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in door opening solutions

Installation Manual

DRAFT

Orion EMS

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FCC and IC statements

FCC statements

Changes or modifications to the equipment not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Industry Canada statements

These devices comply with Industry Canada licence-exempt RSS standard(s).

Operation is subject to the following two conditions:

- (1) these devices may not cause interference, and
- (2) these devices must accept any interference, including interference that may cause undesired operation of the devices.

Les présents appareils sont conformes aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

- (1) les appareils ne doivent pas produire de brouillage, et
- (2) l'utilisateur des appareils doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

The term "IC" before the equipment certification number only signifies that the Industry Canada technical specifications were met.

Le terme "IC" devant le numéro de certification signifie seulement que les spécifications techniques Industrie Canada ont été respectées.

CAN ICES-3(B) - This Class B digital apparatus complies with Canadian ICES-003.

NMB-3 (B) - CET appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

1. Introduction

Energy is a large cost for hotels, and EMS (*Energy Management System*) is a way of achieving energy savings in guest rooms. With the Orion EMS software option to VISIONLINE it is possible to

- view the Orion EMS status of different rooms
- modify the configurable parameters for a room (or group of rooms/ the entire property)
- provide alarm conditions
- provide energy savings reports
- provide preventative maintenance reports

Note: For mounting of Orion EMS devices, installation of the software option etc, see *Installation manual Orion EMS*.

This manual

- describes how to install the Orion EMS (*Energy Management System*) option and if applicable an Orion EMS client; see [chapter 2](#)
 - for the Orion EMS features to be shown in the VISIONLINE software, it is necessary to install the *Orion EMS option*; follow the steps in [section 2.1](#)
 - if the Orion EMS features should also be available in a separate client where the operators do not see the "ordinary" VISIONLINE items such as doors, follow the steps in [section 2.2](#); this requires that the Orion EMS option has been installed in the VISIONLINE software
- describes how to install the Orion EMS devices; [chapter 3](#)
- describes how to commission the Orion EMS devices in an online network; [chapter 4](#)

Note: For daily operations when the system is in use, see *Daily use manual Orion EMS*. In that document, more information about SysMon (*System Monitor*) features is also found. For more information about the Orion Service software, see *Quick reference guide Orion Service*.

A main task for Orion EMS is to determine whether or not a guest room is physically occupied. When a room is not occupied, Orion EMS controls the HVAC (*Heating Ventilation and Air Conditioning*) systems based on the configurable settings of the system. The items used together with Orion EMS are:

- digital thermostat (two variants: *Orion Thermostat-Zen-HV* and *Orion Thermostat-Original-LV*; in the rest of this document, 'thermostat' refers to both these variants unless something else is stated)

Note: Depending on installation conditions, also a thermostat controller is used or not (only applicable for *Orion Thermostat-Original-LV*). If used, the thermostat controller is the master of the system and the thermostat is only a guest interface device which transmits information to the thermostat controller for processing and decision making.

- motion sensor

Note: The *Orion Thermostat-Zen-HV* has a built-in motion sensor which is by default turned off, but which can be enabled through a VISIONLINE software option. Even if the built-in motion sensor is enabled, it can in some cases (depending on the location of the *Orion Thermostat-Zen-HV* in the room) be necessary to use an external motion sensor in addition.

- door monitoring device; lock, switch
- gateway (the same as is used for online doors; requires the *Online* option which is also installed according to [section 2.1](#))

Note: The gateway is not used in offline scenarios; see [Appendix D](#) for details.

Note: For each room number, it is possible to have either

- one wired thermostat
- up to five motion sensors
- up to five door switches

OR

- one thermostat controller
- up to five battery thermostats
- up to five motion sensors
- up to five door switches

Note: The best conditions for Orion EMS are obtained if also the locks are online and commissioned to the same online network as the thermostat and the motion sensor.

Note: In the rest of this document, the following applies unless something else is stated:

- the term 'thermostat' includes *thermostat* as well as *thermostat controller*
- the information is common for both *Orion Thermostat-Zen-HV* and *Orion Thermostat-Original-LV*

2. To install the software

2.1 To install a VISIONLINE option

If the *Orion EMS option* (and *Online option*) has been ordered together with the VISIONLINE software, it is included in the license code and will be set in the software when the license code is entered. If the option(s) should be added to the system at a later occasion, when the license code has already been entered and system ID is therefore set, an option code is used instead. Several software options can be included in one option code. An operator with the authority to handle option codes must be logged on. Normally, options are set by the system manager or the distributor.

When ordering the option, the system code must be communicated to the ordering department:

1. Double click on **System settings** under the **Reports** tab in the navigation window of VISIONLINE. **System settings** is available even if you are not logged on.
2. Communicate your system code to the order department; see order acknowledgement for phone number and e-mail address. The system code can also be entered in the *Ordering web page* when making the order.

To install an option:

1. Go to **Tools/Option code** in VISIONLINE.
2. Enter the option code and click **Apply**.

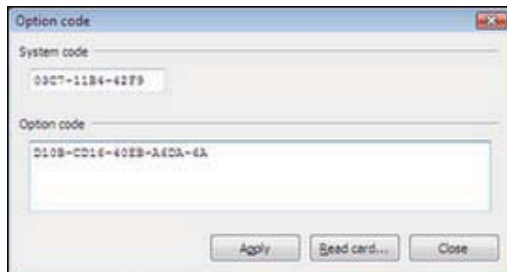


Figure 1

2.2 To install an Orion EMS client

If there should be a separate Orion EMS client (see [chapter 1](#) for more information), this is installed according to the ReadMe file for the applicable operating system. The ReadMe files are found on the Orion EMS software CD.

2.2.1 To start an Orion EMS client

1. Click the **Start** button and go to **Programs/Orion EMS/Orion EMS**.
2. When requested, log on with the same user ID and password as for VISIONLINE.

3. To install the Orion EMS devices

3.1 To install a thermostat controller

Note: The thermostat controller is only applicable for *Orion Thermostat-Original-LV*.

Important: The thermostat controller may not be sealed into a metal box.

If the configuration with thermostat controller is used, the thermostat controller is the master of the in-room system. This item has a built-in router via which it communicates with the VISIONLINE software (or Orion EMS software, if applicable) and the devices within the room. It is also possible to have an offline scenario where there is no connection to the server, and where each room can be seen as a PAN (*personal area network*) which is controlled by its thermostat controller. In this case, the thermostat controller has a coordinator firmware instead of a router firmware. When the different room devices are commissioned (see [chapter 4](#) for details), they are joined to the router of the thermostat controller and registered in the thermostat controller. The thermostat controller stores all parameters needed for the energy management, with a few exceptions which are stored in the thermostat. These are transferred either from a service device, or online from the VISIONLINE/Orion EMS software. The thermostat controller receives entry and exit information from the door lock or switch as well as information from the motion sensor. This information is used to determine the occupancy status of the room and implement energy savings strategy based on this information.

3.1.1 Thermostat controller dimensions in mm (inches)

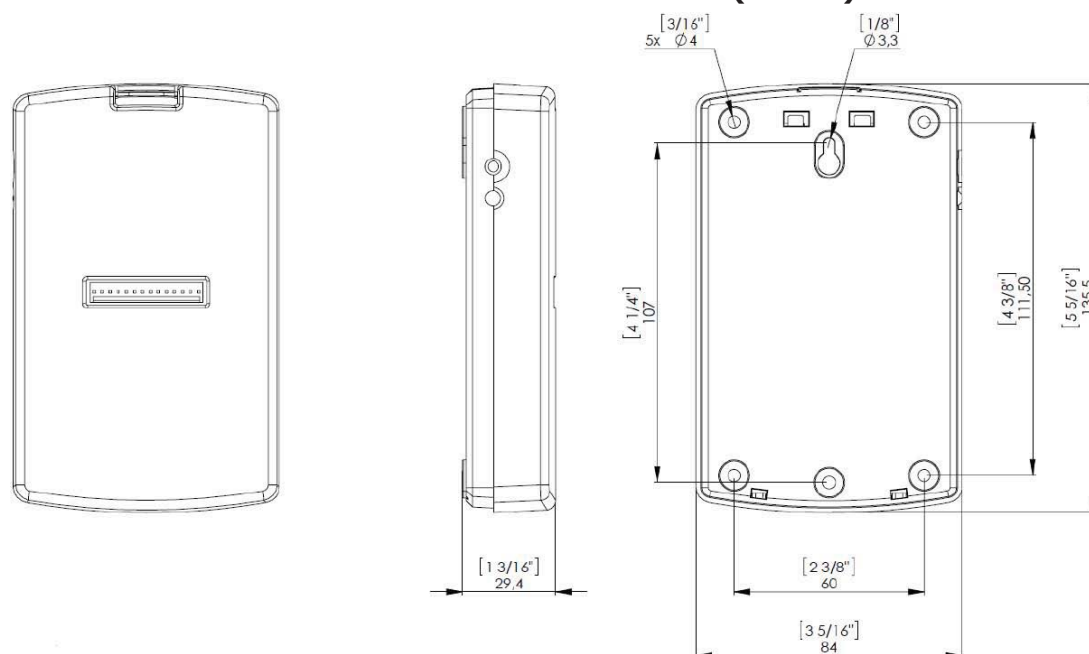


Figure 2

3.1.2 To mount a thermostat controller



Figure 3

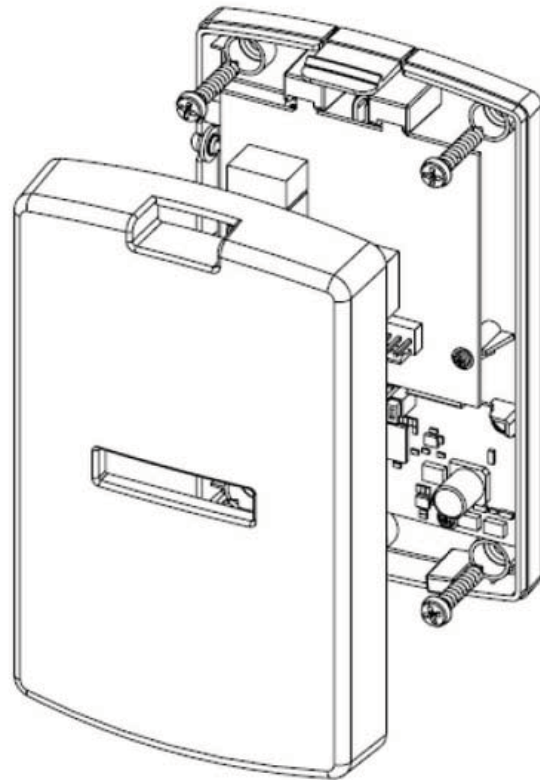


Figure 4

The thermostat controller is designed to be installed on a standard US or European single gang switch box. Figure 3 shows the five screw holes on the back of the thermostat controller.

