curves for the Vitotronic KW10 and the Vitotronic 200/300 controls. With the recent introduction of the Vitodens Cascade control, we see a new style of heating curve adjustment. Along with different adjustments, there are different names for the adjustments.

For a moment, lets recap the fundamental operation of any heating curve. The slope adjustment of a heating curve changes the relationship of outdoor temperature to boiler/supply temperature. A lower heating curve will calculate a relatively cooler boiler/ supply temperature than that of a higher heating curve. In other words, the lower the heating curve, the less the outdoor temperature effects calculated boiler/supply temperature. The higher the heating curve, the greater the outdoor temperature effects boiler/supply temperature calculations. Keep this in mind when we discuss the Cascade control "curves".



Above: Viessmann heating curves for Vitotronic/Dekamatik/Trimatik controls.

Settings
The Viessmann control allows a slope, parallel shift and a normal room temperature adjustment. Along with a number of other "secondary" settings.

The ***slope*** adjustment has a range from 0.2 to 2.6. When the setting is changed, the curve will pivot on the normal room temperature setting. This pivot action allows the recalculation of boiler/supply temperature at a specific room temperature.

The ***parallel shift*** adjustment allows the movement of the entire slope to be moved parallel. In other words, a 5 degree shift at one end of the curve is equal to a 5 degree shift at the opposite end.

When the slope and parallel shift are adjusted in respect to one another, the possibilities are endless.
The third major adjustment is the ***normal room temperature*** setting. The normal room temperature setting may also be known as the "Sun" setting because of the picture associated with the button. The reduced room temperature is also known for the picture of the Moon on the button.

Based on clock settings programmed into the control, the room temperature mode can be switched back and forth a number of times a day. Obviously when the control is not in the normal room temperature mode, it is in reduced mode.

The control's clock will determine when the specific mode is selected based on entered timer settings.

To understand the effects that the normal room temperature has on the heating curve, envision all of the selectable curves coming to one single point on this line. Now envision this single point moving following the diagonal line. As this point moves, the boiler/supply temperature recalculates with respect to outdoor temperature. Please keep in mind that this is not necessarily a parallel shift. A change in the normal room temperature point will not provide the same change in temperature at the top end of the heating curve.

In the past, the normal room temperature setting was the dependant factor for determining the WWSD point. The Vitotronic 200/300 has an address that allows the WWSD point to be determined outside of the normal room temperature setting. This address is A6. The factory default setting is 36. Since this is a value setting, for an address, there is no unit given. However the number 36 does relate to a degrees C unit of measurement.

When the value of A6 is adjusted below 36, the WWSD will occur at that particular value setting with respect to outdoor temperature. When the outdoor temperature exceeds the programmed value at A6, the circuit pumps will turn off and the mixing valve will close.

Unlike that of the Trimatik-MC, the Vitotronic 200/300 controls allow different WWSD/normal room temperature settings for each circuit. With respect to Vitotronic controls that is circuit 1, 2 and 3. Remember this coding change may have to done three times.

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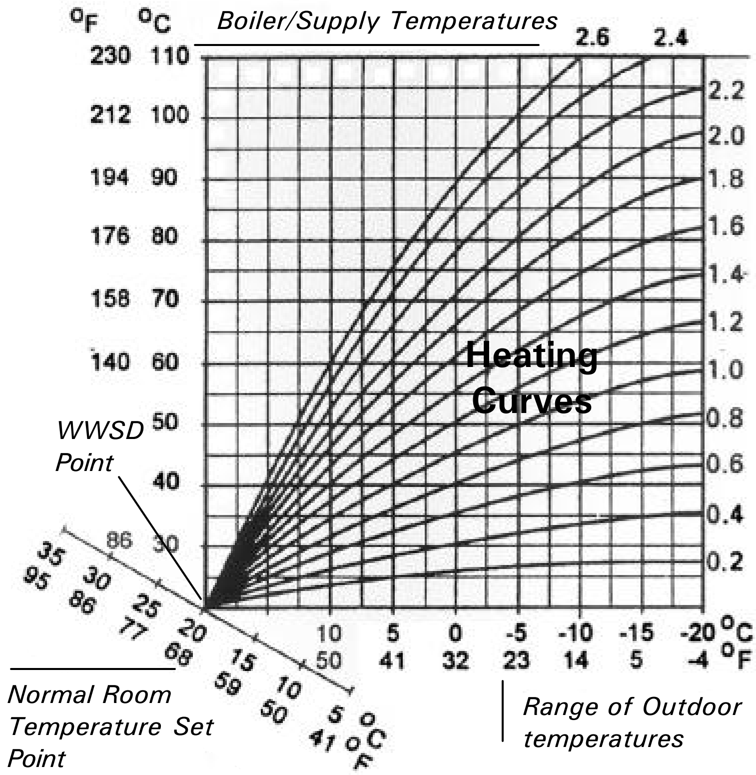
How to Use:
The heating curve graph is relatively easy to use when you know what to look for. Setting the heating curve is based on supplying a specific boiler/supply temperature at a given outdoor temperature.

Using the heating curve graph shown here, select two outdoor temperatures, one at 0°C/32°F and at –15°C/5°F. At 0°C/32°F the desired supply is 70°C/158°F. At –15°C/5°F the desired supply is 90°C/194°F. Determine the heating curve that is to be used.

Draw a line up from the outdoor temperature to the closest heating curve that will provide the desired supply temperature for both points. You will note that the closest curve is 1.8. However, the 1.8 curve does not supply the required boiler/supply temperature that the specification has outlined. The first thing that can be done is to use a parallel shift of 5 degrees or so to calculate the correct supply temperatures.

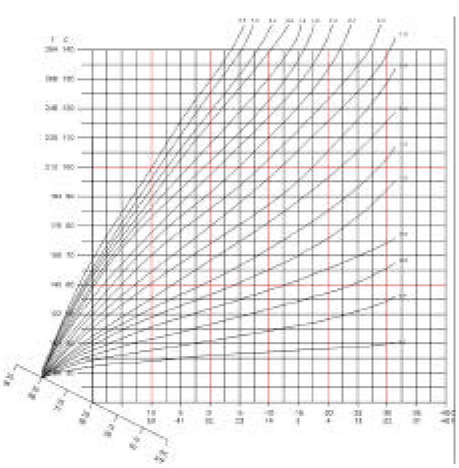
It should be noted that arriving at these results is NOT the only way. The 2.0 curve could have been selected and shifted downwards. A third route to take is to select the 1.8 curve and increase the normal room temperature upwards. All three of these will generate a similar result.

