KWE Technologies Group

VIESSMANN

VITOTALK

KW Electronic Service Inc. and Viessmann, partners in heating technology. Controls newsletter, May 2004 Issue 6

Summer is in the Air!

The smell of summer teases us that its just around the corner. For some of you, it's time to get the golf clubs cleaned and for others, it's time to prepare the boat for the first harbour cruise of the season. Well, for us, it means that the phone stops ringing and we can get to neglected projects from last fall.

Welcome new readers to our little newsletter. This issue is chuck full of useful information to be shared and discussed. We are going to recap some older topics as well as bring you some new features. So, read on and if you have any comments, that you'd like to share, please do so. We look forward to hearing from you!

So, without further adieu, welcome to issue 6 of Vitotalk the first of 2004.

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Did You Know ???

Dekamatik E's do not come with communication boards. This is a very important point to remember especially when adding a Vitocom LON or 0-10V control.

When ordering a Dekamatik E, ensure you add a communication board [Vi P/N 7618 069] to the order.

People generally remember the absence of the communication board when it comes to the external enable/disable but forget when they are wanting to communicate to it.

vvvvvv

Having trouble reading the third boiler on a system with Dekamatik M1/M2/M2? Well, check the DIP switches on the back of the Comfortrol to ensure they are set for heating circuit A only.

To change it from its factory default position of heating circuit A and B, move DIP 2 to OFF. This will position switches A and B beside each other in the OFF position.

Re-install the Comfortrol back into the Dekamatik and check the system operating status for the three boiler temperatures.

vvvvvv

The Vitotronic 100/200/300 controls have been on the scene for a few years now. The incident rate of hinges breaking have considerably dropped, but, just as a refresher, try the following. When opening the lower door of a 200 or 300, apply a little force up wards while opening the door to overcome the latching of the door. This also goes for the 100's larger door front.

vvvvvv

It is not possible to perform a relay test on a 300 Mixing Valve Controller when communicating to a Vitodens boiler with a HK1. Of course this is nothing new since it is well documented in Vitotalk 4 on page 4 under the Operation heading. A simple test for proper operation is to adjust the Sun/ Moon or heating curve up or down to view operation of mixing valve.

Philosophers Corner

Knowledge Vs. Technique

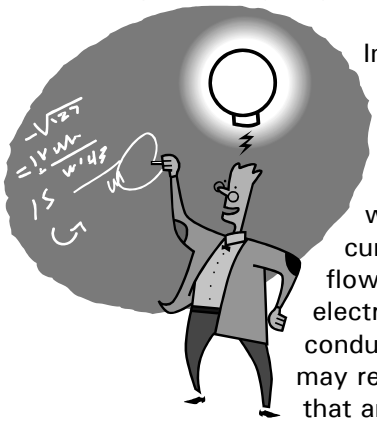
know'ledge: *n* 1.Theroretical or practical understanding of subject or language.

techni'que: *n* 1.Mode of artistic execution. 2.mechanical skill in achieving one's purpose, especially skillfully.

Knowledge can be read from a book or learned from a classroom. It is technique that is found between the lines on a page and learned only by doing.

Technique is the application of knowledge, i.e. tricks of the trade.

Phundamentally Fhysixs



In Vitotalk 5 we covered what happens when current flows in a electrical conductor. You may remember that an electromechanical field is developed around the conductor. This field is directly proportional to the amount of current going through the conductor at that point in time. Staying close to the idea of current flow and magnetic fields, we are going to cover the basics of GFCI's.

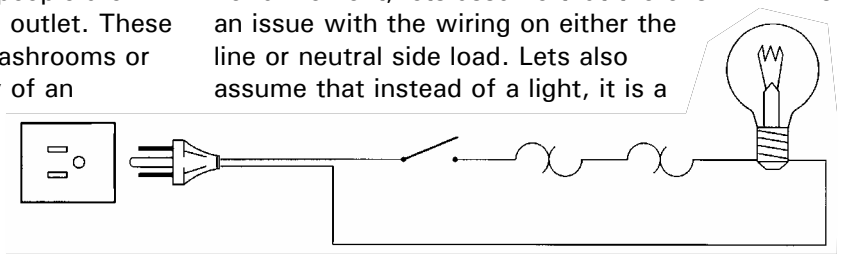
The package that most people are familiar with is the GFCI outlet. These are seen in, kitchens, washrooms or anywhere the possibility of an appliance coming in contact with water is possible. However, it should be understood that a ground fault can occur anywhere, not just around water. Some common areas could be a work shop or garage or anywhere that devices operate on AC voltage such as power tools. After all, how many power tools do you have with exposed wiring in the cords? These areas are fine candidates for GFCI protection.

The acronym GFCI stands for Ground Fault Circuit Interrupter. When this device detects a current drain to ground, it will trip and open both the Line and Neutral portions of the circuit. This allows for a true disconnection of the power supply to the load.

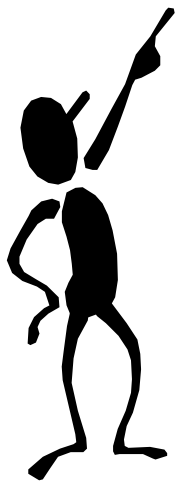
Going back to Vitotalk 1, we discussed simple electrical circuits. As shown in the drawing, we have a power supply, a switch, a couple safety limits, a load and the supply and return conductors. If you recall, the amount of current is a function of the load. As shown in this example below, there is a single light bulb. However, this load could also be represented by a hair dryer, power drill or any electrical device/appliance.

As the switch goes from the open to closed position, current will flow through the entire circuit and the light will illuminate. Now, assuming that everything is working as it should, the amount of current (measured in terms of Amperage) that flows from the ***Line*** connection of the plug, **must** flow back to the ***Neutral*** connection of the plug.

For a moment, lets assume that there is an issue with the wiring on either the line or neutral side load. Lets also assume that instead of a light, it is a power drill. You know, the one that you "inherited" based on the "*Don't make 'em like that nowadays*" principle. The first time the trigger is squeezed, there is a slight tingle in your hand. Welcome to ground fault territory.