Note: The thermostat controller may also be installed inside an air handler as long as it is not encased in metal.

1. The mounting bracket is attached using five screws and can then be snapped into place on the mounting bracket as shown in Figure 4.
2. Once the wiring harness is connected, it is best to insert the thermostat controller on the bottom snaps first; then press down on the top of the mounting bracket as the top is snapped into place.

3.1.3 To dismantle a thermostat controller

1. Press down on the top of the mounting bracket to release the snaps and pull the top of the thermostat controller away from the wall; then lift up to completely remove from the bracket (see Figure 4 above).

3.2 To install a thermostat (Orion Thermostat-Zen-HV)



Important: This thermostat directly controls high voltage circuits and must be installed by a licensed electrician.

Important: All local codes must be followed when installing this thermostat. The thermostat will control a variety of HVAC systems and the installation will vary based on the type of system to which it is installed.



Figure 5

The master controller of the in-room system is the thermostat, shown in Figure 5. To the guest, this device appears and operates as a standard digital thermostat; however, this device also receives entry and exit information from the door lock or switch as well as motion detected information from the motion sensor. This information is used to determine the occupancy status of the room and implement energy savings strategy based on this information. The guest operates the thermostat, which communicates directly with the VISIONLINE software/Orion EMS software and the devices within the room.

3.2.1 Step-by-step procedure (Orion Thermostat-Zen-HV)

For a new thermostat, the following steps must be followed:

1. Make sure that the thermostat has got the latest available firmware:
 - Plug the service cable (see Figure 6) into the thermostat.
 - In *Orion Service* (see Figure 7): choose the **Versions** alternative and click the **Readout** button. See *Quick reference guide Orion Service* for more information about the software.
2. Mount the thermostat according to [here](#).
3. Add the thermostat to the **Thermostats** list in VISIONLINE; in the **Thermostat details** dialog you should also choose the profile to which the thermostat should belong. If no applicable thermostat profile exists in VISIONLINE, create one according to [section 3.4](#).
4. Initialize the thermostat with room number and also with parameters according to the chosen thermostat profile; follow the *Initialize* section in *Quick reference guide Orion Service*. **Note:** If one or more parameters of a thermostat profile are at a later occasion updated, these new parameters will automatically be sent to all concerned online thermostats. If the thermostats are not online, they are updated via the **Initialize** alternative in *Orion Service*.
5. Make external connections according to [here](#).
6. If the thermostat should be online, set it up in the online network according to the chapter [To commission the system](#).



Figure 6: Service cable RJ12 to 3.5mm stereo jack (Art. No 205 999 008)

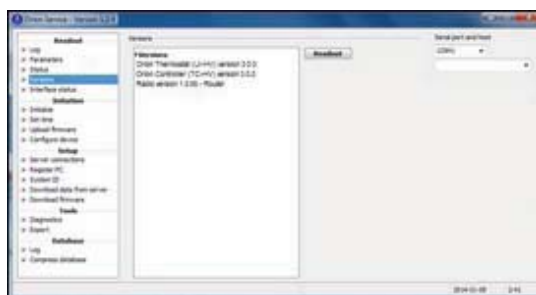


Figure 7

3.2.2 Thermostat dimensions (Orion Thermostat-Zen-HV)

Dimensions in mm (inches)

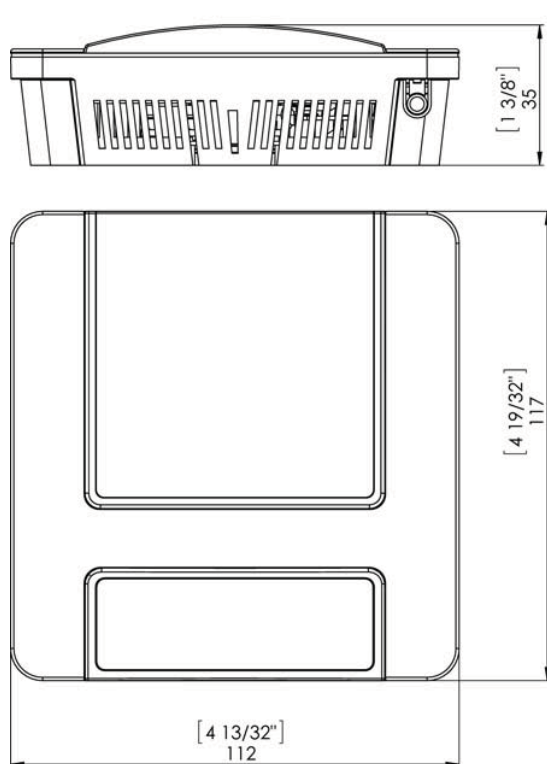


Figure 8

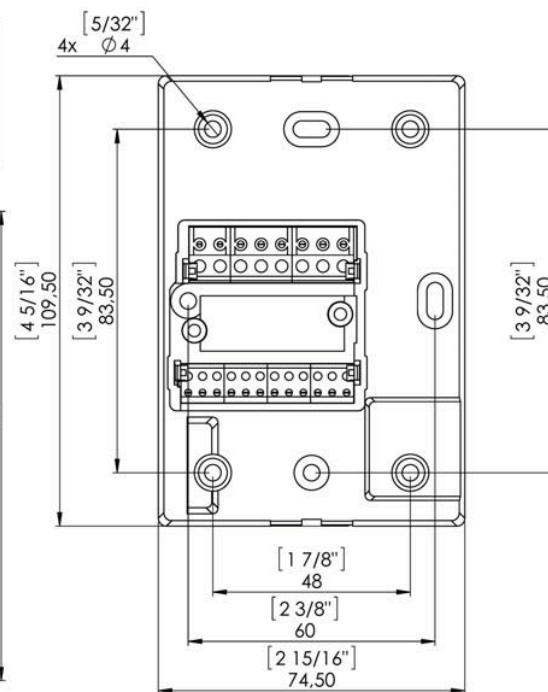
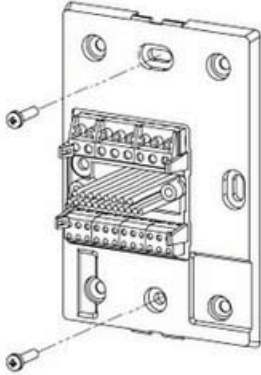
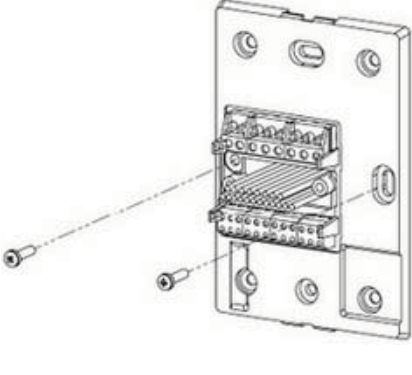
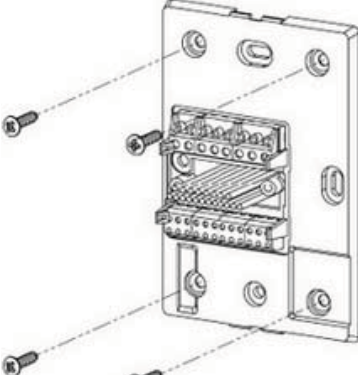
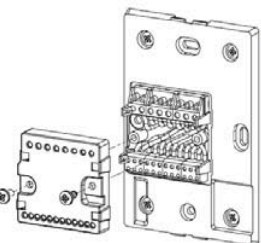
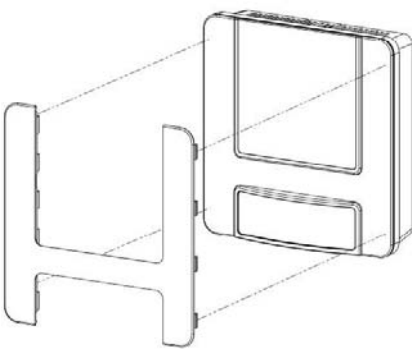
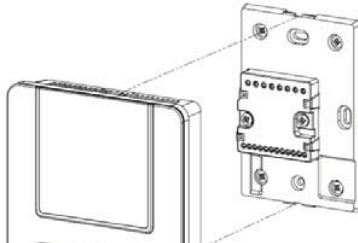


Figure 9

3.2.3 To mount a thermostat (Orion Thermostat-Zen-HV)

 Figure 10	 Figure 11	 Figure 12
1a. If US junction box is applicable: mount the wall bracket to the junction box according to Figure 10, using the two screws that are enclosed with the junction box.	1b. If EU junction box is applicable: mount the wall bracket to the junction box according to Figure 11, using the two screws that are enclosed with the junction box.	1c. If junction box is not applicable: use a PZD-2 screwdriver to mount the wall bracket with the four enclosed 3.5x25 screws.
2. Connect to the two terminal blocks according to here. Note: See a description of the different inputs and outputs in the sections Low voltage terminal block and High voltage terminal block.		
 Figure 13	 Figure 14	 Figure 15
3. Use a PZD-2 screwdriver to fasten the cover for wall bracket with the two enclosed 3.5X9.5 screws.	4. Snap the front plate onto the thermostat.	5. Snap the thermostat onto the wall bracket.
 Figure 16  Figure 17		
6. Push to lock the thermostat from the top and from the bottom.		

3.2.4 To wire a thermostat (Orion Thermostat-Zen-HV)

The thermostat has got two terminal blocks for external connections; one for low voltage and one for high voltage. The different terminals are specified in Figure 17 below. See details about the low voltage terminal block [here](#) and about the high voltage terminal block [here](#).