It can become tricky when an adjustment of normal room temperauture is required. The graphs at the bottom of the page show the effects on the graph with a room temperature shift.



Picture showing different elements of Viessmann graph

Notice that all the curves follow the diagonal room set-point temperature line. When makin a change like this, the entire heating curve moves and thereby recalculating the boiler/supply over the entire range of outdoor temperaures.



Graph: Adjustment of room temperature to setting higher than that of factory

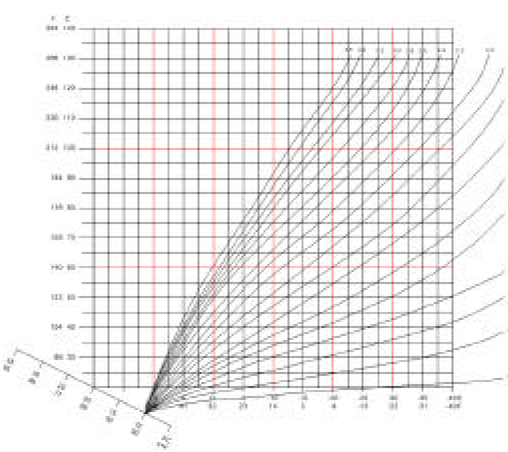
The most common mistake is to increase the room temperature set point and not lower the heating curve value. This will lead hotter boiler/supply temperatures being calcualted than required.

The converse of this is true too. By lowering the room temperature set point, the coldest outside temperature is lower than desired. A high heating curve value is required. A parallel shift is the easiest adjustment. Just add the amount of adjustment to the desired boiler/supply temperature.

Alternate Settings:
There are a number of alternate settings that can be programmed with respect to the Vitotronic controls. These are settings that fine tune or work in conjunction with, slope, shift and normal room temperature.

Two of the most common settings are the minimum and maximum temperature points. These two points allow the user to provide a frame of operation for the boiler or mixing valve. By establishing a minimum, the user can be assured of a constant temperature being supplied to either a high temperaure system or a cooler mixing valve circuit when not in WWSD.

The minimum setting can be adjusted at address C5 for the boiler and mixing valve circuit(s). Ensure that all circuits that are applicable are changed. In the case of the Vitotronic 300, this is done for the boiler circuit, as well as mixing valve 1 and 2.



Graph: Adjustment of room temperature to lower setting than that of factory

The maximum temperature setting will "cap" the heating curve and act as a ceiling for calculated temperatures. Maximum temperature settings are at address 06 for the boiler circuit and address C6 for the mixing valve circuit(s).

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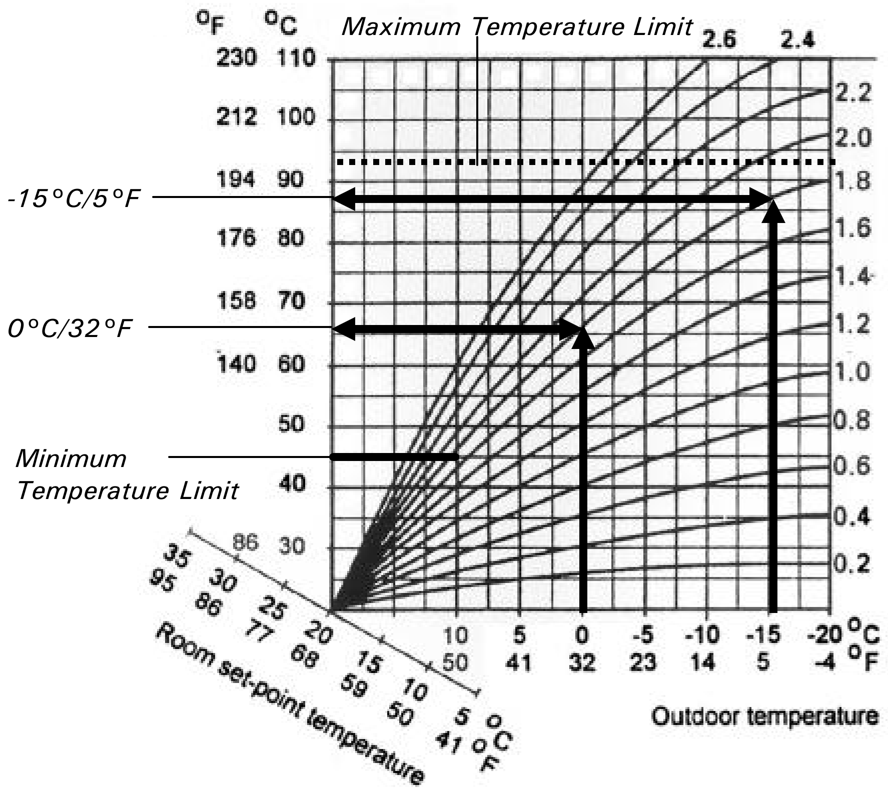
Another setting which co-incides with WWSD control is address A5. This address controls when the pump(s) turn off based on outside temperature above the normal room temperature. A factory default value of 5 means that the pump will shut off when the outdoor temperautre is 1°C/1.8°F above normal room temperature setting. The control allows a range of 5°C/9°F to –9°C/16.2°F above and below the normal room temperature setting respectively.



The heating graph on this page shows everything that was discussed from the previous pages. Look for the minimum temperature, maximum temperature, boiler/supply values at specific outdoor temperatures. Note how they all work together to calculate the necessary boiler/supply temperature to compensate for the heat loss of the structure.

Graph at left:
This graph shows the supply temperature of two outdoor temperature points based on a 1.8 heating curve. Note how the maximum temperature limit will cap the heating curve on the top. The minimum setting will be maintained until such time that the reset portion of the curve starts calculating a higher value. At that point, the boiler/supply temperature will increase based on curve setting.

