KW Electronic Service Inc.

VIESSMANN

VITOTALK

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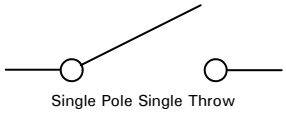
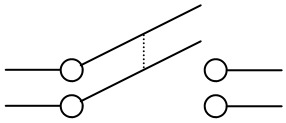
Now, That's A Switch!

Here is the million dollar question for the day, "Are toggle switches, breakers, relays, fuses, contactors and overloads all forms of switches?". Well, the answer is...maybe.

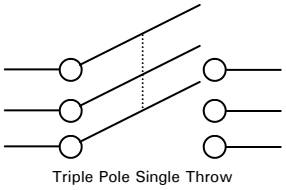


Single Pole Single Throw



Double Pole Single Throw

If the criteria is they are all devices which control the flow of current, than *yes* they are all switches. However, if ***how*** they work is more important, than no, they are not all the same.

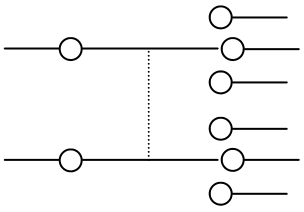


Triple Pole Single Throw

To start, lets define a switch: *Mechanism for making and breaking connection between corresponding parts of a system—electric circuits completed or interrupted.*

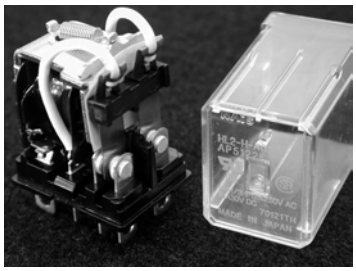
Single Pole, Double throw

A switch is comprised of a couple parts: two contacts and a mechanical lever. The mechanical lever is used to make or break the contact. When the switch is closed, there will be current flow through the contact and when it is open, there is no current flow.



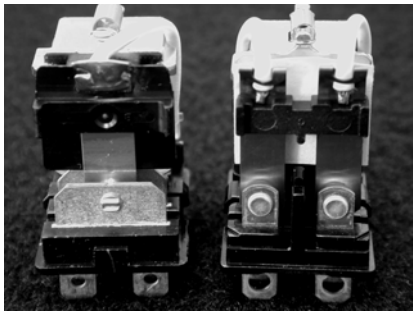
Double pole, Triple throw

Switches generally are classified by the number of "poles" and "throws" they have. The pole is the part that moves. The throw of a switch indicates the number of different positions the switch is capable of. Count the number of movable contacts to indicate the number of poles. Total the number of circuits that can be connected per pole, to determine the number of throws.



Relay shown with cover removed

There are numerous types of switches available, such as the toggle, push button, knife and rotary selector. Each specific application will determine the type switch used.



Picture of Single pole, Double throw relay at left and of Double pole, Double throw relay at right

All of these switch types can be further grouped into another category which describes the "action" of the contact. The action is describes how the contact reacts to the motion command.

A momentary contact switch relies on the switch being held at a specific position to close the contacts. A spring inside will return the switch mechanism to its "at rest" position.

A maintained contact relies on the switch mechanism to keep the contacts closed.

A third classification is the contact configuration. This is always with respect to when the switch is at rest. The contacts of a switch can either be normally closed (NC) or normally open (NO). It is very important to know this information when trying to diagnose a problem.

To complicate matters even further, it is possible to have multiple combinations of all these types: e.g. A single pole, double throw maintained/ momentary contact with centre off position.

While a toggle switch is generally limited to three positions, a rotary switch can have as many as manufacturing will allow.

Relays share very similar classifications to that of switches. A relay can be divided into two physical sections: contacts and coil. By definition, a relay is an electromechanically operated switch. It is the coil that creates the movement of the contacts based on a input voltage signal to the coil. Quite often, a

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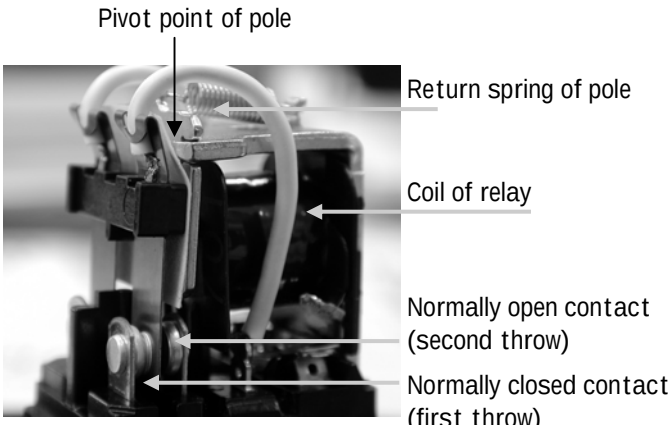
relay is used to switch higher voltage/ current with a lower control voltage.