For connection examples, click the links below:

[Solid state switch output](#)

[Proportional output](#)

[Extra input](#)

[Wired door switch](#)

[Outputs N, L, RW, Y and W](#)

[Fan outputs](#)

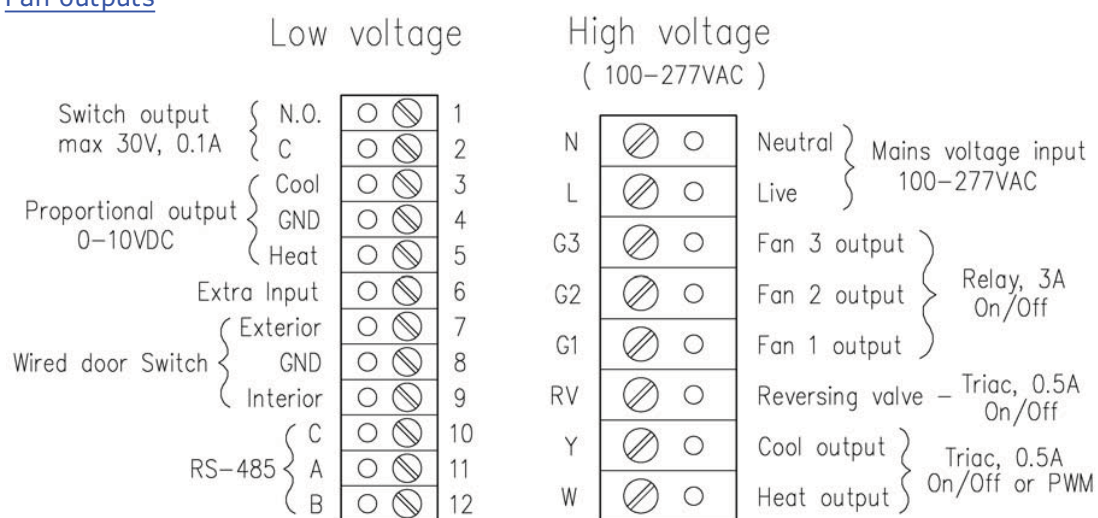


Figure 18

Important: The cabling is different for the two terminal blocks, due to different sizes of the blocks.

Low voltage cable: maximum cable cross section 1.0mm²

High voltage cable: maximum cable cross section 1.5mm²

3.2.4.1 Low voltage terminal block (Orion Thermostat-Zen-HV; 12 pole; 3.5mm spacing)

Note: All parameters should be set up in VISIONLINE; see the section [To set up a thermostat profile](#) for details. The *Orion Service* software can be used for testing parameters, but once a parameter configuration is approved the parameter should be updated in the thermostat profile in VISIONLINE.

Note: For connection examples, click the links in the left column of Table 1 below.

Solid state switch output	Warning: The <i>solid state switch output</i> must not be used to switch the mains voltage. • Max 30V AC/DC, max 0.1A • Potential free so thermostat states relay output • <i>Primary function:</i> contact closed when the room is occupied Note: This is a switch output only; no voltages are output. • Can e.g. be used for giving a signal to a light control system • Alternative use of this output (e.g. use for intelligent switch and welcome scene) must be set up in VISIONLINE.
Proportional output (0-10V)	• Outputs an analog voltage between 0V and 10V, where 0V is off and 10V is max on. Note: This is to control actuators with a 0-10V control input*. • <i>Cool:</i> output to a proportional cool actuator • <i>GND:</i> common reference for the heat and cool outputs • <i>Heat:</i> output to a proportional heat actuator *) Some actuators require other voltages, e.g. 2-10V or 0-5V. This must be set up in VISIONLINE; see details here. The minimum value is 0V, 1V or 2V. The maximum voltage is configurable to 5V or 10V.
Extra input	Important: Do not apply any voltage. This is an input for a switch, connected between the input and the GND terminal. • <i>Primary function:</i> Used as input from a card switch or a wired motion sensor • <i>Alternative function:</i> Input for <i>pipe sensor</i> (hot/cold water); see details here about setting up the extra input in VISIONLINE for this. The pipe sensor can either be a <i>bimetal switch</i> (open or closed depending on the temperature it senses) or a <i>1k NTC resistor</i> connected between this input and the GND terminal. The <i>1k NTC resistor</i> is a temperature-depending resistor, giving an analog value determined by the temperature it senses. The type of pipe sensor which is applicable must also be set up in VISIONLINE; see details here (HVAC heating) and here (HVAC cooling). Note: If the pipe sensor is used, it is not possible to have a wired motion sensor.
Exterior door	Important: Do not apply any voltage. This is an input for a switch, connected between the input and the GND terminal. • Used as input from a switch mounted on an exterior door or window; will turn the AC off when the door/window is open
Interior door	Important: Do not apply any voltage. This is an input for a switch, connected between the input and the GND terminal. • Used as input from a switch mounted on an interior door; applicable when no VingCard online lock is installed
RS-485 (not implemented yet)	• For communication with other equipment (e.g. light control equipment) using the RS-485 standard • A shielded twisted pair cable, made for this communication standard, must be used • <i>A</i> = non-inverting pin • <i>B</i> = inverting pin • <i>C</i> = common
	Table 1

3.2.4.2 High voltage terminal block (Orion Thermostat-Zen-HV; 8 pole; 5.0mm spacing)

Note: All parameters should be set up in VISIONLINE; see the section [To set up a thermostat profile](#) for details. The *Orion Service* software can be used for testing parameters, but once a parameter configuration is approved the parameter should be updated in the thermostat profile in VISIONLINE.

Note: For connection examples, click the links in the left column of Table 2 below.

<u>Mains voltage input</u>	• Universal voltage input 100VAC-277VAC; 50/60Hz • This is the voltage that is output on the high voltage terminals, but it is also used as power supply input for the thermostat internal circuits • <i>N</i> = Neutral • <i>L</i> = Live
<u>Fan outputs</u>	• Max load 3A • Mains voltage output at - <i>G1</i>: Fan 1, when the fan is to be run at lowest speed - <i>G2</i>: Fan 2, when the fan is to be run at medium speed - <i>G3</i>: Fan 3, when the fan is to be run at high speed Note: For information about fan settings in VISIONLINE, click here. Note: For information about live output, click here.
<u>RV: Reversing valve</u>	• Max load 0.5A • <i>Primary function</i>: Used for switching between summer/winter (cold/hot water in the pipes of a 2-pipe system) • <i>Alternative functions (must be set up in VISIONLINE)</i>: - Mains voltage output when the room is occupied - Mains voltage output when the guest enters the room for the first time (welcome scene) Note: These alternative functions can also be set up for <i>G2</i>. - Can be used as return (close) for floating valves Note: For information about live output, click here.
<u>Y: Cool output</u>	• Max load 0.5A • Mains output for cool actuator • <i>Primary function</i>: Mains voltage output when the temperature is above the set temperature (plus deadband)
<u>W: Heat output</u>	• Max load 0.5A • Mains output for heat actuator • <i>Primary function</i>: Mains voltage output when the temperature is below the set temperature (minus deadband)
Table 2	

3.2.4.3 Connection examples for solid state switch output

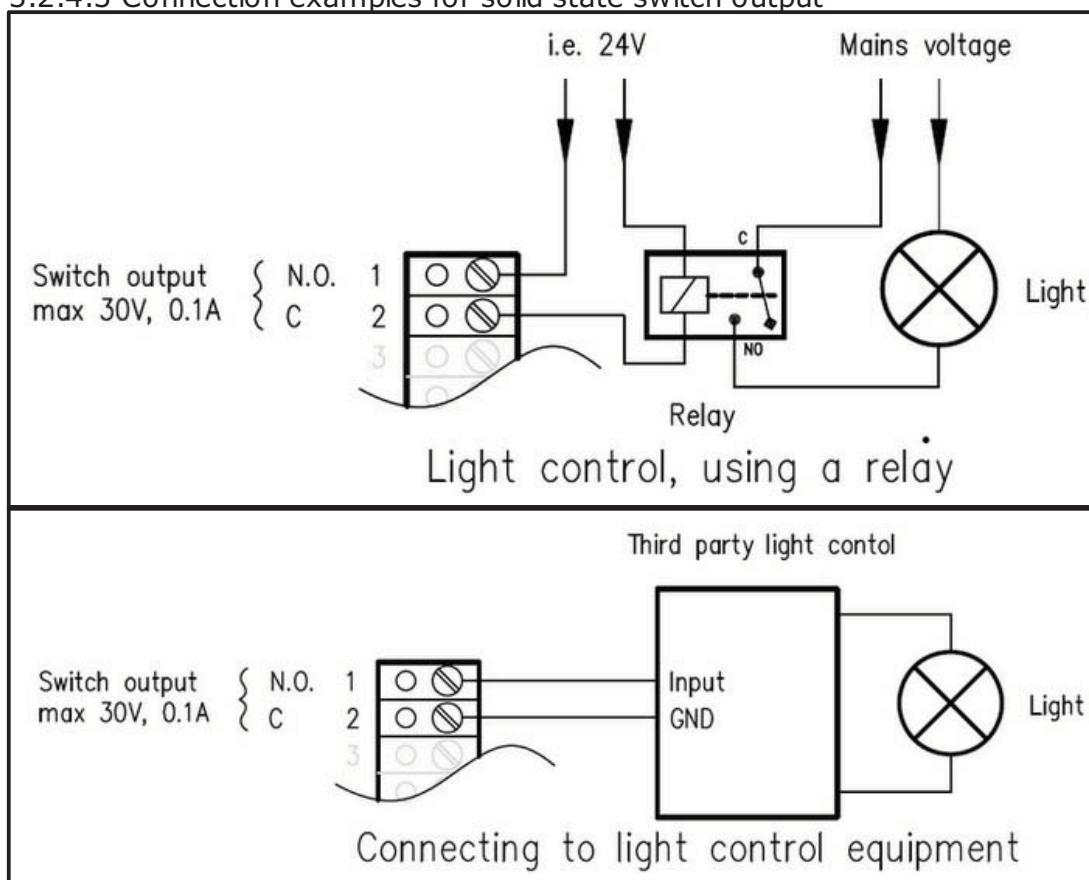


Figure 19

3.2.4.4 Connection example for proportional output

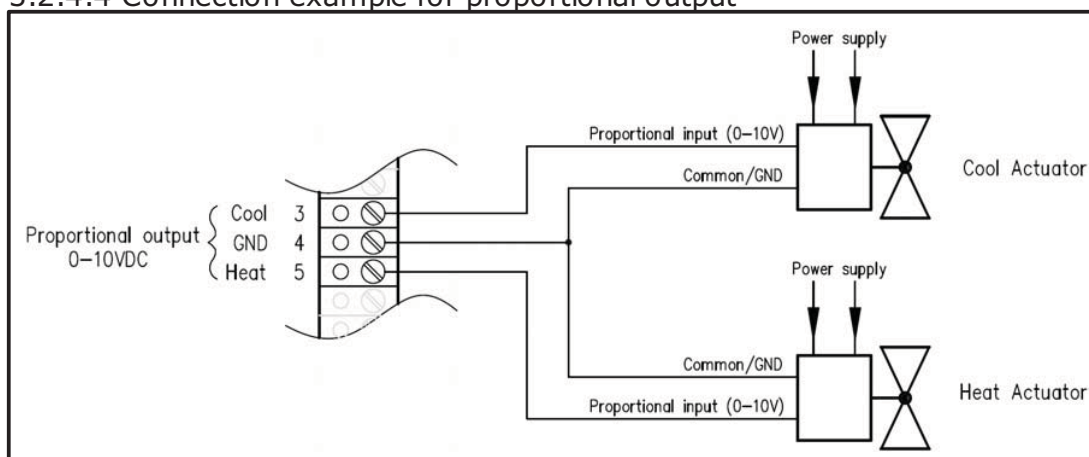


Figure 20

3.2.4.5 Connection examples for extra input

It should be set up in VISIONLINE (or, for test purposes, in Orion Service) if NO (*normally open*) or NC (*normally closed*) switches are used; see details [here](#). **Note:** NO/NC refers to the state of the switch when the card is not inserted, or motion is not detected.