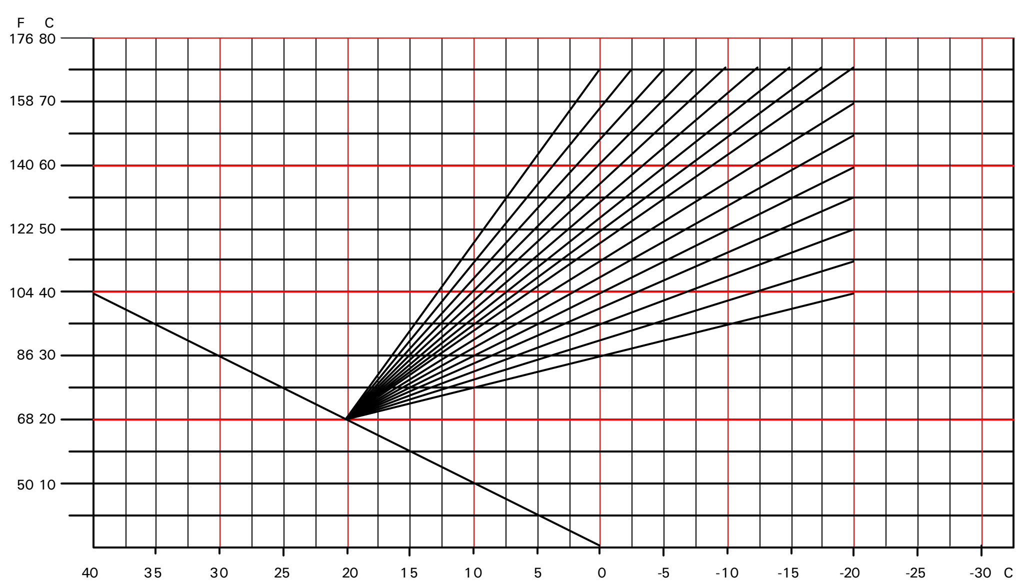
Knowing what boiler/supply temperature you want a specific outdoor temperature is the only way to determine the slope settings. By adjusting all the possible variables, the user can tailor the response of the curve to suit their application. **V**
Questions? Call!

Cascading Waterfall

When we think of the word Cascade, a gentle waterfall may come to mind. In the case of Viessmann, it is the controller of Vitodens that describes Cascade.

The Viessmann Cascade control fills a very unique niche within the control line up. Its primary function is to control the "cascading" of up to 4 large WB2 model Vitodens. It does this by communicating with the individual Vitodens controls on the 145 BUS.

To accomplish the task of cascading the Vitodens boilers, the control uses its own heating curve. Along with the heating curve settings, dedicated outdoor and supply sensors are also used. While the objective of providing the required supply temperature is the same as other Viessmann controls, the methodology and terminologies are a little different. Controls such as the Vitotronic and Trimatik use the slope, shift and WWSD settings, the Cascade control uses a number of fixed points to achieve the same goal.



Picture: Sample of Cascade control heating curves

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Slope!

Definition: *Inclined position or direction, state at which one end is at higher level than the other, difference in level between two points, position on a line neither parallel nor perpendicular to level ground or line serving as standard.*

With respect to the above definition, if two points are plotted on a grid, both at the same elevation, and a straight line is drawn between them, the line will have no slope. However, as soon as we start to increase the elevation of one of those points, the line begins to have a slope value. The amount of slope is dependant on the difference between the two points.

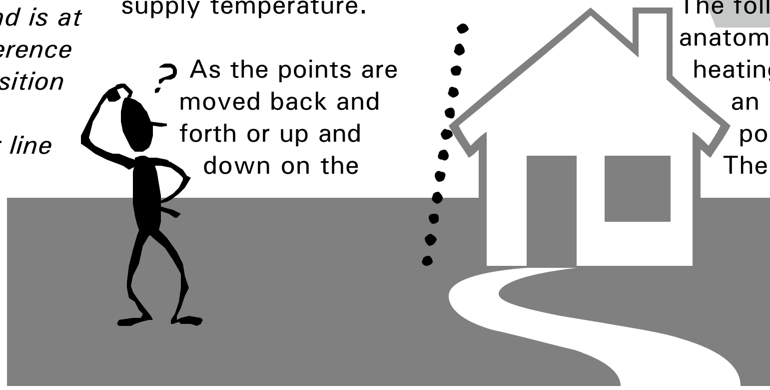
Now, instead of raising the original point, lower the other point the same distance. When the point is lowered the same amount, we can create the same amount of slope and duplicate the line characteristics.

If we laterally increase the distance between the two points, the amount of slope will decrease. If the points are moved closer, the amount of slope will increase.

Think about putting a ladder up against the side of your house. The ladder has two points of contact, the base and where it touches the roof. If the base of the ladder is close to the house, the slope will be greater than if you increased the distance from the house. The closer the ladder is to the house, the faster you can get on the roof.

When the base of the ladder is moved further out, the distance from the base to the house is greater. This increases the area that you can drop you tools over when on the ladder.

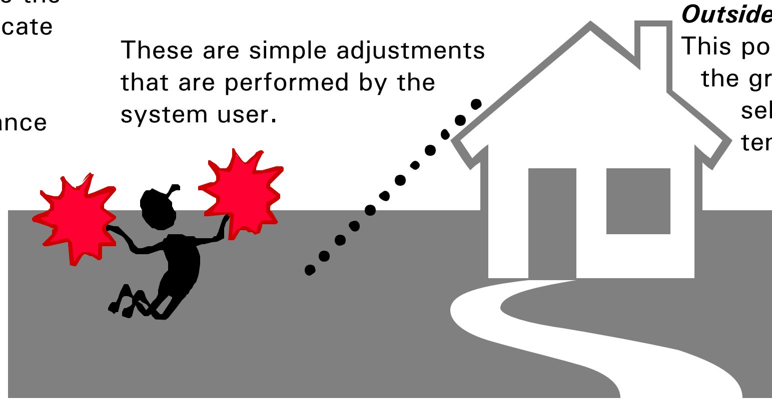
If you are asking your self, “That’s fine for home renovations, but what the heck does that have to do with the Cascade control!!!???”. By fixing or anchoring two points on a grid, we can show how the control will calculate the relationship of outdoor temperature to supply temperature.



Picture: Having the ladder too close makes the slope very steep. Reach the top of the ladder very quickly. Note the points of pivot: ground and roof

As the points are moved back and forth or up and down on the grid, you can affect how supply temperature will be recalculated based on outdoor temperature changes. The steeper the slope, the hotter the supply temperature will be with respect to a smaller change of outdoor temperature. By decreasing the slope, the supply temperature will be more gradual over a greater range of outdoor temperature.