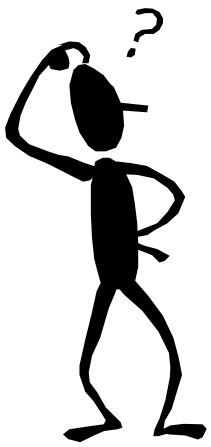
Simple circuit showing power, switch, contacts and load (light bulb)



What is happening is that instead of all the current flowing back to the plug via the power cable, you are grounding the unit through your body. Each time the trigger is squeezed, you complete the circuit. Depending on where the wiring problem may be, you may also feel the tingle when you attempt on picking up the drill.

So, what do you do? Throw the drill out? Buy a new drill? Fix the drill? Well, those are all good suggestions, but first of all, installing a GFCI outlet will prevent things like this happening in the future. If the same drill was plugged into the new GFCI outlet, virtually the instant that the trigger was pulled in, the GFCI would trip. In fact, a GFCI will trip when it senses a differential current as little as 5mA.

You might be asking yourself "*But how does the GFCI work Mr. Fhysixs*". Once again, if we look at our simple circuit, the key is in keeping the amount of current in the line conductor and neutral conductor balanced. If the device senses more current on the line wire than coming back on the neutral wire, the GFCI will trip.



Within the GFCI there is a device called a *Differential Transformer*. When the amount of current that flows on the line and neutral are balanced, the GFCI continues it's normal operation. But when an imbalance is detected, the device will trip.

Let's put the operation in terms that everybody can understand...money. If more money leaves your pocket than returns when payday rolls around, you generally have a problem. By balancing what is going out with what is coming back, you will always operate in a balanced condition.

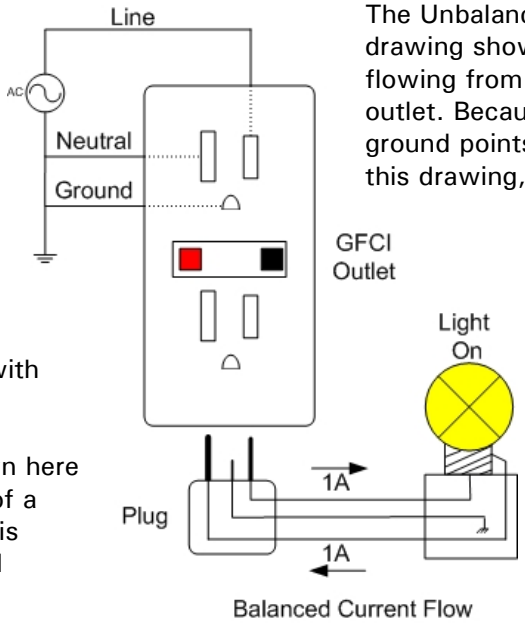
Recently, some of you may have experienced, close up, how a GFCI works when trying to power up a Vitodens via a Power Pump Module.

In designing the installation to be as foolproof as possible, the pump module was engineered, to have the Neutral and Ground points common to one another. If the installer plugged the power pump module into an incorrectly wired outlet, the breaker would trip immediately.

Continued on page V3

An incorrectly wired outlet would also cause ionization issues. The boiler will not operate with a L and N reversal. Having the Neutral and Ground connections tied together, however, caused a problem with GFCI's.

The drawings shown here are representative of a basic circuit which is plugged into a GFCI outlet.

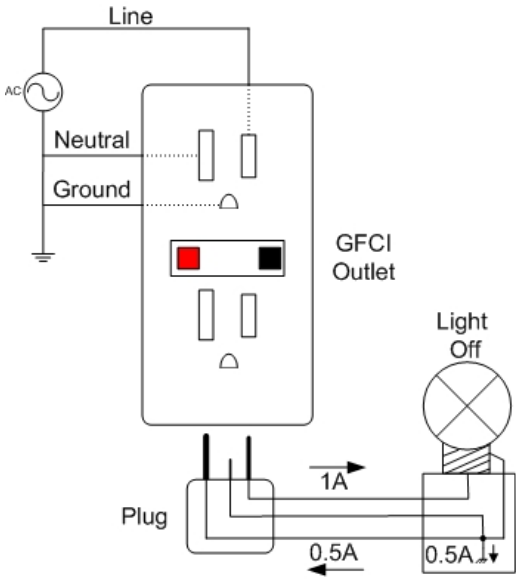


Balanced Current Flow

The Balanced Current Flow drawing shows how the current flow through the light bulb equals 1 Ampere. If 1A leaves the outlet to feed a load, then 1A must return on the Neutral wire to the outlet. Because of the balanced condition, the outlet continues to operate normally.

The Unbalanced Current Flow drawing shows that 1A is flowing from the *line* of the outlet. Because the neutral and ground points are common in this drawing, the current flow will split. This splitting allows current to flow through both the neutral conductor and to ground. Since the amount of current flowing on the *line* conductor is greater than the *neutral* conductor, the GFCI will trip. This is due to the "*Differential Transformer*" device, internal to the GFCI, registering an imbalance from line to neutral.

So, the next time that you find yourself being asked why the GFCI always trips when plugging in a Vitodens Pump Module, you will know.



Unbalanced Current Flow

Learning LON

A significant bit of technology is starting to find its way into everyone's world. It has been a long time coming, since about 1988, or thereabouts. Those of you that monitor its progress, have seen many products adopt its operating standard along the way.

The standard that we are talking about is the ANSI/EIA 709.1 Control Networking Standard, otherwise known as the LONWorks protocol. The standard outlines how devices within a network communicate and share information. While it allows devices connected to a network communicate and share information, the device logic and programming is still very much manufacturer specific.

This brief technical introduction will cover the basics of what LON is and the fundamental terminology associated with it.

Computer networks are commonplace in today's work environments as well as people having networks set up in their homes. In either application, networks allow for large amount of data to be transferred between the computers. Information sharing or database management are generally a motivating factors in setting up computer networks.