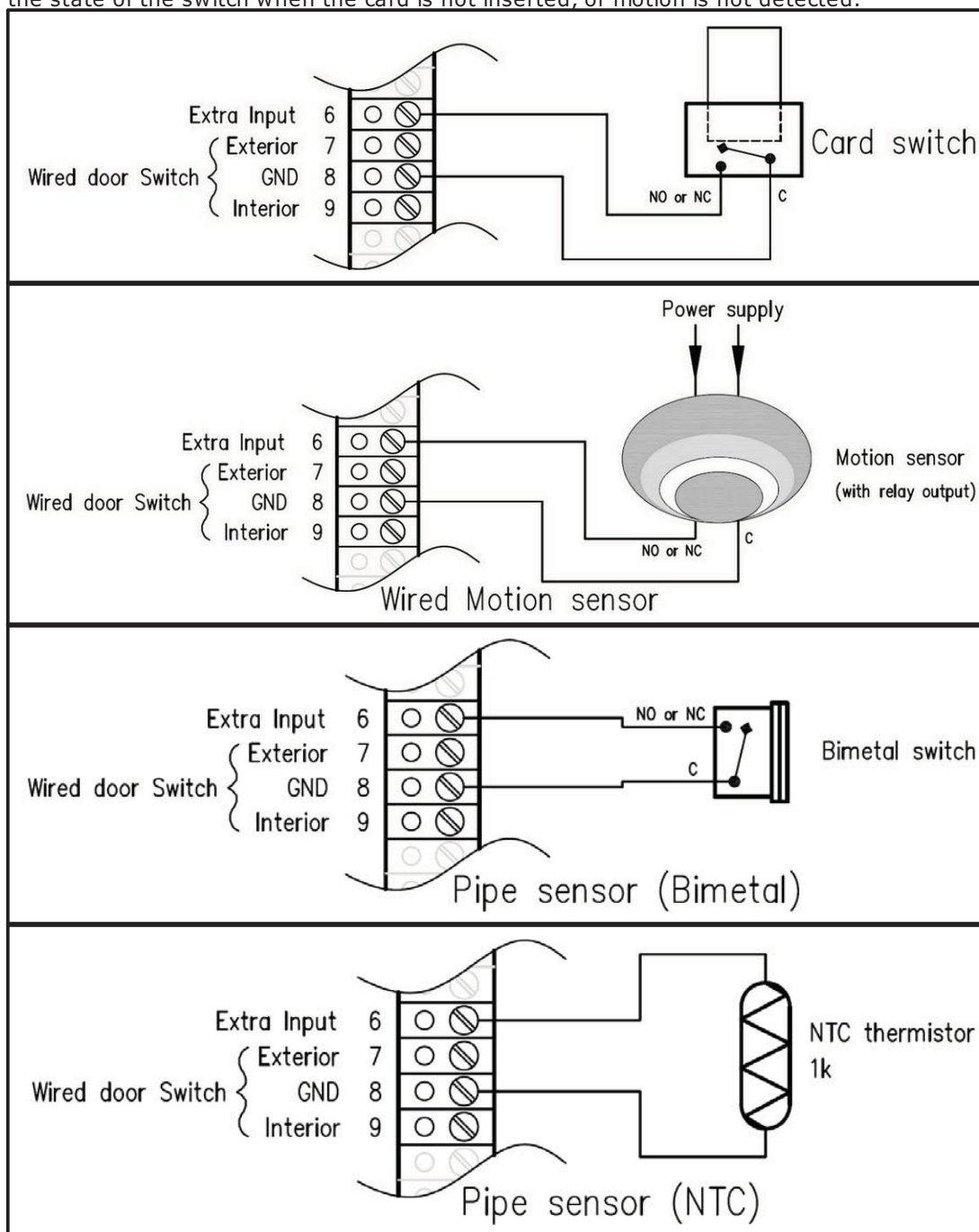


Figure 21

3.2.4.6 Connection examples for wired door switch

It should be set up in VISIONLINE (or, for test purposes, in Orion Service) if NO (*normally open*) or NC (*normally closed*) switches are used; see details [here](#). **Note:** NO/NC refers to the state of the switch when the door or window is open.

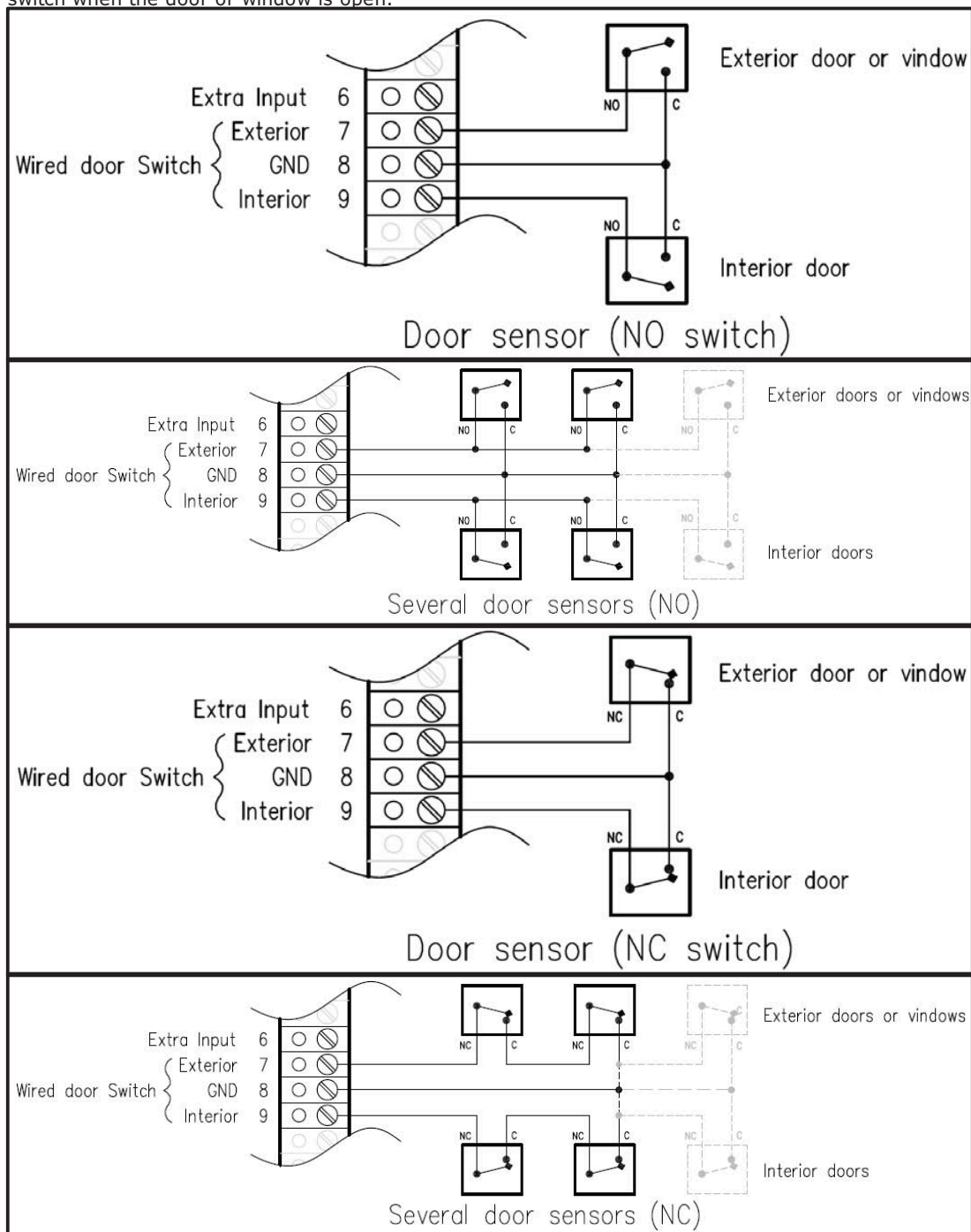


Figure 22

3.2.4.7 Connection examples for outputs N, L, RV, Y and W

In HVAC (*Heating Ventilation and Air Conditioning*) systems, a difference is often made between *2-pipe systems* and *4-pipe systems*.

In a *2-pipe system*, there is one pipe in and one pipe out; both pipes either have cold water or hot water. If there is cold water in the pipes, the air conditioning can only be used for cooling. If there is hot water in the pipes, the air conditioning can only be used for heating. In most cases, cold/hot water in the pipes is changed twice a year (Spring/Autumn) through an actuator connected to the *cool output* on the thermostat.

In a *4-pipe system*, there are two pipes in and two pipes out; one set of pipes in/out has cold water and the other set of pipes in/out has hot water. The thermostat can choose whether cooling or heating is applicable by activating either the *cool output* or the *heat output* on the thermostat.

For a thermostat to know whether the water in a pipe is cold or hot, a *pipe temperature sensor* is used. There are two types of pipe temperature sensors; see details [here](#).