These are simple adjustments that are performed by the system user.



Picture: Moving the ground point, adjusts the slop of the ladder. Reach the top with a more gradual increase over a greater range of movement.

There are four fundamental points that the Cascade controls uses to vary the sloped line: Outside Temperature Fixed Point, Flow Temperature Fixed Point, Outside Temperature Climazone and Flow Temperature Climazone. Along with these four points, there are a few other settings that can modify the operation of the control. They are the Curvature setting, Normal/Economy/ Holiday room setting, Minimum and Maximum Flow settings.

While the names are a little different, the basic function is the same. Instead selecting a specific curve, like that of the Viessmann curve, the four programmed points of the Cascade generate the ratio.

The following page shows the anatomy of the Cascade Control heating curve. We will start with an understanding of how the points can move on the grid. The combination of other Cascade control settings will follow.

Note how setting the starting point and ending point, establish the sloped line to calculate supply temperature based on outdoor.

The best way to start with these new settings is to ask yourself a couple questions, “At what point do I want WWSD to occur?” and “What supply temperature do I want when coming out of WWSD?”.

The WWSD point is determined by the ***Outside Temperature Fixed Point***. This point moves left and right on the grid to allow the user to select a specific outdoor temperature.

The supply temperature that the Cascade control will calculate, when coming out of WWSD, is determined by the ***Flow Temperature Fixed Point***. This point has an up and down movement.

Like setting the base of the ladder, we can move these two points around to set our starting point.

The second point will help to establish the slope. The two points are called the ***Outside Temperature Climazone*** and ***Flow Temperature Climazone***. Fundamentally, these points ask you to think about one question, “What supply temperature do I want based on a given outdoor temperature?”. This question does not necessarily mean maximum temperatures but rather a point of reference for slope calculations.

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Anatomy of Cascade Control Heating Curve

This graph is shown for illustrative purposes only. See manual for exact adjustments.
Graph shown a function of current settings

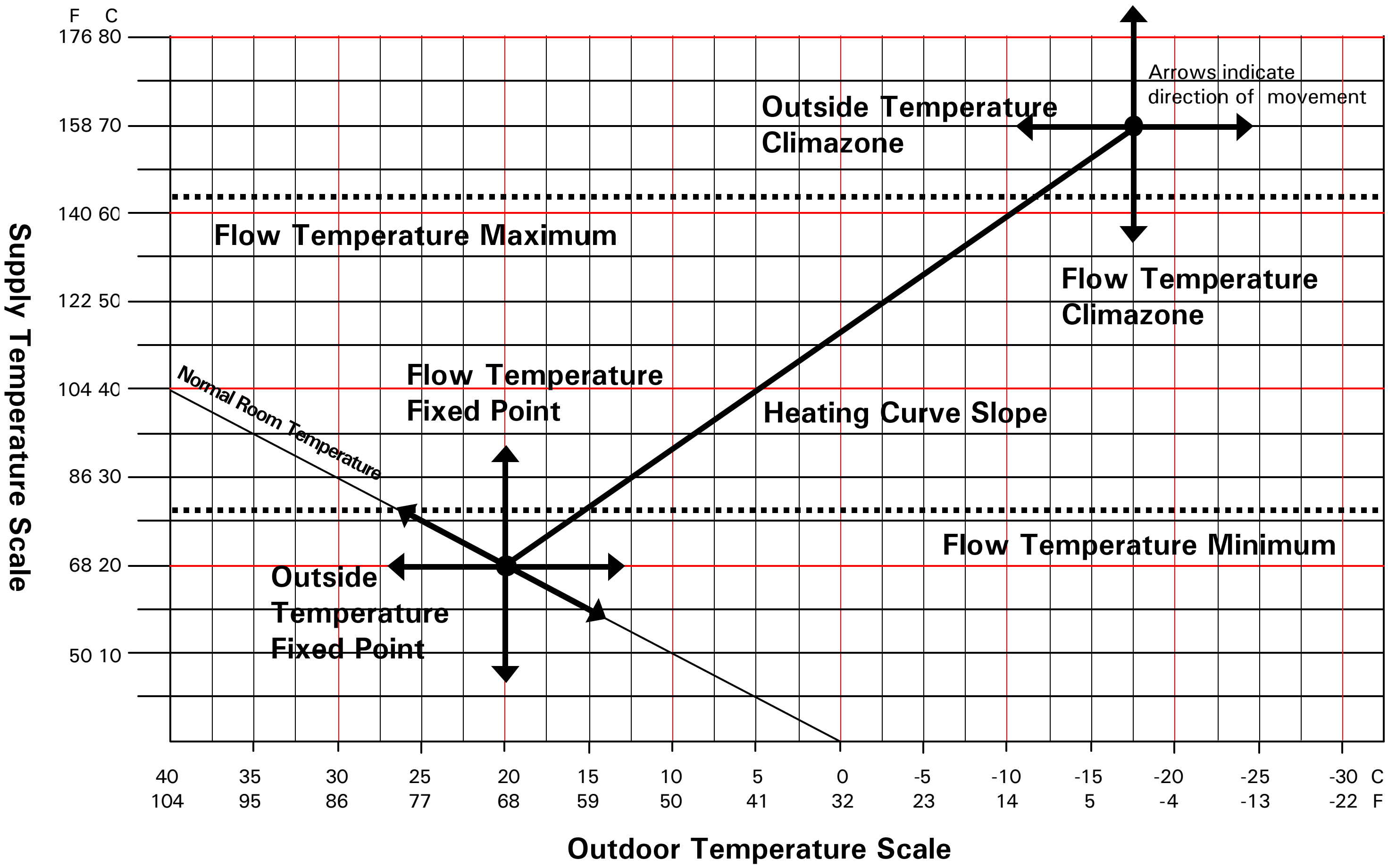
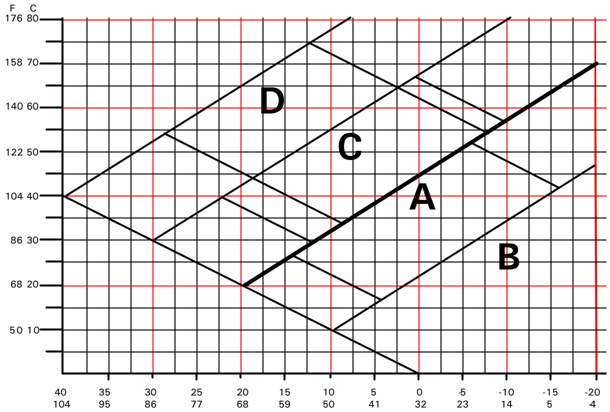