The fundamental difference between a computer and control networks centers around how the devices communicate with one another. Computers use a protocol called TCP/IP, which stands for Transmission Control Protocol/ Internet Protocol. This was first developed in the mid 1970s. Not unlike the LONWorks protocol, TCP/IP is structured around information being formatted into layers and sent out as packets. What differs between the two protocols is *what* and *how* information is required for proper communication.

As stated earlier, computer networks were designed to handle large amounts of data. The purpose behind LON is to communicate very short "*sense and control messages*". These messages contain commands and status information which trigger actions. These actions could include commands for pumps, valves, dampers, lighting or any other device which is controlled by a BMS (Building Management Systems).

Before getting a head of ourselves, it is always best to get a firm grip on the *technobabble* associated it. Here are a several important terms:

Interoperability
The ability of devices, from different manufacturers to be able to communicate without loosing their own control/operational functionality.

Please continue reading on page V4

Continued from previous page V3

Network Variable
Information such as a temperature or status, that is shared with other devices on the network. This can take the form of an input or output network variable.

Neuron Chip
The Neuron Chip is the heart, rather the brain, of the LON ability of any device or control. There are only a few manufacturers of this device.

Node
This is another name for a device which communicates on the LON network.

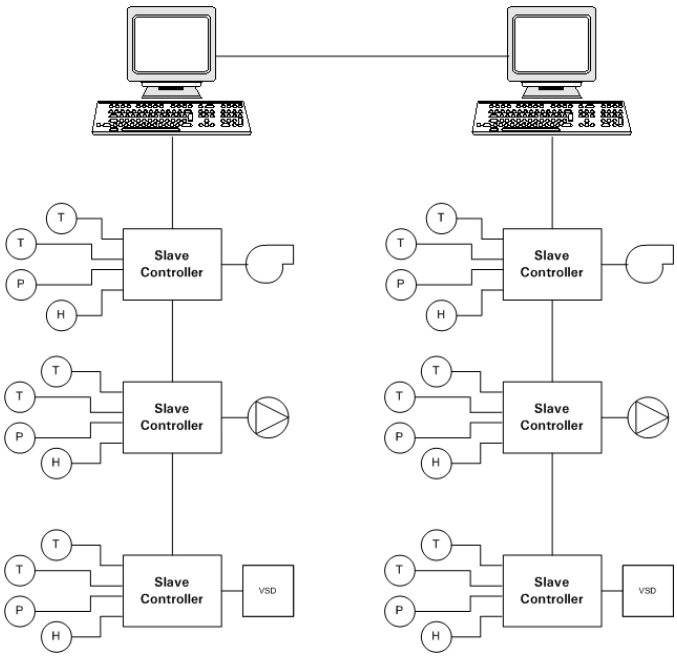
Peer to Peer Communications
Communications that take place between devices without the need for going through a central control.

Router
A device which redirects information from one network or sub-network to an other.

SCPT
This is acronym for Standard Configuration Property Type. This can be pronounced as *Skip-its*. These are standardized definitions of the units with respect to the contents of the configuration properties. These govern the operation of devices within the network.

SNVT
This is acronym for Standard Network Variable Type. This is pronounced *Snivet*. Information that is communicated on the LON network follows guidelines set out in the LONWorks Protocol, i.e. input types, output types, alarms.

It must be understood that data communicated within the network must be interpreted the same way. In other words, if a sensor is set up as Celsius or Fahrenheit it must continue that way while it communicates through the various devices. Not until it is displayed can you change the format of variable used. The network user tool allows you to change the way information is viewed e.g. Celsius to Fahrenheit.



Drawing 1: Typical hierarchical BMS control system

TRANSCIEVER
A device which is both a transmitter and receiver of information within a communications channel

UNVT
This is acronym for User Network Variable Type. This variable is manufacturer specific. Data that is exchanged during communication within manufacturer specific controls.

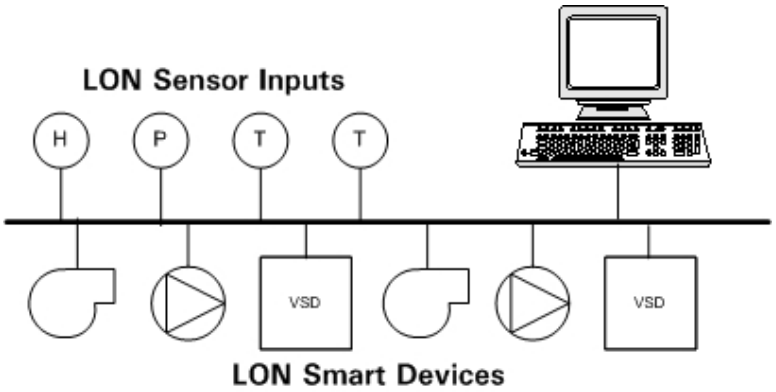
LON Overview
Not so long ago, a BMS system would be comprised of one manufacturer installing their equipment throughout a building. What this generally meant, was that the building was locked into a service/support contract for that specific manufacturer. Anytime there was a component/device failure, 9 times out of 10, it would have to be replaced by the same manufacturer's part.

Drawing #1 shows a main computer interface which communicates to individual slave controllers. The slave controllers are responsible for operation of their own tasks based on inputs from their dedicated input sensors.

With the advent of LON enabled equipment and devices, this has all but wiped out that kind of hierarchical control system methodology. While it is still possible to integrate LON product within older hierarchical systems, those systems do not utilize the full potential of LON such as full peer to peer communications.

Drawing #2 shows a LON version of the same hierarchical components as shown in drawing 1. You will note some differences which can contribute to cost savings for the end user as well as fewer components to fail over time. The primary difference between these two drawings is the number of sensors and slave controllers that are not required. The LON network allows you to use a single sensor to provide feedback information to multiple devices.

The driving force that allows a technology like LON to flourish is the price and availability of microprocessors. As an example, when calculators first started appearing in stores in the early seventies, a four function unit was over $100.



