The set point tolerance is defined by a hysteresis range. Once the set point is achieved, the controller shuts off the TEA. When the control temperature changes to outside the hysteresis range, the controller turns on power to the TEA and restarts the cooling mode process. This cycle continues until the controller is shut down. Thermostatic control is often used in refrigeration mode in an indoor environment with climate control, where a narrow temperature swing can be tolerated. Laird Technologies offers two standard single directional thermostatic temperature controllers, QC-50 and QE-50.

Climate widget allows you to easily control temperature and humidity in each room/zone separately. It is very flexible to setup and easy to use.

INTRODUCTION
Traditional, stand-alone thermostats are devices which consist of:

- **thermometer**, measure current room temperature
- **input buttons**, for setting up desired temperature (programmable thermostat has more buttons for navigating programing menu)
- **display**, for showing the temperature, shows current temperature and adjustable desired temperature (programmable thermostats have bigger display which allows schedule and parameters programing)
- **actuators**, for turning on/off the heating/cooling
- l**ogic processor**, calculates when to turn on/off the heating/cooling depend of user input and current thermostat value (programmable thermostats do have more options for schedule based desired temperature).

Having all those functions in one device demands this device to be much more expensive if advanced logic is needed. Furthermore, many of them do have low profile display limited by its functionality. When more features or user friendliness is added, much more expensive they become, and the price is difficult to justify as this is just a thermostat, and it should be used for specific purpose only. But biggest disadvantage of traditional thermostats is this "all in one" concept itself. As the display should be placed somewhere reachable by the customers, actuators should be connected to the heating/cooling bodies, temperature is different near the windows then near the heating/cooling bodies, programing should be easy as Internet, but it will be done very rare and it shouldn't be based on expensive interface, the best solution would be to have "**DISTRIBUTED THERMOSTAT**".

This one should have all the components placed on the place which fits best to them:

- thermometers, should be placed on more than one place and main unit should calculate average temperature in room/zone, as thermometer is very cost effective component, there are many automation devices which already includes one in it, so it is not even necessary to buy dedicated devices sometimes.
- input buttons, not necessary at all, once programed properly, the thermostat will do it all by itself, and if customers sometimes need to slightly increase or decrease desired/preprogrammed temperature, they can use various different devices (e.g. regular wall switches, mobile phones...)

- display, not necessary at all, any mobile phone could be used, tv screen and all other display already available in customer's home, and for programing purposes, there is nothing better than common PC
- logic processor, should be placed somewhere off site as it's look is not as important as it's power

MULTI ZONE (ROOM)
Biggest advantage of distributed thermostats comparing to traditional ones is their ability to be distributed through more than one room/zone. This way, distributed thermostats becomes much more cost efficient as customer can use one logic processor and one display for all rooms/zones. Also, distributed thermostats can control each heating and each cooling body separately and this way ensure more comfort and be much more energy efficient.

Zipato is the perfect example of distributed thermostat:

- central logic is placed in Zipabox which uses more powerful CPU than any traditional thermostat
- programing could be done by using web browser and from anywhere in the world
- can be manually adjusted by using any mobile, tablet, PC, or regular wall switch
- can control up to 233 heating or cooling devices by using wireless actuators or valves
- user can create virtually unlimited number of virtual thermostats - zones

SETTING UP VIRTUAL THERMOSTAT
For setting and programing your virtual thermostats for each room/zone, press ✚ on Climate widget.

TEMPERATURE
Heating outputs
Zipabox can control heating devices like radiators, or air conditions by using actuators. For example, if you like to control radiator you can use battery powered thermostatic valve, with built in wireless module for communication with Zipabox, or you can use regular thermostatic valve powered by electrical current and use actuator switches able to communicate with Zibabox and control those valves. Here you can choose devices like actuators or electrical valves, or virtual devices (e.g. Infra-Red codes which can turn on/off your heating body) which you would like to include into this virtual zone/room. Once you choose right device, Zipabox will use them to turn on/off heating automatically, whenever you or your program requires it.

*****Heating input**
If you would like to use some special (level input) device for manually setting your desired heating point for this virtual zone, you can choose it here. For example, if you are using wall mounting thermostat device which support some of the common communication protocols (ZigBee, Z-wave...), you can use it for setting temperature point in which heating will turn on/off.