The contacts of a relay are configured like that of regular switches. However, relays are limited to double throw configurations since the relay is either powered or not. Combinations of normally closed and normally open contacts can be contained in one package.



Picture showing a DPDT relay with protective cover removed

There are a number of areas that relays differ from switches, but the functionality is the same.

BREAKERS and OVERLOADS

A breaker can be considered as a type of switch that use a thermal-magnetic mechanism to sense the current flow through it. When the breaker senses a peak in-rush current greater than its rated value, it will trip. This action helps to protect the device from excessive current draw.

Breakers are all generally a single pole, single throw configuration. A two pole and three pole breaker can be made up of multiple single pole breakers. A mechanical linkage ties all the switch levers together.

An overload operates similar to that of a breaker. However, instead of being sensitive to a peak "in-rush" current draw, the overload is time and temperature related. When an increase of current over a period of time is detected, the overload will trip. Unlike that of the breaker, the trip setting of an overload can be adjusted within a range of operation.

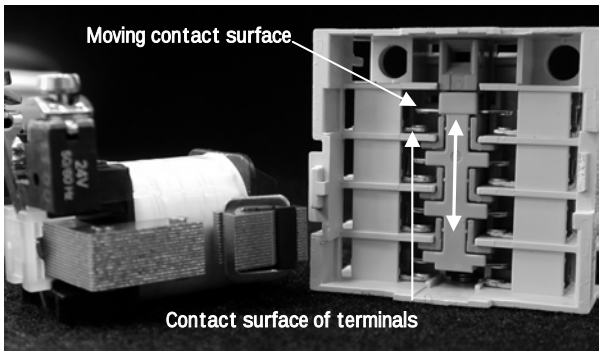
When the overload trips, the internal contacts open and voltage is removed from the load. The mechanism of the overload allows for an auxiliary contact to be mounted onto the overload "block". The auxiliary contacts are available in a couple of configurations:

activated any time main contact is open (automatically or manually) and activated in trip condition. The latter is called a trip indicator. This is generally used to monitor failure alarm.

CONTACTORS

Contactors can be considered part of the relay family. The operation of the contactor is similar to that of a relay. When voltage is applied to the contactor, the electromagnet causes a mechanical movement to take place. This movement causes the contacts to change state i.e., open to close or close to open. This movement either powers the load or removes power from the load.

There is one mechanical difference between a relay and a contactor. The contactors contact configuration is similar to that of a push button than a toggle switch. The push button contact has a linear movement between contacts. The toggle switch contacts pivot on the pole.



Picture showing the internals of contactor. Contacts on right and electromagnet on left

FUSES

Fuses are a devices which are calibrated for a specific current rating. When the rating of the fuse is exceeded, the calibrated element is broken. The broken element will cease the flow of current through the device and therefore remove power. This helps to protect all the components of the circuit.

The fuse must be removed and replaced with another of the same specifications. In some household and industrial fuses, a new element can be installed in the fuse housing. However, in most cases, the entire fuse is replaced.

Fuses come in a multitude of different sizes, shapes, ratings and materials. Two of the most common types are time delay (slow blow) and fast acting. The delay function allows a slight inrush of current without blowing. This inrush peak is caused from accessories such as pumps or motors.

Warning

Never install a fuse of a greater rating than the circuit was designed for. Severe damage may result to the device.

RATINGS

All of the components that we have talked about so far have specific ratings which determine the correct application for each device. The ratings must be adhered to or damage may occur.

All switches and relays are rated in terms of voltage and current. The part will have a 120VAC rating as well as a 240VAC rating. This rating is given so as not to exceed the capabilities of the contact. If the actual current is greater than that of the rated current, the contacts will suffer a reduced service life.

Hopefully, we have provided you with enough information for you to decide whether a fuse is a switch?