Drawing 2: Typical LON configuration of BMS system

Please continue reading on page V5

Continued from previous page V4

As we all know, technologies change so rapidly that demand will always drive prices down.

Dumb vs. Intelligent
A dumb sensor or device is one which performs a specific function with the aid of input from a master control. Without the input, the sensor has no function or intelligence.

An intelligent device has built in logic. It does not require input from a master controller. It is responsible for its own operation. It will communicate to any device that is programmed to listen/ receive from that particular device.

The heart and brain of an intelligent device is the Neuron Chip. The chip is where all the internal programming is stored. From the factory, each Neuron Chip is given a Neuron ID number. The number is unique to each specific chip.

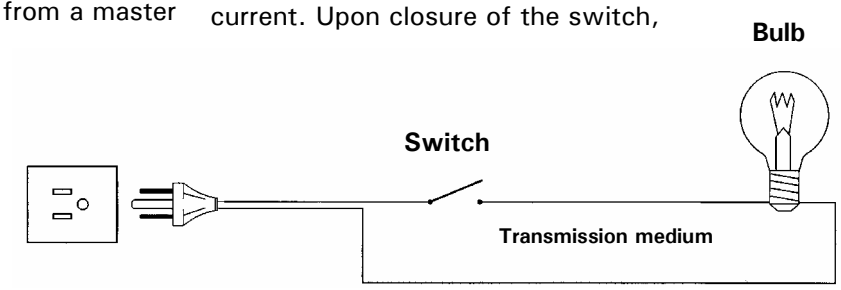
The chip is made up of three processors. The processors work together to fulfill communication and application tasks.

When engineering how the chip was to function, the fundamental premise of universality among LON devices was paramount. To achieve this goal, of the seven layers of internal structure, only one is required by the user to program. This layer is called the Application Layer.

The Application Layer is to be programmed by the user. The Application Layer is responsible for processing information between the Neuron chip and the field supplied device processor. This processor is the part that is added by the device manufacturer to achieve their goals for each specific product.

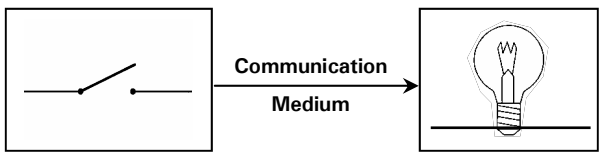
Programming
The connection between Intelligent devices is accomplished through software which "bind" devices together. In effect, this allows the output to be taken from the LON sensor and connects it to a input for a control device.

Lets use the example of a switch and a light. When the switch is open, the light is off. As discussed before, the reason the light is off is because the switch has interrupted the flow of current. Upon closure of the switch, the light will illuminate. Current starts flowing through the switch, the conductor and through the bulb. Lets explore the LON version of this.



With LON, the switch and lamp holder are intelligent devices. When the switch is open, it communicates its status to the bulb device. This in turn keeps the bulb off. Upon closing the switch, the switch communicates it's status on the LON network. When the bulb device "sees" the switch is closed the bulb is to be enabled. Whether it be a circuit or communication connection, the end result is the same, the bulb illuminates.

Aside from a simple switch, the manufacturers of these program the devices to record when the switch has been turned on or off, how long the switch was off or on or even control the switch on a timer. The same is true for the bulb device.



LON example showing simple switch and bulb

When binding the switch to the bulb, it is a matter of telling the output of the switch to control the input of the bulb.

Addressing
When programming LON devices to communicate with one another (binding), the structure of how they are numbered is key to efficient communication. Each device or Node has a number assigned to it. This can be the Neuron ID number, but because of the 48 bit length, it is generally not used. A number which is system specific is given by the *System Integrator*. This is generally much shorter which allows faster communication between devices. The ID may be used for diagnostic purposes as well as network management.

How devices are numbered within a system is very important. The numbering system of LON devices can be compared to something that we are very familiar with on a day-in, day-out basis, telephones.

The LON device number system is divided into three levels: Node ID, Subnet ID and Domain ID. The Node ID can be compared to an individuals local phone number. A Node ID number range is from 1 to 127. The next level is the Subnet ID. This is similar to the telephone's area code. The Subnet ID number range is from 1 to 255. The final number range is the Domain ID number. It can be compared to the country code. The Domain ID ranges from 1 to 281,474,976,710,656.

Node Interconnections
Another important area that should be considered is the medium that information is transmitted by. Obviously, the first example of the switch and bulb are restricted to wiring based on an electrical connection. The LON version is considerably more flexible.

Since LON functions by communicating between devices, there are a number of different mediums that can be used. Most often, transmission is via a twisted pair of wires because of it's cost effectiveness. However, in some

Please continue reading on page V6

Continued from previous page V5

Learning LON

Continued

instances, because of obstructions or other obstacles, wiring may not be the answer. For this reason, power line communication, or wireless, may be the only alternative.

Viessmann
At this point, you may be asking your self "where does Viessmann come into the picture"? Well, Viessmann is one of over 300 LONMark Partners.

What is LONMark? "*LONMARK International is a global membership organization created to promote and advance the business of efficient and effective integration of open, multi-vendor control systems utilizing ANSI/EIA/CEA 709.1 and related standards".* The membership was formed in 1994 by 36 companies.

Currently, Viessmann offers LON communication through a device called the Vitocom LON. In technical terms, this unit is considered a Gateway. The Gateway is a device which translates 141 Viessmann 2 wire BUS communication into LON.

For a LON based network to be able to communicate with a Vitocom LON, a XIF file is required. This file contains the points, SNVTs, that are seen by the LON Network. These points are comprised of set point temperatures, actual temperatures as well as failure status.

The XIF file can be emailed ahead of time for a project that has been ordered. The Vitocom LON is programmed for specific controls. The XIF file is a summary of points for the controls programmed into it such as Dekamatik M1/M2 or E with HK2/4.

A very important point that must be taken into consideration is "*What information is required to be able to seen via LON*". While the LON protocol outlines how information is transmitted via LON, there are no guidelines as to its content.