Cooling output
Zipabox can control cooling devices like radiators, or air conditions by using actuators. For example, if you like to control radiator you can use battery powered thermostatic valve, with built in wireless module for communication with Zipabox, or you can use regular thermostatic valve powered by electrical current and use actuator switches able to communicate with Zibabox and control those valves. Here you can choose devices like actuators or electrical valves, or virtual devices (e.g. Infra-Red codes which can turn on/off your cooling body) which you would like to include into this virtual zone/room. Once you choose right device, Zipabox will use them to turn on/off cooling automatically, whenever you or your program requires it.

*****Cooling input**
If you would like to use some special (level input) device for manually setting your desired cooling point for this virtual zone, you can choose it here. For example, if you are using wall mounting thermostat device which support some of the common communication protocols (ZigBee, Z-wave...), you can use it for setting temperature point in which cooling will turn on/off.

Temperature
Zipabox can get information about current temperature from more than one thermometer (most of the motion sensors do have thermometers in them already) for each room, it can create virtual zone by grouping all thermometers within one room, and customer is able to choose which algorithm will use for current temperature:

-
  - **LAST**, as battery operated thermometers are sending info about temperature occasionally (energy saving issue), user can use last value provided by any thermometer as the current temperature
  - **AVERAGE**, as most of the average thermometers are calibrated differently, most precise value would be average number of all the values received from all the thermometers within one room
  - **HIGH**, the highest temperature value sent from any temperature meter
  - **LOW**, the lowest temperature value sent from any temperature meter

Just choose all the thermometers which you would like to include in this zone, and below, you can choose right algorithm which best fits to your needs.

HUMIDITY (everything same as for temperature)

Humidifying outputs
Zipabox can control humidity devices like regular room humidifiers. For example, if you like to control radiator you can use battery powered thermostatic valve, with built in wireless module for communication with Zipabox, or you can use regular thermostatic valve powered by electrical current and use actuator switches able to communicate with Zibabox and control those valves. Here you can choose devices like actuators or electrical valves, or virtual devices (e.g. Infra-Red codes which can turn on/off your humidifying body) which you would like to include

into this virtual zone/room. Once you choose right device, Zipabox will use them to turn on/off humidifying automatically, whenever you or your program requires it.

*****Humidifying input**
If you would like to use some special (level input) device for manually setting your desired humidifying point for this virtual zone, you can choose it here. For example, if you are using wall mounting thermostat device which support some of the common communication protocols (ZigBee, Z-wave...), you can use it for setting temperature point in which humidifier will turn on/off.

Dehumidifying output
Zipabox can control dehumidifying devices like radiators, or air conditions by using actuators. For example, if you like to control radiator you can use battery powered thermostatic valve, with built in wireless module for communication with Zipabox, or you can use regular thermostatic valve powered by electrical current and use actuator switches able to communicate with Zibabox and control those valves. Here you can choose devices like actuators or electrical valves, or virtual devices (e.g. Infra Red codes which can turn on/off your dehumidification body) which you would like to include into this virtual zone/room. Once you choose right device, Zipabox will use them to turn on/off dehumidifier automatically, whenever you or your program requires it.

*****Dehumidifying input**
If you would like to use some special (level input) device for manually setting your desired dehumidification point for this virtual zone, you can choose it here. For example, if you are using wall mounting thermostat device which support some of the common communication protocols (ZigBee, Z-wave...), you can use it for setting temperature point in which dehumidifying will turn on/off.

Temperature
Zipabox can get information about current temperature from more than one thermometer (most of the motion sensors do have thermometers in them already) for each room, it can create virtual zone by grouping all thermometers within one room, and customer is able to choose which algorithm will use for current temperature:

-
  - **LAST**, as battery operated thermometers are sending info about temperature occasionally (energy saving issue), user can use last value provided by any thermometer as the current temperature
  - **AVERAGE**, as most of the average thermometers are calibrated differently, most precise value would be average number of all the values received from all the thermometers within one room
  - **HIGH**, the highest temperature value sent from any temperature meter
  - **LOW**, the lowest temperature value sent from any temperature meter

Just choose all the thermometers which you would like to include in this zone, and below, you can choose right algorithm which best fits to your needs.

USING VIRTUAL THERMOSTAT

Once you save new virtual thermostat, you should configure it to maintain perfect climate in this particular zone. It is amazingly easy and intuitive.

CLIMATE MODES

Before you start with thermostat configuration, you should understand climate modes. To avoid setting up temperature and humidity manually all the time, and to allow thermostat to deal with both heating and cooling, there are 4 major pre-configured thermostat modes which all includes different heating, cooling, humidifying and dehumidifying set points.