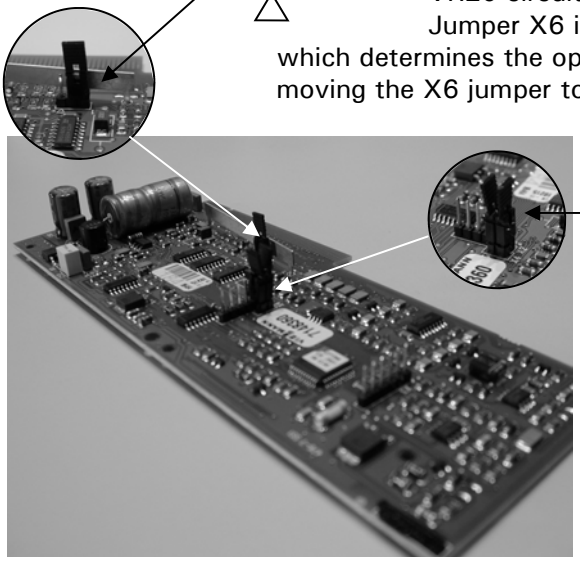
VITODENS

There is a great deal of information regarding the operation of the Vitodens boiler. This forum will endeavor to provide you with the most complete and technically up-to-date information there is. Look to the pages of **VITOTALK** for future articles.

As with any new product, there are a many details and features to be aware of and be made aware of. The Vitodens line is no exception. To make the learning process as easy as possible, continue to look here for new information, technical tidbits or any other Vitodens topics.

VITODENS and Switching Module V

In the first issue of **VITOTALK**, we addressed the functions of the Switching Module V with respect to the Vitotronic 200 and 300 control. The VITODENS boiler has a distinct advantage over the Vitotronic 200 and 300, it doesn't need a Switching Module V. The control has the ability to accept dry contacts directly via plug in connectors.

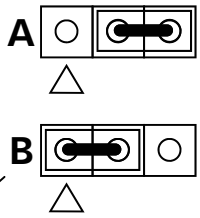


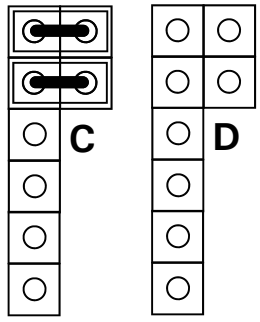
Much like the Dekamatik controls, the Vitodens can be remotely overridden and disabled. There are specific programmable features that can be altered with either the override/disable input.

The operating mode can be switched between daytime and set back modes with a dry contact input as well.

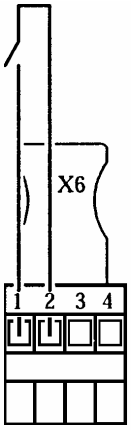
It should be noted however that there are limitations with respect to the input commands. If the homeowner wants to remotely mount the Comfortrol out of the Vitodens, the external disable feature is not possible. This is because there are specific changes that are made to the logic of the boiler. Address 0A8 allows the user to modify the operation of the heating circuit pump, mixing valve pump, mixing valve control and the DHW pump. Refer to the table in the service manual for specific operating changes.

If it is decided that the homeowner wants the external disable function, the first change that must be done is a plug-in jumper change. The picture below shows the PCB where the jumper change is made. This board is known as the VR20 circuit board. Jumper X6 is the one which determines the operation. By moving the X6 jumper to the two pins adjacent to the indicator, the control is programmed for the disable function. The two jumper positions are shown in drawings A and B above. Drawing A shows the default position. Whereas drawing B is the alternate position.



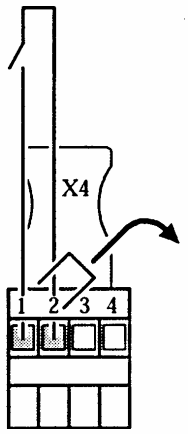


The actual wiring connection of the external blocking feature is shown here with the X6 plug. The dry contact is wired into terminals 1 and 2 of the plug. The remaining terminals of the X6 plug , terminals 3 and 4 are used for the outdoor sensor.



Remote Comfortrol and room sensor connections are addressed later in this Vitotalk.

The override/operating mode change is another function that the Vitodens has built into it without the need of a Switching Module V. Another plug is used to perform these functions. Terminals 1 and 2 are used on plug X4. Upon wiring the plug, you will note there is a jumper already installed. This jumper is removed to allow for the proper wiring connections to be made.



Depending on the functionality that the homeowner is looking for, specific address changes will be necessary. There are four individual addresses that need to be consulted. They are addresses 011, 027, 0A2 and 0C5. Along with address changes, a pair of jumpers must be removed from the VR20 PCB. They are shown as C and D at the left.

Address 011 activates the function of either the external override or the operating mode changeover. Change address 011 to 001 to activate.

Address 027 allows the selection of either the override or the operating mode changeover. The default value, 000, programs the operation to operating mode changeover. Value 001 selects the external override function.

When operating mode changeover is selected, ensure the proper boiler operating mode is selected. There are four alternate settings of operating modes that can be selected. Refer to the operating manual for proper settings on front of Comfortrol. Coding address 0C8 allows the user to select specific functionality when the changeover contact is enabled. Please consult service manual for details.