Table of Adjustments

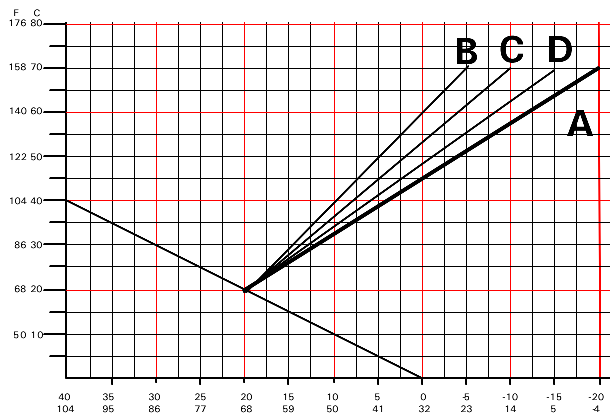
Setting	Function	Movement on Grid	Range °C
Outside Temperature Fixed Point	The *outside temperature* that you want the control to come out of WWSD and resume regular operation	Left and right	1 to 30
Flow Temperature Fixed Point	The *supply temperature* that you want to calculate when the control comes out of WWSD resume regular operation	Up and down	1 to 100
Outside Temperature Climazone	The *outside temperature* at which you want the control to calculate maximum supply temperature	Left and right	0 to –20
Flow Temperature Climazone	The maximum *supply temperature* that you want to calculate based on the Outside Temperature Climazone setting	Up and down	1 to 100
Normal Room Temperature	Provides a parallel shift of curve based on *Outside Temperature Fixed Point*	Diagonal movement of heating curve slope	5 to 40
Flow Temperature Minimum	A minimum supply temperature setting	Up and down	1 to 74
Flow Temperature Maximum	A maximum supply temperature setting	Up and down	1 to 74

Sample Graphs with 1.0 Curvature



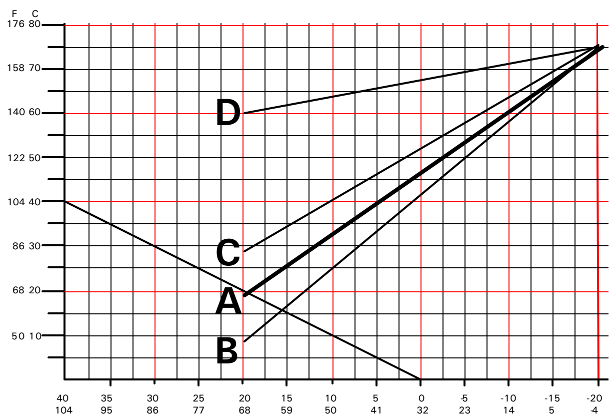
Adjustment	A	B	C	D
Outside Temp Fixed Point	20	20	20	20
Flow Temp Fixed Point	20	20	20	20
Outside Temp Climazone	-20	-20	-20	-20
Flow Temp Climazone	70	70	70	70
Normal Room Temperature	20	10	30	40

Note: ***A*** line is moved in a diagonal direction when *Normal Room Temperature* setting is altered. Slope of line remains the same



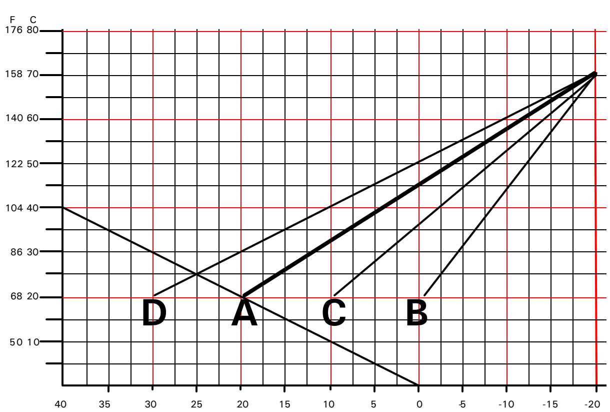
Adjustment	A	B	C	D
Outside Temp Fixed Point	20	20	20	20
Flow Temp Fixed Point	20	20	20	20
Outside Temp Climazone	-20	-5	-10	-15
Flow Temp Climazone	70	70	70	70
Normal Room Temperature	20	20	20	20

Note: Adjusting the *Outside Temp Climazone* point adjusts the slope of the curve. Maximum supply calculation adjusted based on outdoor.



Adjustment	A	B	C	D
Outside Temp Fixed Point	20	20	20	20
Flow Temp Fixed Point	20	10	30	60
Outside Temp Climazone	-20	-20	-20	-20
Flow Temp Climazone	70	70	70	70
Normal Room Temperature	20	20	20	20

Note: Adjusting the *Flow Temp Fixed Point* increases or decreases the supply set point when the control comes out of WWSD. Note the slope.



Adjustment	A	B	C	D
Outside Temp Fixed Point	20	0	10	30
Flow Temp Fixed Point	20	20	20	20
Outside Temp Climazone	-20	-20	-20	-20
Flow Temp Climazone	70	70	70	70
Normal Room Temperature	20	20	20	20

Note: Adjusting the Outside Temp Fixed Point controls the WWSD point. Note the slope.

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The beginning point and ending point also serve as anchors for the Cascade controls curvature settings. This will be expanded on further in the next section.

Cascade Curvature

Until now, the relationship of outdoor to calculated supply temperature has been shown with a 1.0 curvature. This setting creates a linear relationship between outdoor and supply temperatures.

One feature of the Cascade control is that it allows a curvature setting to be programmed. This modifies the linear relationship from a straight line into an arc. The arc runs from the starting (anchoring) point to the end point that has been programmed into the control during set up.

By design the arc bows out more at the bottom end of the curve and gradually starts tapering back to the ***Flow Temp Climazone Point*** at the top. When the curve is plotted, it looks very similar to that of the Viessmann heating curve. But because we can adjust the points that the curvature operates in, we can provide a “bump” in temperature anywhere along the slope.