- **COMFORT MODE** - most demanding mode in which heating and cooling points are set to ensure maximum comfort, no matter which one is needed. Ordinary it is 23°C for heating and 24°C for cooling.
- **ECONOMY MODE** - mostly used when shortly out of the home, to save energy, but still be able to reach comfort levels of temperature and humidity.
- **NIGHT MODE** - used during the night when lowest level of comfort is needed
- **AWAY MODE** - some sort of freezing and overheating protection mode, while no one is at home

You can customize each mode to best fit to your needs.

Set points

Set points are desired values for each action (e.g. heating, cooling, humidification, and dehumidification). To avoid overlapping of heating and cooling or humidifying and dehumidifying, there are ADJUSTMENT ZONES which are set to 1°C for each set point. This means, if you put your heating set point to 23°C, heating will turn on once the current temperature reach 22°C and turn off once it reaches 24°. On the other side, if in the same time, you put your cooling set point to 24°C heating will turn on when current temperature reaches 25°C and turn off when it reaches 23°C. This is an example of highly comfortable mode in which heating and cooling modes are very close to each other. Same is for the humidifying and dehumidifying.

CONFIGURATION OF MODES AND SCHEDULES

Just press on your thermostat display, within Climate widget, and you will have four TABS:

DEVICES

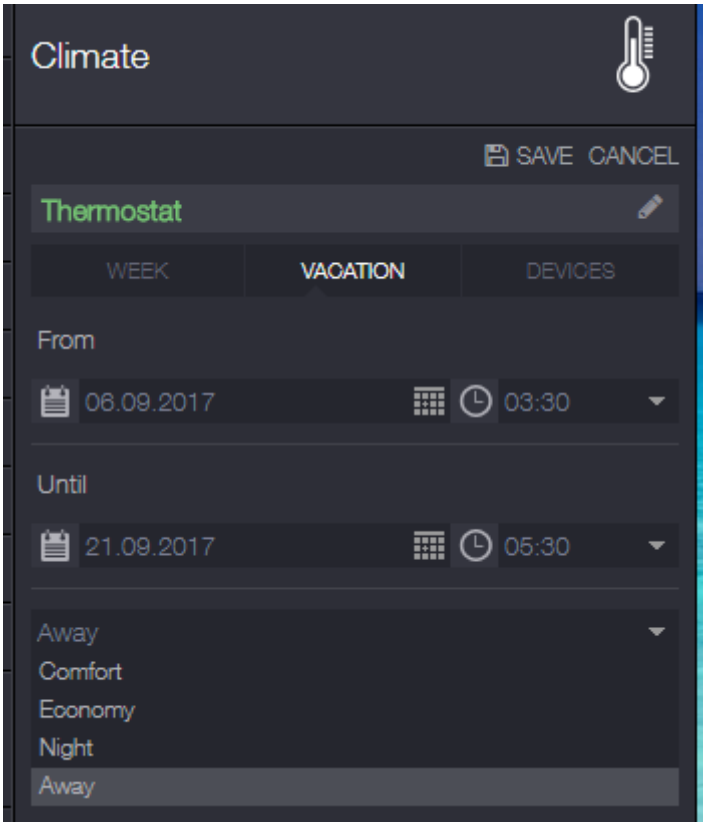
Here you can change the devices which you set up during initial thermostat creation (described in "setting up virtual thermostat").

AWAY

Here you can select period in which your thermostat will go into AWAY MODE (mostly used for vacation). You can select which mode will be used while you are away if you don't want to use predefined "away" mode.

PROGRAM
Here you can program your weekly schedule for all your thermostat modes and setup each mode parameters (comfort, economy, night and away)

DAILY
This is used when you want to change your thermostat schedule just for the current day. For example, your kids will come from school earlier today and you want thermostat to go to comfort mode at 4pm instead of 6pm



MANUAL USAGE
If you like to adjust your heating or cooling manually like on traditional thermostat, you can alway use temperature display within Climate widget. There are four major types of current thermostat mode:

- **PROGRAM**, thermostat is working according to your preprogrammed settings
- **HOLD UNTIL,** thermostat is working according your manually adjusted settings, but it will go back to pre-programed mode once the mode change is done by scheduler (e.g. if you adjust your thermostat manually at 2pm, and thermostat is scheduled to go in comfort mode at 6pm, in this mode it will go to comfort mode at 6pm as scheduled)
- **PERMANENT**, thermostat will work according to your manual setup until you change it manually

- **HOLD FOR**, you can set exact amount of time (e.g. 45 minutes) in which your adjusted settings will be applied, afterwards, thermostat will continue working according to scheduler