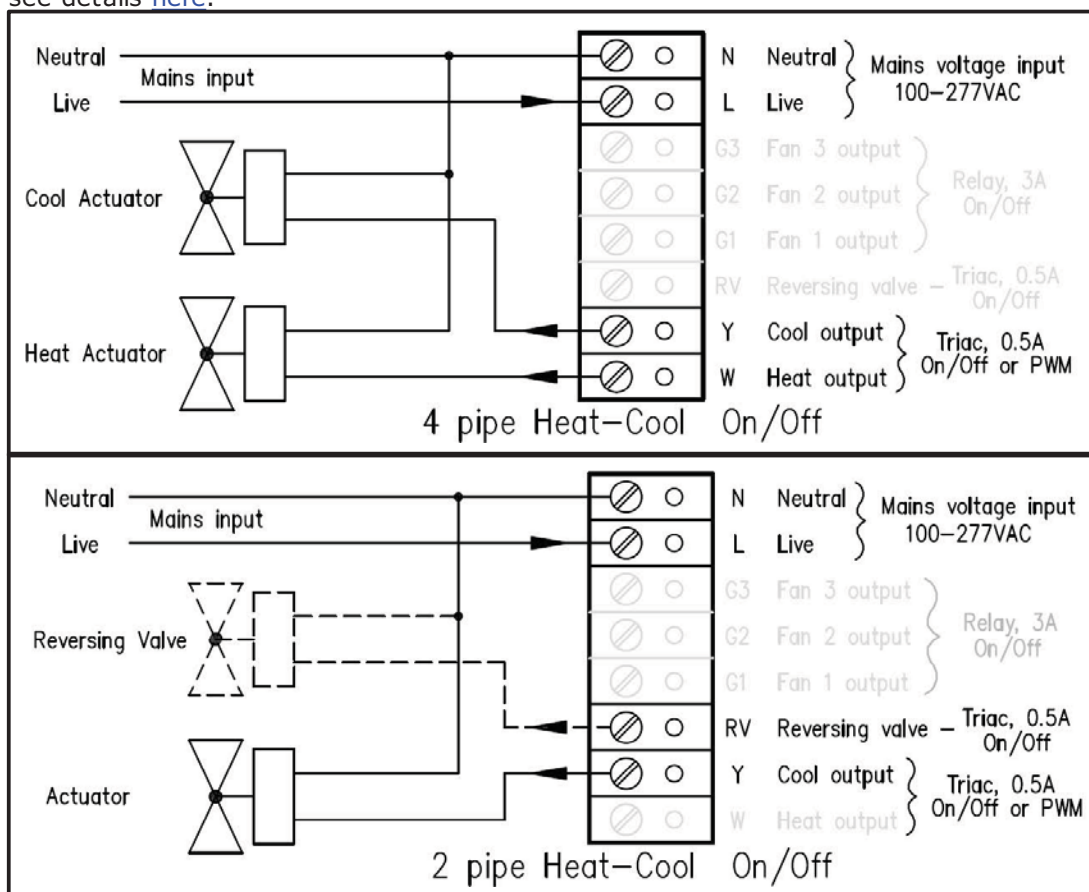


Figure 23

Other connection examples for the outputs N, L, RV, Y and W:

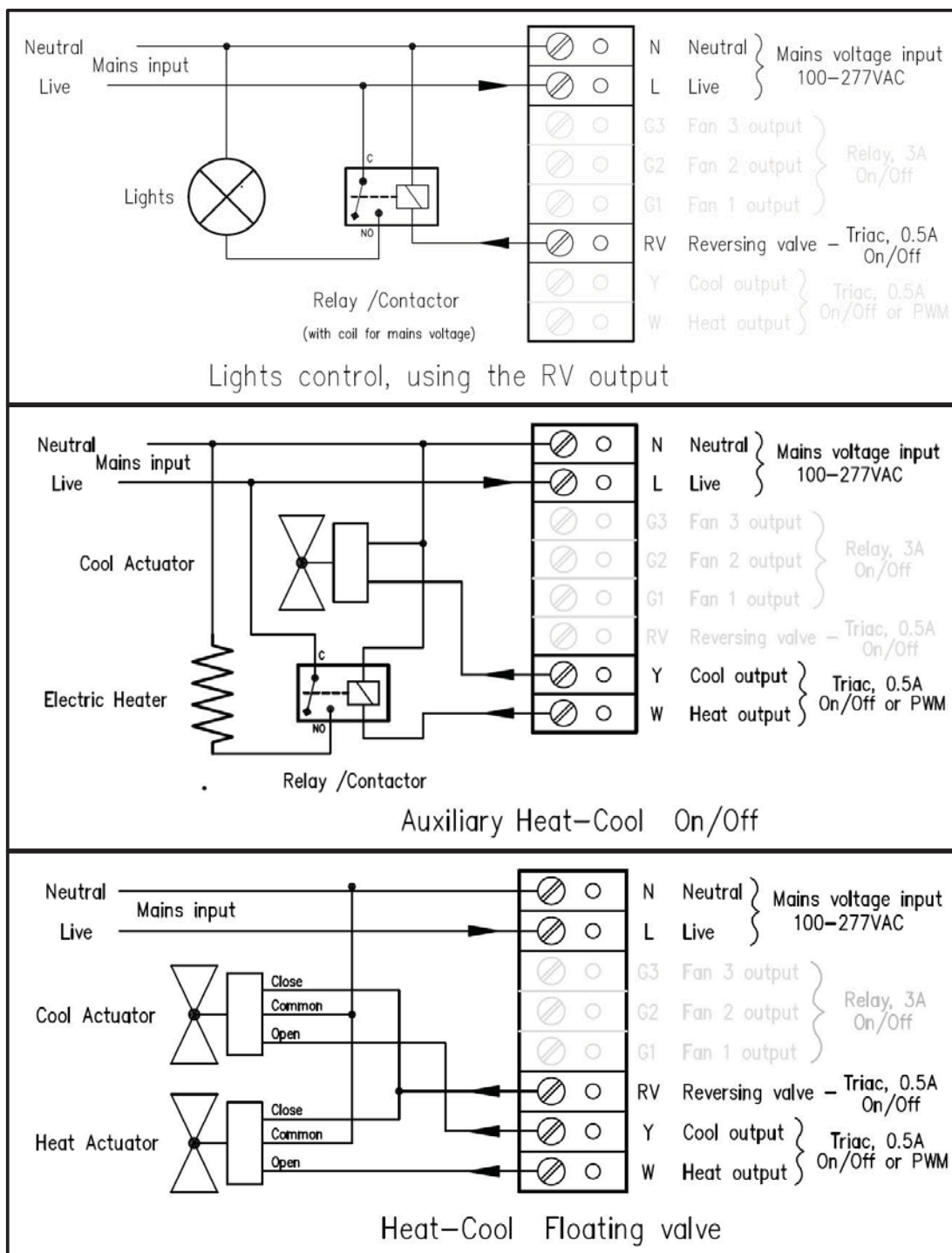


Figure 24

3.2.4.8 More about live output

All loads below each have two connections:

- [Fan 1 - Fan 3](#)
- [W output](#) (heat output)
- [Y output](#) (cool output)
- [RV output](#)

The thermostat is connected to 110VAC or 230VAC. To be able to disconnect a load, one of the connections is broken by one of the two items below:

- relay (applicable for Fan 1 - Fan 3)
- triac (applicable for [W output](#), [Y output](#) and [RV output](#))

'Neutral' is connected to one of the load connections, while 'Live' is connected to the other connection; see Figure 25.

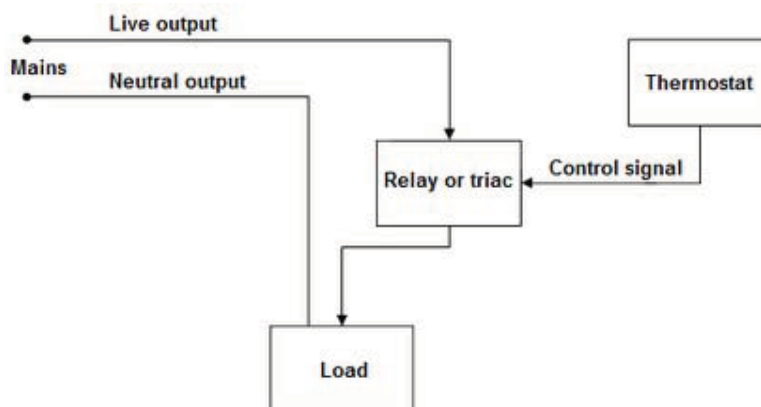
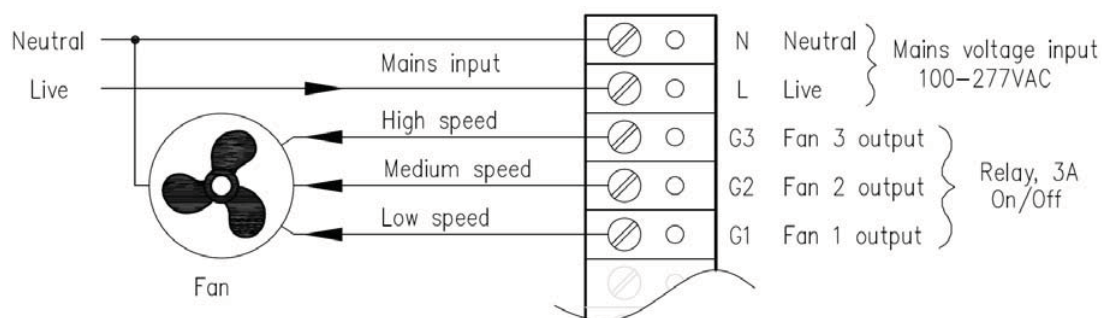


Figure 25

3.2.4.9 Connection example for fan outputs



Connecting the fan

Figure 26

3.2.4.10 Connection example for floating valve

A floating valve has three connections:

- one for opening the valve ([W](#) for heating valve and [Y](#) for cooling valve)
- one for closing the valve ([RV output](#))
- one for ground; COM (neutral)

One of the three connections is always fully closed. While one of the valves is activated, the valves open slowly during the desired time, and while deactivating the valves close slowly for the desired time. *Example:*

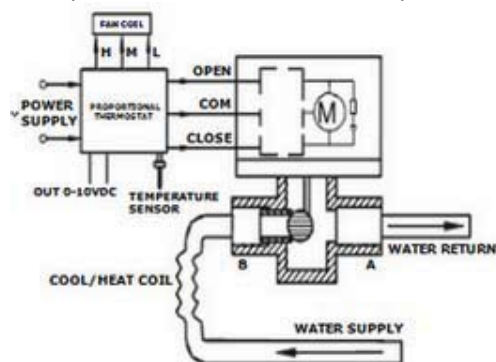


Figure 27

- When the thermostat is in *heating mode*, the *W output* is used for increasing the temperature and the *RV output* is used for decreasing the temperature.
- When the thermostat is in *cooling mode*, the *Y output* is used for decreasing the temperature and the *RV output* is used for increasing the temperature.