Continued from previous page

Address 0A2 allows the user to select a programmable set point temperature when the unit is overridden. The default value is 75. This value can be changed from 0 to 127. It should be noted that while these values correspond to Celsius temperatures, they will not change when degrees F is programmed. It should also be noted that while temperatures above 75 degrees C can be programmed, the boiler temperature is limited to 83°C or 181°F.

The remaining address, 0C5, allows the user to program how the heating circuit pump, mixing valve, mixing valve pump and the DHW pump operate during the external override command. Consult the service manual for this detailed information.

The remote Comfortrol can be installed with the Vitodens boiler only when the external disable function is **NOT** going to be used. Remotely mounting the Comfortrol allows the user to check operating status from a remote location within the building. Changes can be made to the operation of the remote Comfortrol at address 019. Consult your service manual for an operation description.

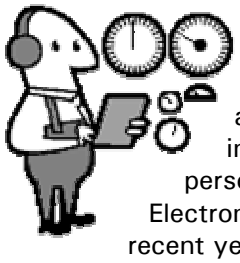
Along with the remote Comfortrol as a remote, the WS/RS sensor can be installed. As always, the RS sensor should not be used with high mass systems.

The WS/RS sensors are automatically recognized when plugged into the Vitodens control (address 020). Depending on the system coding, the WS/RS sensor will assume operation of the Sun/Moon function from the Comfortrol. Any changes to the WWSD or set back set point are made on the WS/RS sensors. Heating curve and other logic functions are still the responsibility of the Comfortrol.

If the system uses a mixing valve extension kit, the WS/RS will code itself to the mixing valve circuit.

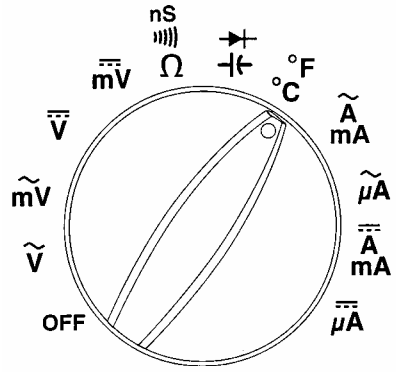
Look here for future topics about the Vitodens boiler!

Multimeter Basics



Possibly the most underrated, misunderstood and neglected tool in the service persons arsenal is the Electronic Multimeter. In recent years the Multimeter has been replaced with the "idiot light". This is the tool that tells you "Yep, ya got juice!", by illuminating when you bring it near a current carrying conductor. Yes, this tool does have its place, but the likelihood that a misdiagnosis will occur is much greater than when taking an actual measurement. It's what this tool doesn't tell you that matters.

A good meter can be had now a days for not a lot of money. Most every large hardware/ home improvement store will have a selection covering all price ranges. Once you have made your selection, use it and trust it.



Sample Multimeter dial

A good basic meter should have the ability to measure four basic areas of concern: AC Voltage, DC Voltage, Current and Resistance.

In the past, most meters had specific ranges of operation. More and more meters today have an auto ranging function. This allows the user not to have to select or worry about different operating ranges when measuring voltages. Just simply touch the test leads to the device and presto.

VOLTAGE

ALWAYS USE CAUTION WHEN WORKING ON LIVE CIRCUITS!

Most meters use symbols to reference to specific options. The most common is the letter V with a wavy line above it. This wavy line is a symbol for alternating current. It is an indicator of a sine wave. When this is selected on the front of the meter, all AC voltage measurements are possible.

A letter V with a solid line and dotted line under the solid line is an indicator of DC voltage. A direct current measurement DC is now possible.

Smaller AC and DC voltages may need a specific setting on the meter. Depending on the meter quality, it may not be possible to measure very small voltages. Some meters may just show the voltage as a decimal point shift instead of having a specific range.

CURRENT

Current measurement with the meter is similar to that of Voltage. Select the current setting depending on whether AC or DC current. Most meters require the user to make a test lead change when measuring current. This generally entails moving the red test lead from one position to another. The plugs are colour coded to help avoid incorrect connections, red and black.

The meter settings use the same symbols for current as voltage. The only difference is that it may not be necessary to make a selection for small current measurements and large current measurements. Small current measurements such as microamps (μA) may not necessarily be measurable on some meters. A decimal point shift may allow the user to read a basic measurement. Only a meter with a μA setting will give you a precise display of the current measurement. The flame ionization signal is only possible with meters that can measure μA currents.

RESISTANCE

This measurement selection (Ω) allows the user to test continuity and resistance. This is very useful when checking for short circuits, fuses and tracing wires.

Look in future issues for the continuation of Multimeter Basics.