The up-coming replacement of the Dekamatik control is the NR2. The NR2 controls are LON based and do not need a gateway type device to communicate to a LON network.

Summary
Until now, we have just skimmed the surface of LON and the technology associated with it. In future issues of Vitotalk, we will expand further on the internal workings of LON and go into more depth of the individual areas. If you have any questions. Please do not hesitate to e mail them to KWE. **V**

Diagnostic Do's & Don'ts

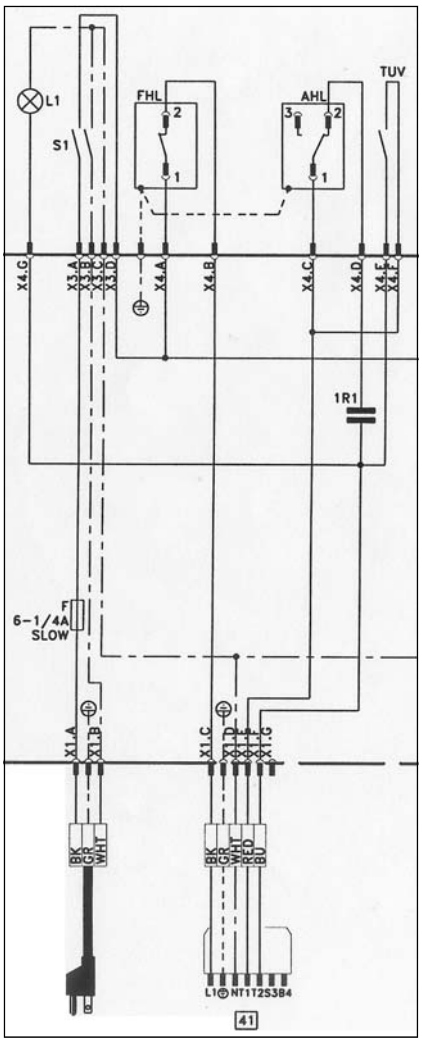
Playing Doctor can take on a whole new meaning in the world of electromechanical systems. However, the fundamental practices are the same: applying standard tests or techniques to troubleshoot problems.

When trying to find fault in electrical/electronic systems, people will generally always reference their tests to ground. What this means is that they will follow a current path with one meter test lead on ground and the other through the power circuit. While this is an acceptable method, it can lead to an incorrect diagnosis of a problem.

All Viessmann controls use a power switch that switches both the Line and Neutral connection. This type of switch allows a full disconnection of incoming wiring than that of switches that just break the Line.

If we were to use the example of the SR-V control, as shown below, there are a number of points we can test voltage from.

Obviously, we would start right from the power outlet to ensure we have 120VAC feeding the control.



Next we would want to follow a sequential path through the fuse, power switch and so on through the entire control. Having the reference point on ground may be an issue if there is a break of the Neutral connection.

Let's for a moment assume that the Neutral conductor or the Neutral side of the power switch were to fail. By referencing all you test points to Ground, you would not find the Neutral break. However, if your reference point is part of the Neutral circuit from inside of the control, you would find this almost immediately.

Please continue reading on page V7

Continued from previous page V6

Do's & Don'ts Continued

Do take proper precaution when working on "live" controls

Don't use a light bulb for a tester and say you have 120VAC based on the brightness of the bulb.

Don't use a piece of tin-foil for a fuse replacement "just for the time being".

Don't reference how a system is working based on a remote mechanical thermometer. A control device has no idea what a thermometer is displaying. Rather, reference why the control isn't functioning, as you think it should, based on the information the control is using. Look at the temperature the control is displaying based on its own sensors.

Do use proper test equipment to gather information.

Do record tests and results for future reference.

Don't just perform a relay test to ensure the functionality of a control. Instead, adjust settings and anticipate the operation based on your knowledge of the control.

Adjust the heating curve up and down to watch a mixing valve open or close. Ensure that the valve is actually opening, not closing, on an increased adjustment

Don't be afraid you are going to break something.

Don't adjust or change more than one variable at one time. It is impossible to know what fixed the problem for the next time.

Do establish a point of reference or base line of information.

Do perform simple tests. Swap sensors for known good ones to try and isolate a potential problem. If the fault code or operation changes with the sensor, you have narrowed the problem down.

Cascade Control: Part Deux!

In the last issue of Vitotalk, heating curve settings of the Cascade Control were discussed at length. A number of you had excellent questions as to the operation of the control with respect to heating curve settings. In this issue, the operation and connections between the Vitodens and the Cascade will be covered.

Picture above and to left show strap-on sensor, band and attachment to pipe.

There have been a number of misconceptions with respect to the Cascade Control when connected with multiple Vitodens boilers. As the saying goes, "*the truth shall set you free*", so here you go.

As most of you know, the Vitocontrol-S is capable of communicating up to 4 Vitodens. It does not matter whether a Vitocontrol S or C is used, the Cascade control can be connected to 2, 3 or 4 boilers. The number of boilers is programmed into the Cascade Control on start up of the Vitocontrol panel.

Picture above shows parts of outdoor sensor: sensor body, cover and strain relief. Outer cover not shown in picture.

As was stated in the above paragraph, each boiler communicates to the Cascade control. It must be understood that each boiler is responsible for it's own operation i.e., burner modulation, temperature limits, flue gas adaptation and so on.

The Cascade Control has it's own unique strap-on supply and outdoor sensor. These two sensors cannot be interchanged with any other Viessmann sensor. Both of them govern the operation of the Cascade Control and subsequently, the Vitodens boilers.

Once all of the settings have been programmed into the Cascade Control, a set point will be calculated. The set point is a function of outdoor temperature with respect to the heating curve. This set point is referenced to the unique Low Loss Header Sensor. This sensor is located on the outlet supply connection on the Low Loss Header (LLH). It is strapped on to the pipe as close as possible to the LLH.

Operation of the boilers is a function of the LLH set point and actual temperature. When the LLH temperature drops below the set point, the Cascade control will provide a boiler temperature set point demand.