To control the floating valves, the below parameters must be configured in VISIONLINE.

Note: Heating and cooling must be configured separately, under HVAC/Heating and HVAC/Cooling respectively in VISIONLINE. For information about the settings that can be made for floating valves, click [here](#).

3.3 To install a thermostat (*Orion Thermostat-Original-LV*)

Important: The thermostat is only to be installed by qualified installers. All local codes must be followed when installing a thermostat. The thermostat will control a variety of HVAC systems and the installation will vary based on the type of system to which it is installed.

Important: Do not connect the *Orion Thermostat-Original-LV* directly to high voltage as this will destroy the thermostat.



Figure 28

The master controller of the in-room system is the thermostat, shown in Figure 28. To the guest, this device appears and operates as a standard digital thermostat; however, this device also receives entry and exit information from the door lock or switch as well as motion detected information from the motion sensor. This information is used to determine the occupancy status of the room and implement energy savings strategy based on this information. The guest operates the thermostat, which depending on configuration communicates either

- directly with the VISIONLINE software/Orion EMS software and the devices within the room.
- OR**
- with the thermostat controller

The thermostat buttons and thermostat display are the same in both cases. In the case of battery operated thermostat, 3AA batteries (4.5 VDC) in a battery package are used. The *Orion Thermostat-Original-LV* is a low voltage (12-24 V AC / 15-24 V DC) device and the air handler to which it is installed must have a 24V low voltage interface.

If no low voltage interface exists, one supplied by the BU/distributor or another qualified installer must be installed. The thermostat may be connected on air handlers with either *standard (on/off)* control or *heat pump* control.

3.3.1 Step-by-step procedure (Orion Thermostat-Original-LV)

For a new thermostat, the following steps must be followed:

1. Make sure that the thermostat has got the latest available firmware:
 - Plug the service cable (see Figure 29) into the thermostat.
 - In *Orion Service* (see Figure 30): choose the **Versions** alternative and click the **Readout** button. See *Quick reference guide Orion Service* for more information about the software.
2. Mount the thermostat according to [here](#).
3. Add the thermostat to the **Thermostats** list in VISIONLINE; in the **Thermostat details** dialog you should also choose the profile to which the thermostat should belong. If no applicable thermostat profile exists in VISIONLINE, create one according to [here](#).
4. Initialize the thermostat with room number and also with parameters according to the chosen thermostat profile; follow the *Initialize* section in *Quick reference guide Orion Service*. **Note:** If one or more parameters of a thermostat profile are at a later occasion updated, these new parameters will automatically be sent to all concerned online thermostats. If the thermostats are not online, they are updated via the **Initialize** alternative in *Orion Service*.
5. Make external connections according to [here](#).
6. If the thermostat should be online, set it up in the online network according to *Quick setup guide Orion EMS in VISIONLINE*.



Figure 29: Service cable RJ12 to 3.5mm stereo jack (Art. No 205 999 008)



Figure 30

3.3.2 Thermostat dimensions (Orion Thermostat-Original-LV)

Figure 31 shows the dimensions of the thermostat. The design allows the unit to be mounted onto a US or European single junction box.

Dimensions in mm (inches)

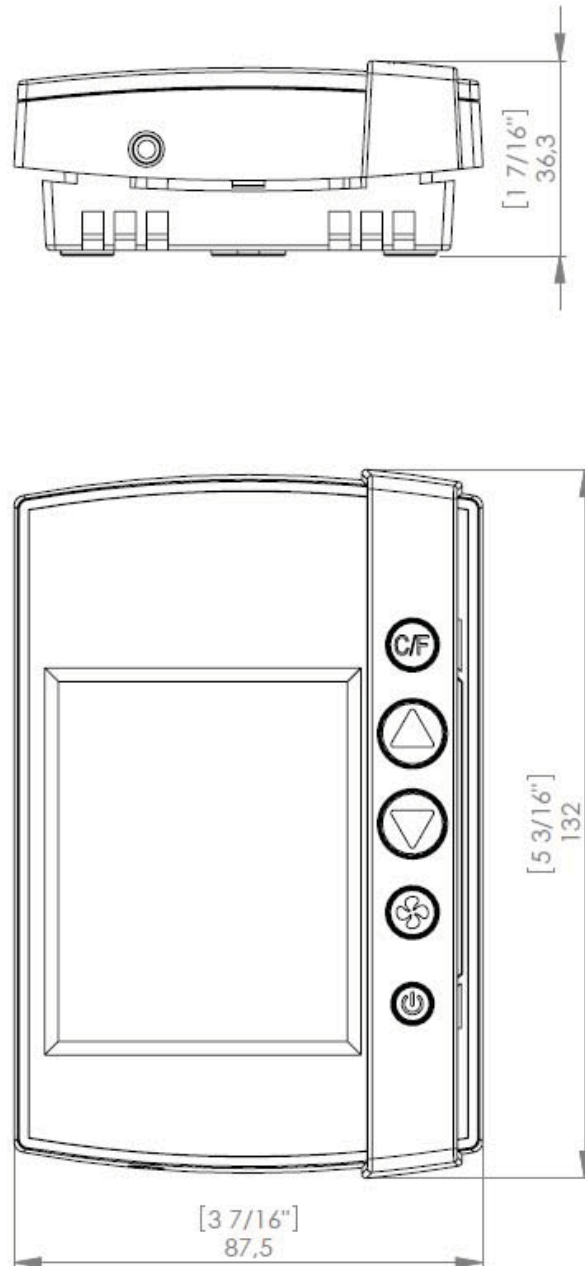


Figure 31

3.3.3 To mount a thermostat (Orion Thermostat-Original-LV)

If there are no existing thermostats, a few important items should be considered in determining placement:

- Do not mount the thermostat in the direct air flow of the air handler.
- Do not mount the thermostat in direct sunlight.
- Do not mount the thermostat directly above or behind any heat generating device such as a light or a TV.
- Generally, the thermostat should be mounted about 1.5m (5 feet) above the floor for standard rooms; however, local codes must be followed.

Note: When applicable, also follow local handicap requirements.

The thermostat is designed to be installed on a standard US or European single gang switch box.

- The mounting bracket is attached using two screws and the thermostat can then be snapped into place on the mounting bracket as shown in Figure 32.
- Once the wiring harness is connected, it is best to insert the thermostat on the bottom snaps first; then press down on the top of the mounting bracket as the top is snapped into place.

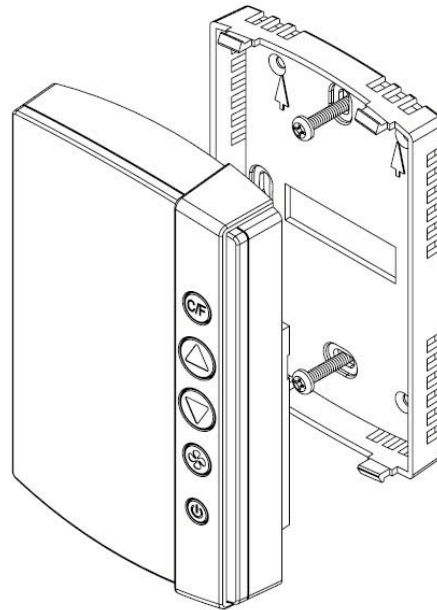


Figure 32

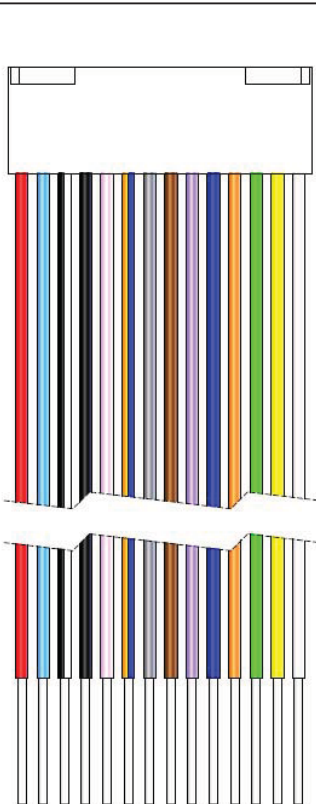
3.3.4 To dismantle a thermostat (Orion Thermostat-Original-LV)

1. Press down on the top of the mounting bracket to release the snaps and pull the top of the thermostat away from the wall; then lift up to completely remove from the bracket; see Figure 38.

3.3.5 To wire a thermostat (Orion Thermostat-Original-LV)

Table 3 shows the inputs and outputs for *Orion Thermostat-Original-LV* which are connected via the wiring harness supplied with the thermostat.

Pin	Input / Output	Wire Color
1	W/W2: Heating (output)	White
2	Y/W2: Cooling/Compressor (output)	Yellow
3	G1: Fan 1/low (output)	Green
4	G2: Fan 2/medium (output)	Orange
5	G3: Fan 3/high (output)	Dark blue
6	RV: Reversing valve (output)	Violet
7	Extra output: not used	Brown
8	DS_I: Interior door switch (input)	Gray
9	DS_E: Exterior door switch (input)	Orange/ blue
10	EX1: Extra input 1 (motion sensor/ card switch I/O)	Pink
11	Signal GND relative to V+: Power – Common/Ground	Black
12	V+ (load max 50mA DC)	White/ black
13	C: Power input -	Light blue
14	R: Power input +	Red
		Table 3



Note: V+ can be used for voltage feeding of e.g. a wired motion sensor.

Note: All signal inputs (pins 8-10) are relative to GND (active high).

Note: Connect input voltage 12-24 V AC or 15-24 V DC to pins 13 and 14.

Note: If a thermostat controller is used, the wiring harness is connected at the front of the thermostat controller as shown in [Figure 34](#).

Note: If no thermostat controller is used, the wiring harness is connected at the back of the thermostat as shown in [Figure 35](#).

Configuration with thermostat controller

If the thermostat controller is used,
the wiring harness is connected on the
thermostat controller front.