Generally speaking, as you adjust the curvature setting, each .10 increment adds about 1°C or 1.8°F to the calculated supply temperature. This increase is most noticeable in the 5 to −5°C or 41 to 23°F range. However, the closer the points are together, the smaller the “bump” is to the point where a 1.6 curvature may increase the supply temperature by only 2°C/4°F.

The graphs below show the incremental increase of curvatures from 1.1 to 1.6. They finish off with a combination of all the major curvature settings. Note the gradual increase of temperatures from setting to setting. Because the increments are in units of 100’s, the amount of curvature can be quite fine.

As with all heating curve settings, the determination of the amount of curvature may take a few adjustments. If the system needs a little bump when the weather starts getting a little colder, start with a lower setting and go from there.

Cascade Combo

Until now, all the graphs se have shown the Climazone settings at low outdoor temperatures and high supply temperatures. By lowing both of these settings, we increase reset below what the graphs show. As well, if curvature is also added we can get some unique curves.

When you start using the Cascade Control you will note the lowest Outside Temperature Climazone point is −20. This is not to say the control cannot calculate lower than −20 but

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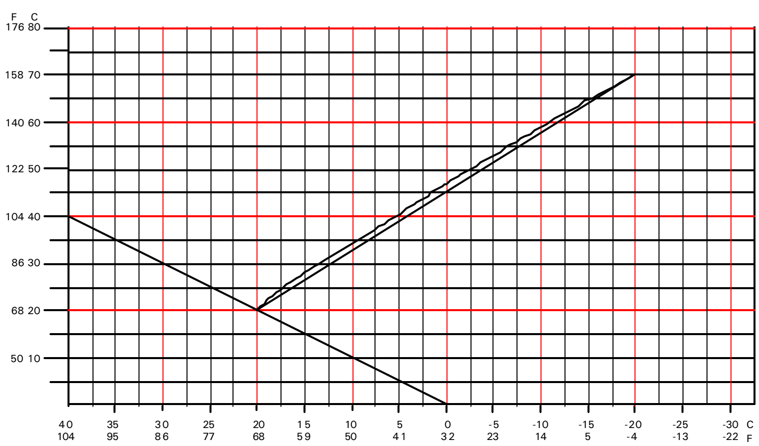
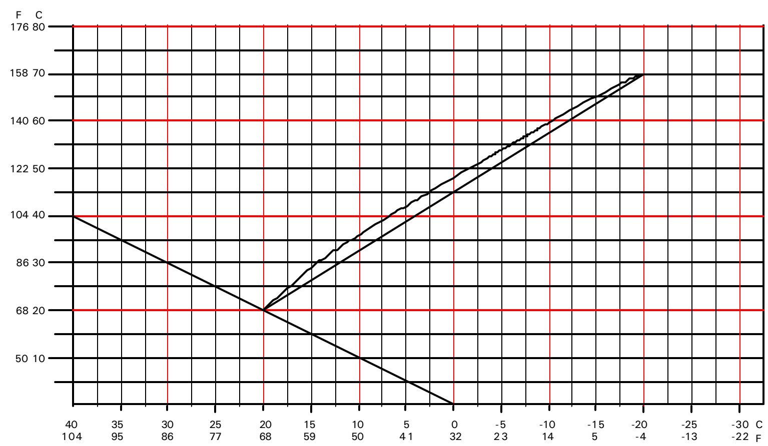
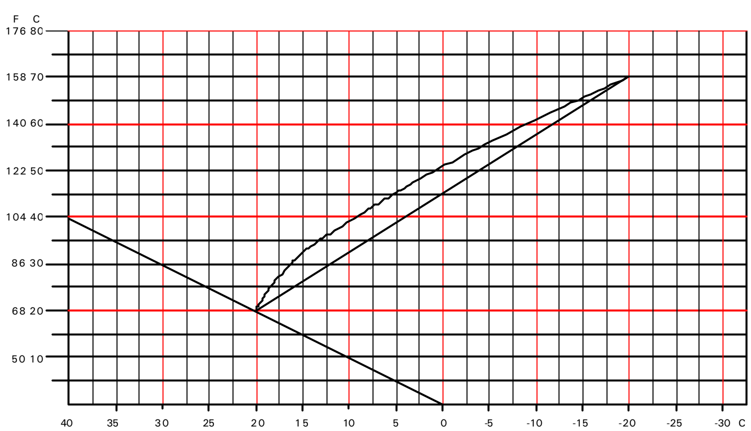


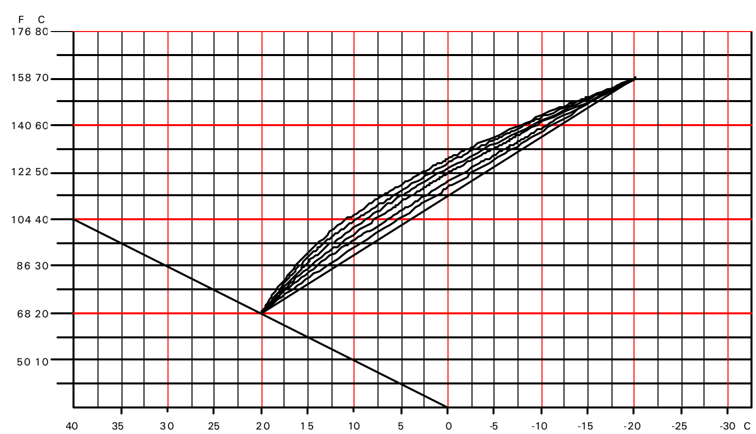
Graph 1: Shows the 1.1 curvature in relation to 1.0 setting



Graph 2: Shows the 1.2 curvature in relation to 1.0 setting



Graph 3: Shows the 1.4 curvature in relation to 1.0 setting



Graph 4: Shows 1.0, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6 curves

Continued from previous page

rather a reference point for slope. The graph below shows how a slope can be programmed for a design temperature of −40°C/-40°F at 70°C/158°F boiler supply.

You will note on the graph below we have programmed the Outside Temperature Climazone point for −10° C/14°F and the Flow Temperature Climazone to 45°C/113°C.

Even though the control was set to −10°C/14°F, the control continues to calculate a supply temperature as the outdoor tempeature drops. As mentioned before, it will only go to a maximum of 74°C/165°F supply water temperature. With respect to the curve below, the maximum temperature will not be hit until below −40°C/-40°F.