This set point demand temperature can be viewed on the Cascade control in the Operation Data menu choice in programming level 3. The boiler set point can be viewed in the Operating Status menu of the Comfortrol. You will note, that there is a three degree Celsius difference between the Cascade control and the boiler. In other words, if the Cascade is looking for 50°C (122°F) then the calculated boiler is calculating 53°C (127.4°F).

Staging of the boilers occurs when the Cascade control "sees" how the LLH

Please continue reading on page V8

Continued from previous page V7

Cascade Control: Part Deux!

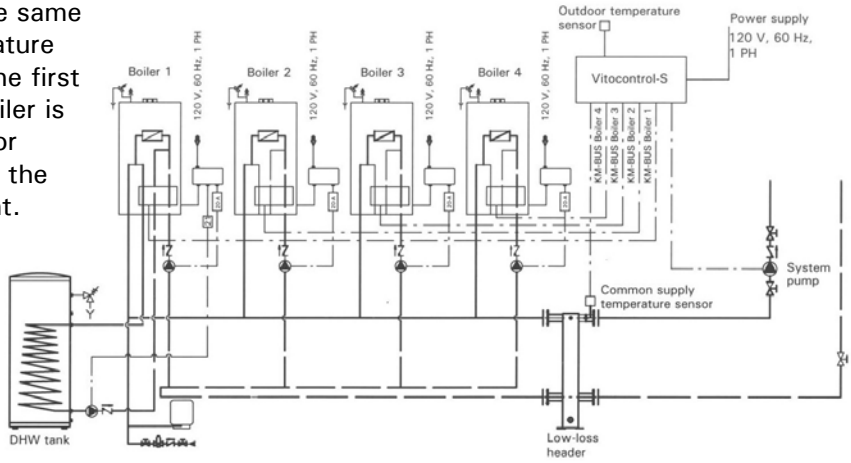
temperature is responding to the set point. Each subsequent boiler is brought ON in the same manner as the first boiler. The Cascade provides each boiler with the same boiler temperature set point as the first boiler. The boiler is responisible for modulating to the given set point.

When the LLH temperature aproaches the set point and possibly surpases it, the boiler temperature set point will gradually decrease. The greater the actual LLH temperature is above the set point, you may see the boiler set point drop as much as 15 degrees C. As the boiler set point decreases, the boilers that are currently operating will modulate down. Each boiler then looses its call from the Cascade control and shut down.

In the *Nominal Values* selection in the Cascade menu, it is possible to adjust the time delay when each subsequent boiler is brought on. This timer setting can be set to a minimum of 1 minute to a maximum of 30 minutes. The boilers being staged on is also a function of the difference between actual and set point LLH temperatures. In other words, if the timer setting is set to one minute and there is only a degree or two between set point and actual, the subsequent boiler may not come on. An increase in time allows for the boiler to modulate to the given set point. Because the Vitodens takes into consideration the history of operation, the time required for each boiler to modulate may vary. If you find that the following boiler(s) is/are coming on too early or too late, make an adjustment to the delay setting.

DHW Demand

Like most of the projects we do with controls, a common answer given to a specific question is "*it depends*". For some odd reason, people don't seem to like this answer. *Well*, **how** is DHW production done with Vitodens when connected to a Cascade control?...it depends.

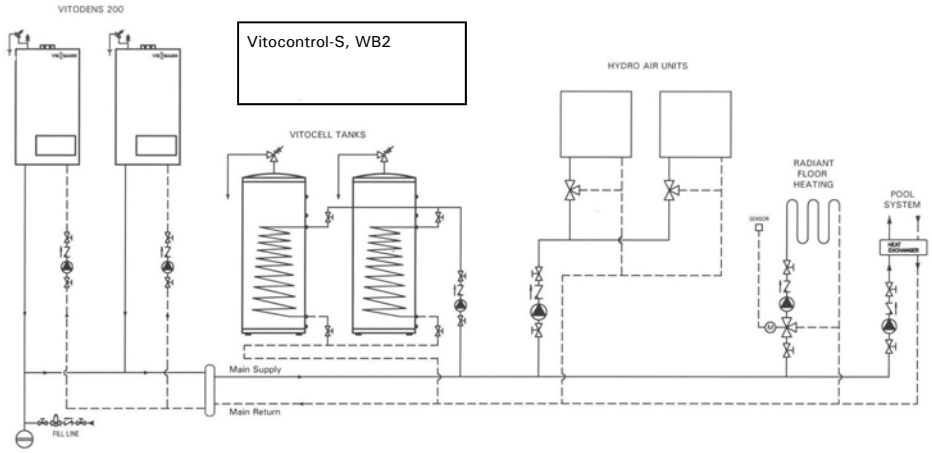


Drawing showing DHW tank connected to one boiler for DHW production

There are two fundamental ways of doing DHW: directly from a Vitodens and from the Vitocontrol. This cannot be decided by anybody else than the person designing the system.

DHW Vitodens Connection

The primary consideration for connecting the tank, to an individual boiler, is the amount of stored DHW required as well as the recovery rate.



Drawing showing DHW tanks on secondary side of LLH. External demand from DHW control

When connecting the tank to one Vitodens, it must be understood that only that specific boiler will come on to satisfy the DHW load.

The DHW sensor is inserted into the tank well and then is plugged into terminal X7 (X7.1 and X7.2). The DHW pump is wired into the Power Pump Module of that specific boiler on plug 21. Because the Vitodens is not connected to a Low Loss Header temperature sensor, the DHW Recirculation pump output can be utilized. This pump is wired to the 20 plug. The boiler pump is connected to the 20A plug.

The DHW temperature is set on the Comfortrol of the boiler that the sensor is connected to. Timer functions for both DHW production and recirculation pumps also can be used via the Comfortrol interface.

When there is a DHW call, only the Vitodens that the sensor is plugged into will come on to satisfy the call. It is possible to view on the Cascade Control when the boiler is operating for DHW production. As well, you have the option of selecting priority options if necessary.