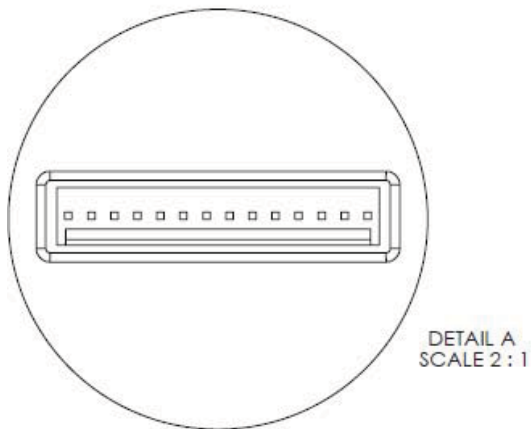
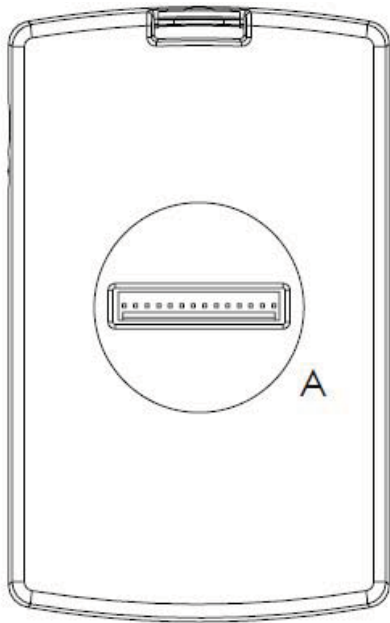
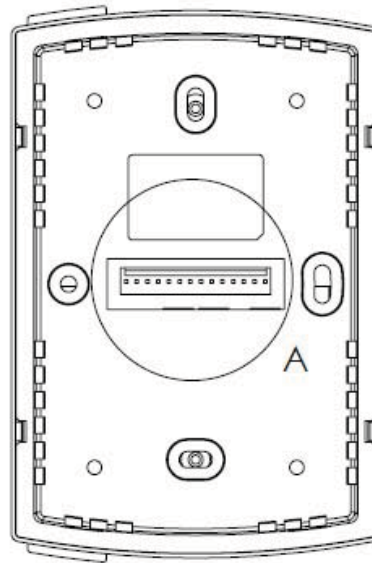


Figure 34

Configuration without thermostat controller

If no thermostat controller is used, the
wiring harness is connected on the back
of the thermostat.



Pin 1

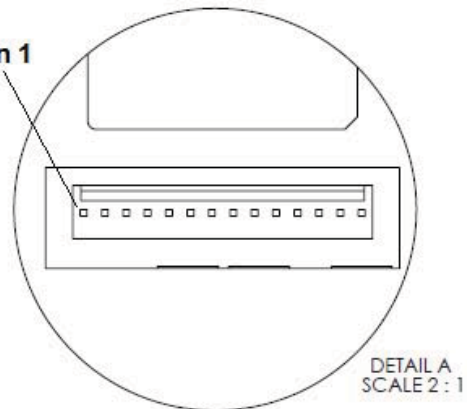


Figure 35

3.3.5.1 Recommended wire specification (Orion Thermostat-Original-LV)

It is recommended to use 0,82 – 0,33 mm² / 18 – 22 AWG (equivalent) stranded solid copper wire (Plenum rated if required by local code) from the *Orion Thermostat-Original-LV* to the HVAC system or *line to low voltage interface*. The same can be used if installing a wired door switch. The number of conductors to the HVAC system will depend on the particular installation. A 2-conductor wire is required for the wired door switch.

3.3.5.2 To connect a thermostat (Orion Thermostat-Original-LV)

The wires of the wiring harness (see [Figure 33](#)) are to be connected to the low voltage thermostat inputs of the air handler. These include heat, cool, three fan speeds and the reversing valve (heat pump only).

Note: If connecting to an air handler that has only two fan speeds, connect the low fan to the Fan 1 output and the high fan to the Fan 2 output. If the air handler has only one fan speed, connect to the Fan 1 output.

Important: If connecting to a high voltage air handler, a *line to low voltage conversion kit* must be used.

W/W2 (white)	For standard systems, this controls HEAT. For heat pumps, this is connected to the Stage 2 heating element if applicable.
Y/W2 (yellow)	This controls the COOL function for standard control and the Compressor for heat pump control. (For heat pumps, this is Stage 1 heating).
G1 (green)	This controls fan speed 1 (low).
G2 (orange)	This controls fan speed 2 (medium).
G3 (dark blue)	This controls fan speed 3 (high).
RV (violet)	This controls the reversing valve (heat pump only). The logic is set by the configurable parameters when the thermostat is commissioned.
Power - Common / Ground (black)	
Power (red)	12-24 V AC 15-24 V DC
	<i>Table 4</i>

3.3.5.3 Line to low voltage conversion (Orion Thermostat-Original-LV)

Figure 36 shows the wiring diagram for connecting to a *line to low voltage conversion* kit. This kit is typically located in the control box of the HVAC system or in close proximity to the unit. **Note:** Local codes must be followed when installing the *line to low voltage conversion* kit.

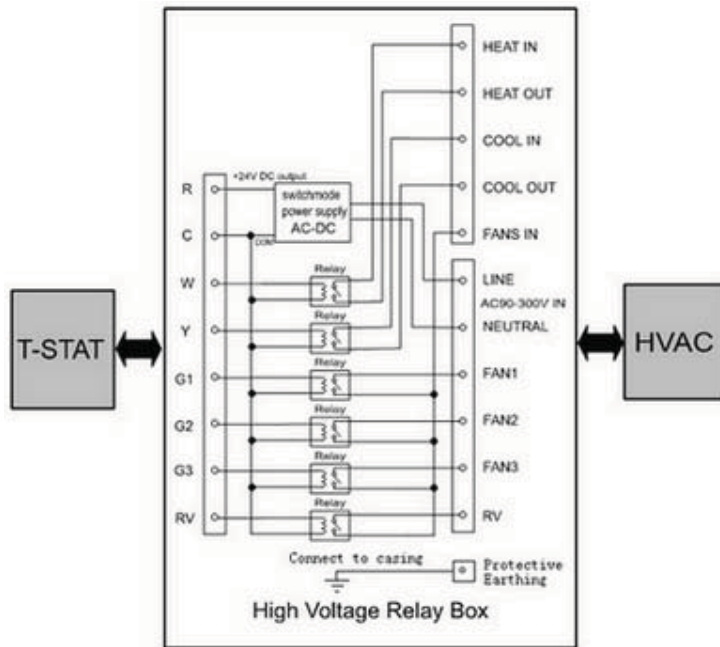


Figure 36

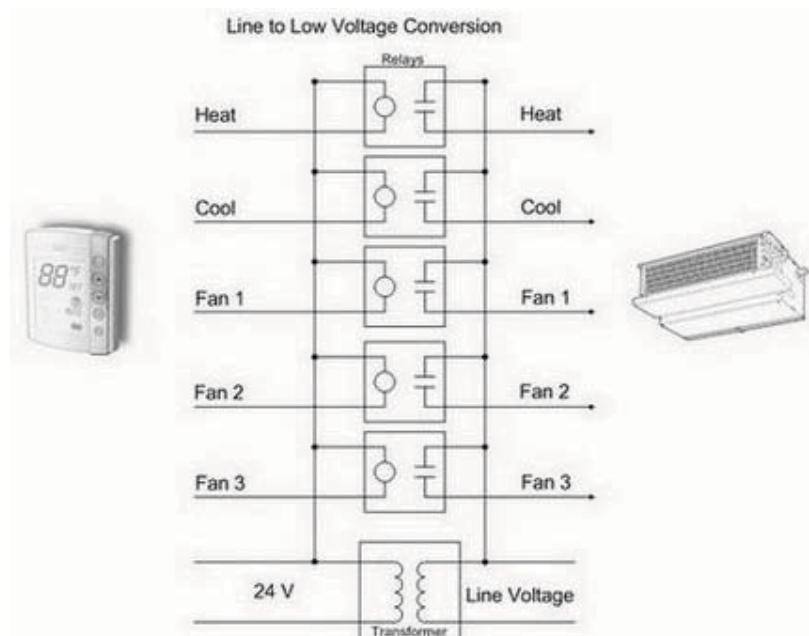


Figure 37

3.3.5.4 RS-485 interface (Orion Thermostat-Original-LV)

Next to the 14-pin contact for the wiring harness described [here](#), there is a 3-pin contact for RS-485 communication; see Figure 47. The three RS-485 wires which should be connected to the corresponding wires on the 3rd party RS-485 equipment are described in Table 5.

Description		Wire Color
A } B }	Twisted pair data bus	A: Red B: White
C	Common reference	Black
		Table 5

A is the non-inverting pin and **B** is the inverting pin.

Note: For Lutron RS-485 equipment, a different naming convention is used; MUX and MUX(bar), where **A = MUX** and **B = MUX(bar)**.

Other 3rd party RS-485 equipments may use other naming conventions; please check the applicable RS-485 equipment manual for correct configuration. Swapping the A and B lines does not harm the equipment, so the "try-and-see" approach is also useful.



Figure 38



Figure 39

3.3.5.5 To connect a wired door switch (Orion Thermostat-Original-LV)

If a wired door switch will be used to monitor the position of the door, it is recommended to use a magnetic 2-wire door switch. These wires are connected to the thermostat wiring harness as follows:

- If the door is exterior (leads to the outside), connect the wires to the orange/blue (exterior door input) wire and the white/black wire of the thermostat wiring harness.
- If the door is interior (leads to an interior corridor), connect the wires to the gray (interior door input) wire and the white/black wire of the thermostat wiring harness.

Installation of the door switch will vary depending on the type of switch used. Follow the instructions provided with the door switch to install it at the door.

3.4 To set up a thermostat profile

All thermostats that are mounted in the premises must be set up in the **Thermostats** list of the VISIONLINE software. Each thermostat must also belong to a thermostat profile, e.g. a template with certain thermostat parameters. The thermostat profiles are set up in the **Thermostat profiles** list in VISIONLINE. When a thermostat is first set up, it must be initialized with the thermostat profile parameters via the **Initialize** alternative in *Orion Service*; see *Quick reference guide Orion Service* for details.

Note: If one or more parameters of a thermostat profile are at a later occasion updated, these new parameters are automatically sent to all concerned online thermostats. If the thermostats are not online, they are updated via the **Initialize** alternative in *Orion Service*.

Note: If nothing else is stated, the parameters are applicable for *Orion Thermostat-Zen-HV* as well as for *Orion Thermostat-Original-LV*.

1. Double click on **Thermostat profiles** in the VISIONLINE navigation window.
2. Click **Add** to add a new thermostat profile, or mark an existing profile and click **Properties**.
3. Go through the different alternatives in the left pane of the **Thermostat profile details** dialog; see details in section 3.4.1-3.4.7.
4. When all settings have been made, click **Save** and **Close** (or **Update** and **Close** if an existing profile was modified).