Once again lets think of the two points we program as pivots. This time instead of pivoting at the low end we will now pivot at the high end.

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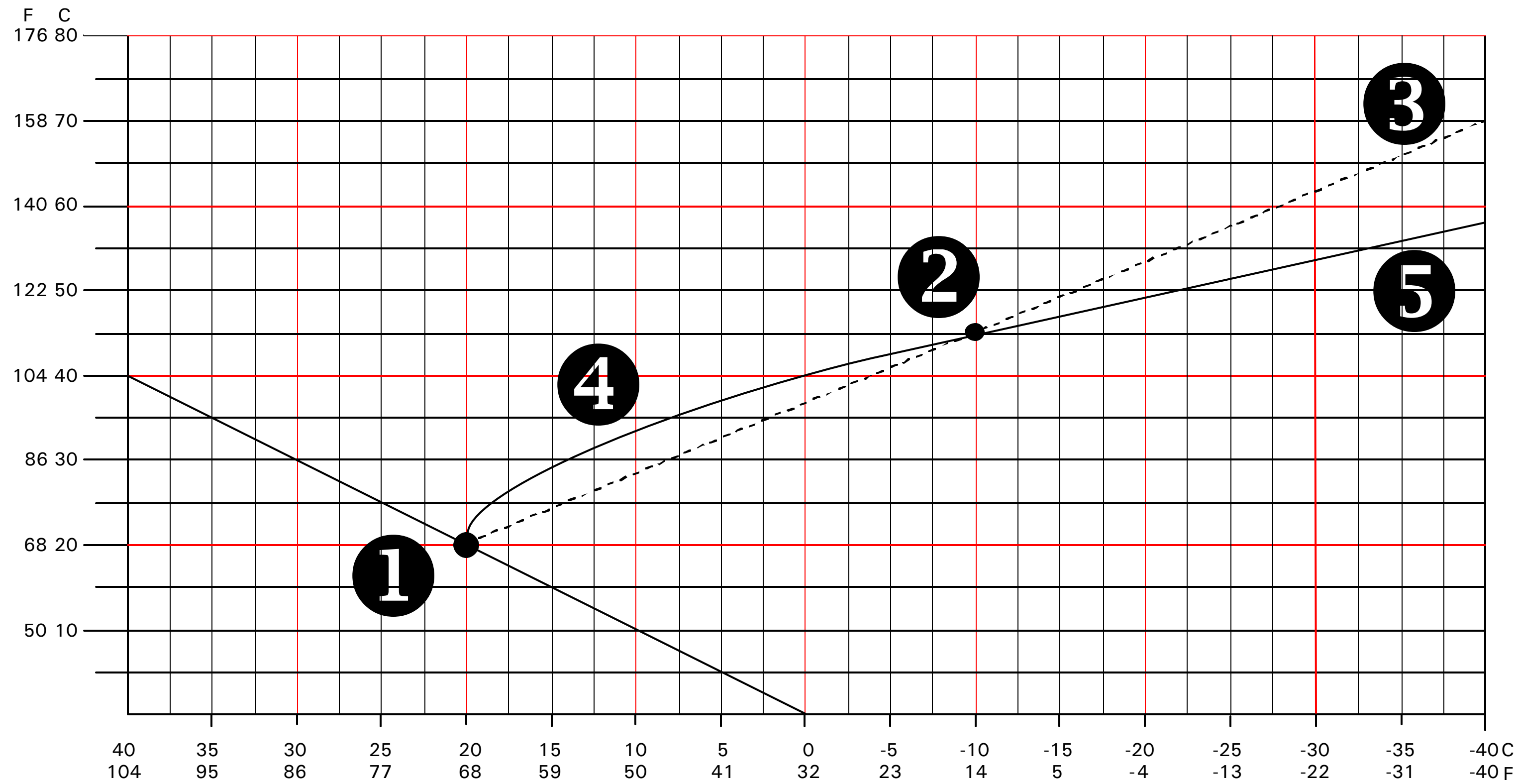

1. Starting point for both sloped lines: Outside Temperature Fixed Point and Flow Temperature Fixed point and Normal Room Temperature.

2. End point for curvature. Calculated supply temperature continues based on outdoor temperature shown by dotted line. Only limited by maximum boiler water temperature.

3. Dotted line shows sloped line with no curvature setting. Maximum temperature limited by Vitodens boiler.

4. Curvature setting only affects section of slope between points 1 and 2. Once the curve gets past point 2, the line continues to maximum supply temperature setting.

5. Gradual increase of supply temperature. Line flattens out after point 2. Notice change in slope until maximum temperature reached. The portion of this line affected by heat curvature setting. The lower the curvature setting the greater the slope after point 2 and vise versa.

Adjustment Comparison

Viessmann Control Adjustments	Cascade Control Adjustments
Slope	Combination of Settings (see below)
Parallel Shift	Combination of Settings
Normal Room Temperature	Normal Room Temperature
Reduced Room Temperature	Economy Room Temperature
Minimum Temperature Setting	Minimum Temperature Setting
Maximum Temperature Setting	Maximum Temperature Setting
WWSD (Vitotronic address setting)	Outside Temp Fixed Point
External Demand Set Point (Sw Mod V)	Flow Temp Set Point
——	Outside Temp Fixed Point (slope)
——	Flow Temp Fixed Point (slope)
——	Outside Temp Climazone (slope)
——	Flow Temp Climazone (slope)
N/A	Curvature

Continued from 2nd page: Phundamentally Physics

It is very important to understand this relationship particularly when running low voltage communication or sensor wire near high voltage/current power wires.

When installers are making connections for communication and/or sensors they will quite often do so with basic thermostat wire. This is a very common type of wire used in many low voltage applications. It may also be known as bell wire—referring to door bells.

There are a number of available conductors with thermostat wire but the most common is two, single, solid conductors individually insulated from each other and encased in an outer brown jacket. The two conductors may have white insulation on one wire and black on the other

By design, the wire can be laid quite flat because the two conductors are parallel to each other. The solid wires allow it to be fed easily around obstructions during installation. While this wire is popular, it is definitely not the best choice if there is the possibility of electromagnetic interference.

In a recent installation of a Vitodens boiler and single mixing valve controller, repeated communication errors were being experienced. Exhausting the regular fixes, it was decided to have a look at the wiring. A shielded, stranded twisted pair wire replaced the standard communication cable that is sent with the mixing valve controller. The shielding was grounded at one end of the cable run. This ground provides a “drain” to ground for any noise or induced voltage. After this wiring change was completed, the communication errors disappeared.