Pros:

Ready DHW pump output
DHW timer
Comfortrol based set point
Relay test from Comfortrol

Cons:

Only one boiler to satisfy DHW load

DHW Vitocontrol Connection

The second option for controlling DHW is to connect the DHW tank(s) to the secondary side of the LLH. The primary consideration for this method is due to the number of tanks and having the entire boiler bank satisfy the load.

Please continue reading on page V9

Continued from previous page V8

Cascade Control: Part Deux!

This configuration requires an external set point control. The extra control is used to operate the DHW pump and provide the dry contact signal for heat demand.

The external heat demand can also be used for snow melting and pool/spa applications. All the dry contact demand are connected in parallel into these terminals

When configuring the Cascade Control, the external heat demand set point is adjusted at the *Flow Temperature Set Point* menu option in Level 3 of Nominal Values.

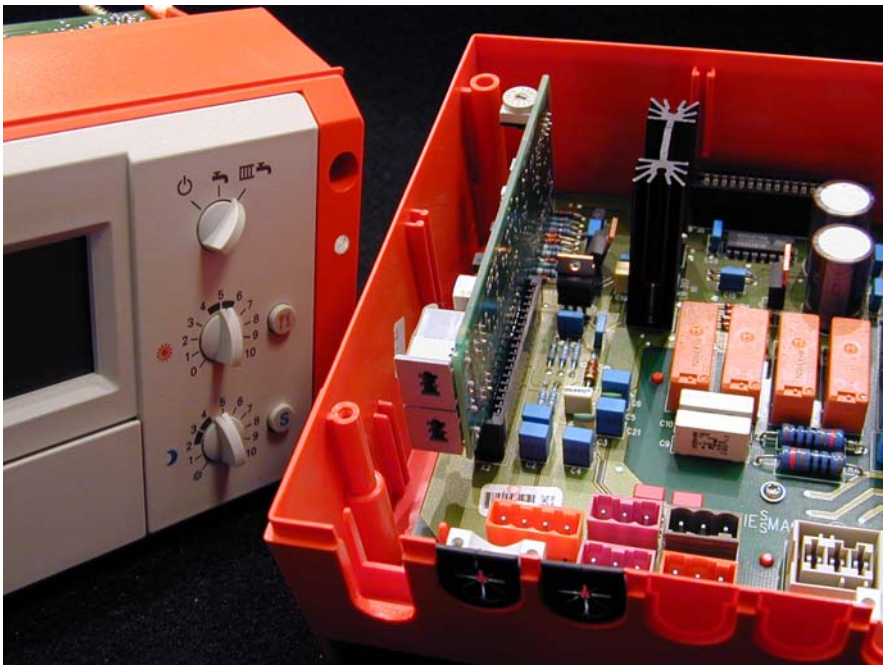
Upon a call for DHW, the set point control turns the pump on and closes the external demand contact. The Vitocontrol registers this contact closure and elevates the LLH set point from the regular outdoor reset value. The boilers will be staged *ON* as they normally would (as described in earlier paragraphs).

Pros:
Entire bank of Vitodens used for DHW
Larger number of tanks

Cons:
Extra control required
Extra wiring with respect to pump and demand contact

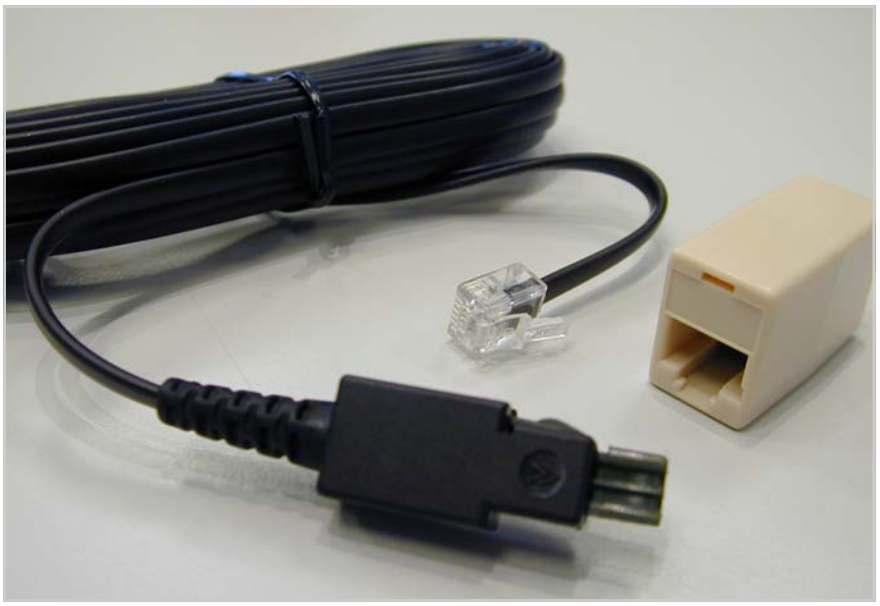
When determining the best way to do DHW, consider what the customers needs and wants are to determine the best method.

Mixing Valve Connection
The first version of the Cascade Control, used in the Vitocontrol-S, did not allow for communication to a Dekamatik HK control. As of last fall, we started receiving the first controls which had the ability to communicate using the 141 BUS.



Above: HK1 shown with communication board at left of unit plugged into motherboard

Currently all production of Vitocontrol-S and C control panels that use the Cascade control will have the ability to communicate via 141.



Picture showing 141 communication cable and phone type connector located in upper right of control panel.

Not sure if a Vitocontrol-S, WB2 can communicate? Here are a couple things to look for. Inside of the Vitocontrol, you may find a bundled black cable. One end is plugged into the Cascade Control while the other end has a RIKO style black plug. Another sign to look for is a "phone" style plug in the upper right hand corner of the cabinet. The last check is to verify the version number of the Cascade Control. Follow the menu structure as described in the Operation Manual. If you have a unit that displays Version 1.1, then you are able to communicate.