That is not to say that all low voltage wires should be replaced for twisted pair stranded. However, one fundamental mistake that installers make is running the low voltage wires parallel to higher voltage wiring. Where possible, run the low voltage wire perpendicular to high voltage wires. This intersection of cable helps to minimize the likelihood of noise from one cable to another. The intersection surface areas of the two wires are reduced to a single point than a long distance.

At this point you may be asking yourself “What is it about stranded, shielded, twisted pair wire?”. There are numerous properties of better quality wire, which include, but are not limited to, material of outer jacket casing, amount and type of shielding, number of strands in each conductor, type of individual conductor shielding.

The most important properties of this list are twisted and stranded. Having each stranded wire twisted together minimizes the likelihood of noise from adjacent cabling. Quite often the reduction of noise is referred as the attenuation of EMI.

Look in future issues of Vitotalk for continued discussions on this topic. **V**

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Now that we have covered the majority of the operation of heating curves for the Cascade control, keep in mind, it is the relationship of each point, to one another, that determines the operation of the control.

Watch for further issues that discuss the other excellent features of this control.

Included in Vitotalk is a blank work page that will allow you to plot your own heating curve settings. Photocopy or print the page as required.

Combining the flexibility of the Vitodens, with the flexibility of the Cascade control, makes for a very potent combination. **V**

Continued from 2nd page: Tips "N' Tricks

the type of fault does not change, there maybe other issues taking place within the control.

It is **very** important to know the sensors are of equivalent values and curve characteristics before exchanging them. Manufacturers rate their sensors as having a specific resistance at a given temperature. As an example, 500 ohms at 0°C/32°F or some may be 10Kohms at 0°C/32°F. Ensure you refer to the correct controls manual for this information.

A sensor that fails intermittently can cause many headaches. The Vitotronic 200/300 and Vitodens maintain an internal fault history. This allows the service person to view a sensor failure with no present sensor failure.

As part of a contractors start-up sequence, ensure that any past fault histories have been deleted. As well, it is a good practice to erase any failures after fixing the problem. **V**

BONUS MATERIAL!

Shown below is the schematic that is included in the Vitocontrol-S documentation. It is based on the view of looking into the panel and seeing the terminal strips at the top.

You will note that there are three specific sections of terminations: Power/Pump supply connections, alarm dry contact and low voltage terminations.

Power Supply:
120VAC, 10A, 60HZ, 1PH.

Supply Pump:
120VAC, 8FLA.

Alarm Output:
120/24VAC 5A

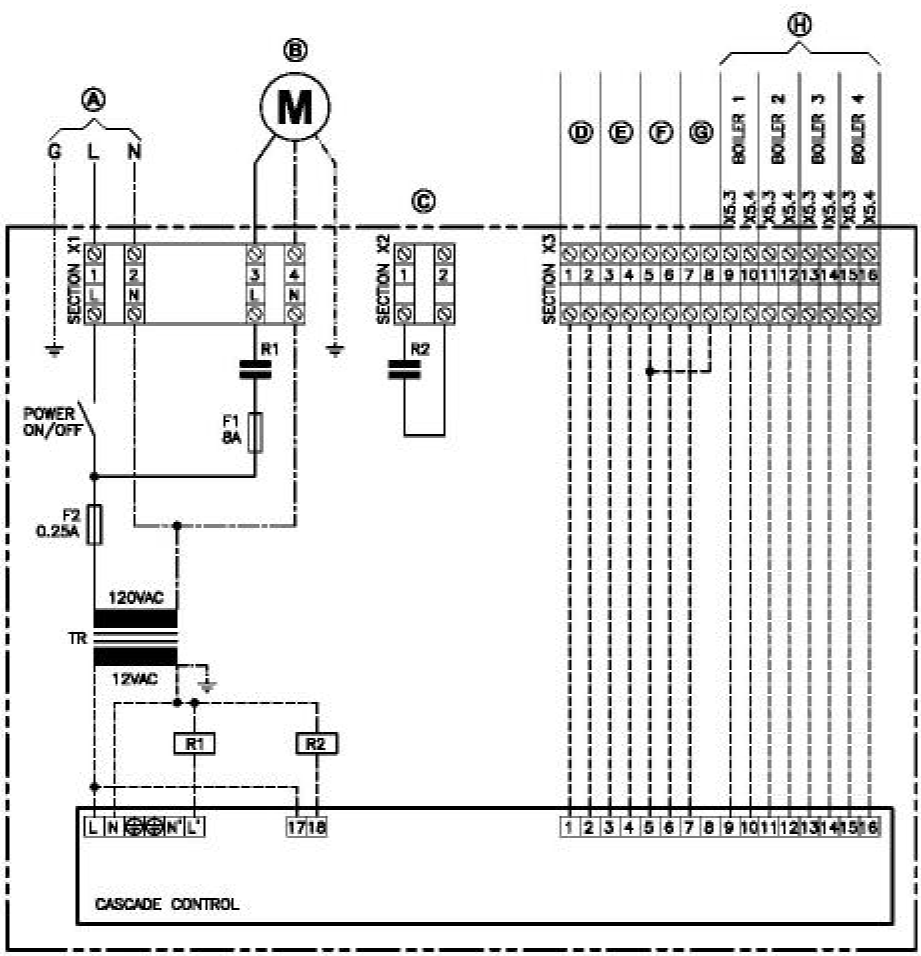
The control panel has a side mounted disconnect that switches the line connection. The panel is fused internally with a 0.25 ampere and a 8 ampere fuse.

The Cascade control itself is powered by a 12VAC transformer. Take note of this if emergency field replacement is absolutely necessary.

Dimensions:
17"x12"x6.5"
430mm x 300mm x 165mm

Weight:
Panel weight 22lb/10Kg
Shipping weight 24lb/11Kg
V

VITOCONTROL-S, WB2



A- Power supply 120VAC, 10A, 1PH
B- Supply pump 120VAC, 8FLA
C- Dry contact 120/24V, 5A- compiled failure alarm
D- Outdoor temperature sensor
E- Supply temperature sensor
F- Party switch (dry contact)
G- External heat demand (dry contact)
H- KM-BUS