Now, the inevitable question is "what mixing valve control do I use?". *Well*, it depends.

First of all, it ***must*** be understood that **no** mixing valve control can be directly connected to an individual Vitodens boiler within multi boiler installation with a Cascade Control.

As we already know, the Vitodens boiler communicates to the Cascade Control by using the 145 KM-BUS connection. If you were to use the mixing valve controller for the Vitotronic 300 or a stand-alone Vitodens, with one mixing valve, it doesn't work...we've tested it. The only way to communicate to a mixing valve control is from the Cascade Control.

Now, you may say to yourself, "Yeah, but **I** know that the 300 MV Extension Kit can be changed to 141 by moving that pink plug". Oh, smart guy(!), that's true, but *what* interface do you use to set the heating curve or look at status information? So, the last resort is to use HK1 with the 141 communication board option.

Please continue reading on page V10

Continued from previous page V9

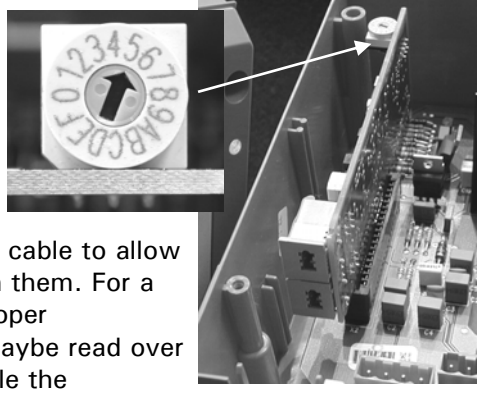
Cascade Control: Part Deux!

The part number for the two HK1's with communication are 7133 369 for the mixing valve mount model. The wall mounted model is 7133 371, but don't forget the actuator 7133 391.

How many mixing valves can I communicate to? Well, that depends. Generally, the rule of thumb is two mixing valves. The reasons for this are many, but if you need any more than two, it probably in the best interests of your customer to look at a Vitocontrol-C.

The Vitocontrol-C will allow you to eliminate wiring problems because of in-field installation issues. Also, there are a number of other features such as Hand/Off/Auto switches, status indicators, quick connection terminal blocks and so on that make the Vitocontrol-C the intelligent choice.

However, if you are staying with the HK1's, the most important thing to remember is the rotary dial addressing between the two units. The first unit connected to the Vitocontrol-S is set to 4. This is the factory setting. The second HK1 is set to 5. The HK1's include a communication cable to allow wiring between them. For a refresher on proper connections, maybe read over Vitotalk 4. While the application is a little different, the settings are identical.



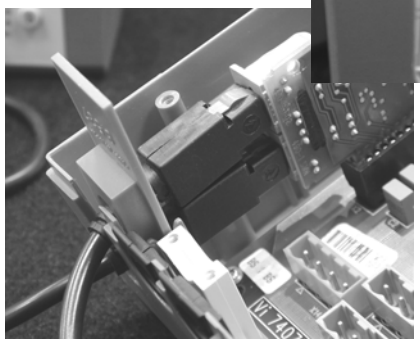
Picture showing rotary dial set to position 5 for second HK1 valve

The first HK1 is connected with the supplied cable from the Vitocontrol-S. It is plugged into the 141A socket of the HK1. The cable supplied with one of the HK1's can connect the first to the second. Plug the cable from the 141B to the 141A of the second HK1.

Since the mixing valves can communicate, there is no need for an outdoor sensor for either mixing valve control. Ensure you follow proper coding practices and select *"No OTS"* in Coding Level 1 of the HK1's.

Heating curve selection is a function of the individual Comfortrols. Keep in mind, the heating curve in the Cascade, is only for the non-mixed LLH temperature. If you do not need a high temperature loop, the HK1's will provide the set point temperature to the Cascade Control. As always, the highest heating curve setting will always determine the calculated demand.

Keep in mind, while all these devices communicate and have some kind of control interface to themselves, you cannot do a relay test on a mixing valve from one of the Vitodens boilers.



Pictured above: RIKO plugs inserted into communication board in HK1. Note 141A is bottom plug closest to motherboard. The 141B is above 141A.

Mixing Valve Summary
Up to two HK1's connected to Cascade Control.
Mixing valve mount 7133 369
Wall mount mixing valve 7133 372
(actuator 7133 391)
More than two valves = Vitocontrol-C

Vitocontrol Connections with Vitodens
Each Vitodens is connected to the Vitocontrol panel via the 145 KM-BUS terminals in the boiler and panel. The boiler wiring is terminated at X5.3 and X5.4. This is a hard wired connection since the X5 is a plug connection. Wiring is run to the Vitocontrol-S, WB2 and connected to terminals 9 through 16. The schematic shows the specific locations for each boiler.

Programming Considerations
We are all familiar with the set up that is required on a single Vitodens installation. While one job may have four Vitodens installed and connected to a Vitocontrol-S, WB2, the programming is the same as a single boiler.

Because the LLH sensor is connected to the Vitocontrol panel, there is no need to connect that sensor to one of the Vitodens. The only consideration is if one of the boilers has the responsibility for DHW. If so, then program that particular boiler for that function.

There is no Vitodens specific programming to code out the outdoor temperature sensor. It is not necessary to install it, but just make sure that the boilers and panel are turned on at the same time to avoid an outdoor temperature sensor fault. If the boilers are started up before the Vitocontrol panel is installed, the outdoor sensor fault will disappear when they start to communicate.

Once communication occurs, any of the heating curve settings (slope, shift, WWSD, electronic high limit) do not effect the operation of the boiler or calculation of boiler set point.

Coding Summary
No DHW 000:000, 0B8:000
With DHW 000:001, 0B8:001 or 002

After everything has been checked and double checked, go through the *General Configuration Settings* as well as the *Cascade Configuration Settings*. Perform a relay test of all available outputs. Set the time and date. All of these things can be found in Level 3. Refer to necessary manuals for specific information. Good Luck!

Look forward to future informative issues of VITOTALK!