3.4.1 General

Enter **Name** and, if desired, **Description**.

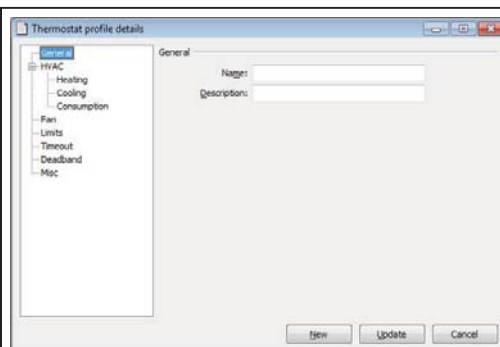


Figure 40

3.4.2 HVAC

Choose the applicable **Model**;
'High voltage' for *Orion Thermostat-Zen-HV*
and 'Low voltage' for *Orion Thermostat-Original-LV*. For further details, see below.
[High voltage](#)
[Low voltage](#)

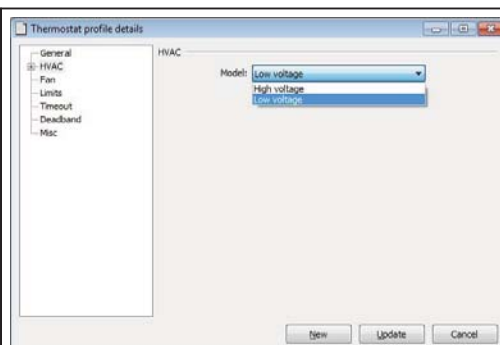


Figure 41

3.4.2.1 High voltage (Orion Thermostat-Zen-HV)

If 'High voltage' is chosen at **Model**, the additional choices **Input configuration** and **Extra input configuration** will be shown; see details in steps 1-5 below.

1. At **Ext. input** (*extra input*), choose between 'Normally open' and 'Normally closed'.
2. At **DSW ext. input** (*door switch exterior input*), choose between 'Normally open' and 'Normally closed'.
3. At **DSW int. input** (*door switch interior input*), choose between 'Normally open' and 'Normally closed'.
4. If **extra input** is applicable, choose at **Extra input configuration** between 'Wired motion sensor' and 'Pipe temperature sensor', depending on what is applicable.
5. If 'Wired motion sensor' is chosen, a checkbox 'Delay wired motion sensor' will be shown; mark the checkbox if needed.

Note: This can be applicable in warm countries where there is a great difference in temperature inside and outside the room, to avoid that motion is triggered when someone opens the door, leaves the room and locks the door.

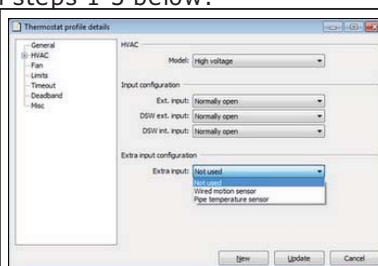


Figure 42

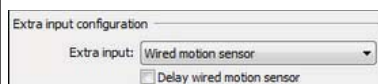


Figure 43

6. Click the plus sign in front of **HVAC** in the left pane of the **Thermostat profile details** dialog; the three alternatives **Heating**, **Cooling** and **Consumption** are shown. At **Heating**, make the applicable choice in the drop-down-menu; the available alternatives are shown in Figure 44. For the below alternatives, further settings can be made; click the links for details.

[2-pipe fan coil with automatic switching](#)
[Proportional](#)
[Floating valve](#)

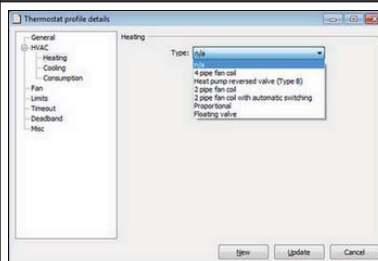


Figure 44

7. At **Cooling**, make the applicable choice in the drop-down-menu; the available alternatives are shown in Figure 45. For the below alternatives, further settings can be made; click the links for details.

[2-pipe fan coil with automatic switching](#)
[Proportional](#)
[Floating valve](#)

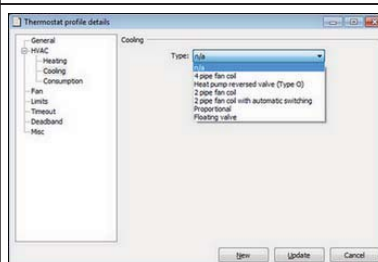


Figure 45

8. The **Consumption** alternative is only applicable if the *Integrated Room Control dashboard* is used. If this is the case, enter applicable values for the three cases 'Cooling', 'Heating' and 'Fan only'; see examples in Figure 46.

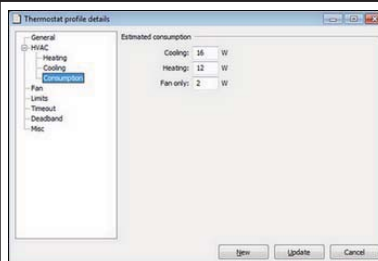


Figure 46

If '2-pipe fan coil with automatic switching' is chosen at **Type**, the alternatives **Pipe sensor** and **Trigger level** will be shown.

1. If the pipe sensor is a bimetal switch (open or closed depending on the temperature it senses), choose at **Pipe sensor** the applicable one of 'Cooling' and 'Heating'.
2. If the pipe sensor is an *1k NTC resistor*, a **Trigger level** (in the range 0-100%) for switching between heat and cool should be entered. When the temperature reaches the switch-over-temperature (default 3 °F; this is chosen under the **Deadband** alternative in the **Thermostat profile details** dialog, see Figure 48), it is checked whether the pipe sensor has reached the trigger level so that the thermostat can change mode from heating to cooling or vice versa.

Note: When '2-pipe fan coil with automatic switching' is chosen as HVAC type, the cooling relay (Y) is the only relay that applies, forced by the thermostat.

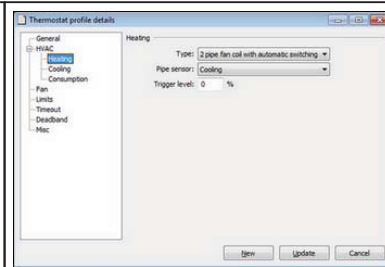


Figure 47

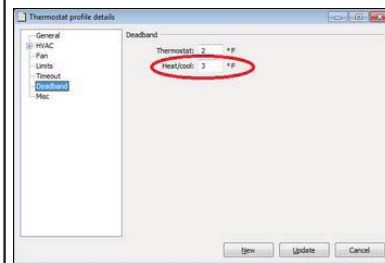


Figure 48

If 'Proportional' is chosen at **Type**, the below parameters are applicable. If necessary, make changes to the default values which are shown in Figure 49.

1. The value at **Prop. band/gain** describes the regulator output of the HVAC system related to the difference between *measured temperature* and *set temperature*.
Example:
Measured temperature = 23 °C
Set temperature = 20 °C
Gain = 1.9V
The regulator will set 3x1.9V=5.7V on the output (if all default values in Figure 49 are used)
2. The **Integral gain/reset** describes to the HVAC system regulator what gain it can use when integrating the previous average temperature values, in order to settle the temperature around the desired set value.
3. The **Derivative time** describes to the HVAC system regulator what gain it can use when looking at the rate of the temperature change.
4. The **Cycle time** describes how fast the HVAC system regulator makes calculations for a new output.
5. At **Min output**, the minimum output voltage is chosen; can be 0V, 1V or 2V.
6. At **Max output**, the maximum output voltage is chosen; can be 5V or 10V.

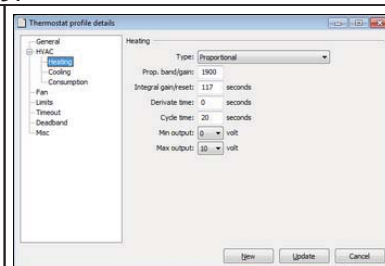


Figure 49

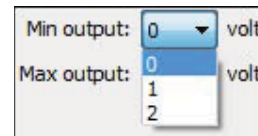


Figure 50

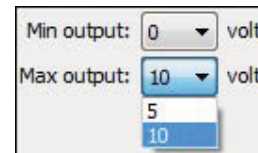


Figure 51

If 'Floating valve' is chosen at **Type**, the below parameters are applicable.
If necessary, make changes to the default values which are shown in Figure 52.

1. **Max opening** states the maximum number of seconds required to fully open or fully close the floating valve.
2. The floating valve should typically move to a given position, so that the thermostat can try to close or open to decrease or increase the temperature. **Start position** states the number of seconds it takes to run the thermostat to the desired position of the floating valve.
3. There are three different values for runtime, i.e. how long the floating valve should operate related to the difference between measured temperature and setpoint: **Max runtime**, **Medium runtime** and **Min runtime**. Based on a calculation of the selected deadband and the temperature deviation from setpoint, the thermostat chooses an applicable valve throttle.
***Example 1:** If the temperature difference is 1 degree outside the deadband that has been set up in the dialog shown [here](#), the floating valve is opened/closed according to 'Medium runtime'.*
***Example 2:** If the temperature difference is -3 degrees, the thermostat will use 'Max runtime' and run the floating valve for 16 seconds "back" to a new position $90s - 16s = 74s$.*
4. **Check interval** describes how often the regulator checks the real temperature against the setpoint.

The screenshot shows a software window titled 'Thermostat profile details'. On the left is a tree view with categories: General, HVAC, Heating, Cooling, Consumption, Fan, Limits, Timeout, Deadband, and Misc. The 'Heating' category is selected. The main area is titled 'Heating' and contains a 'Type' dropdown menu set to 'Floating valve'. Below this are several input fields with units: 'Max opening' (120 seconds), 'Start position' (90 seconds), 'Max runtime' (16 seconds), 'Medium runtime' (8 seconds), 'Min runtime' (4 seconds), and 'Check interval' (300 seconds). At the bottom right are three buttons: 'New', 'Update', and 'Cancel'.

Figure 52

3.4.2.2 Low voltage (Orion Thermostat-Original-LV)

1. Click the plus sign in front of **HVAC** in the left pane of the **Thermostat profile details** dialog; the three alternatives **Heating**, **Cooling** and **Consumption** are shown. At **Heating**, make the applicable choice in the drop-down-menu; the available alternatives are shown in Figure 53. For *2-pipe fan coil with automatic switching*, further settings can be made; click [here](#) for details.

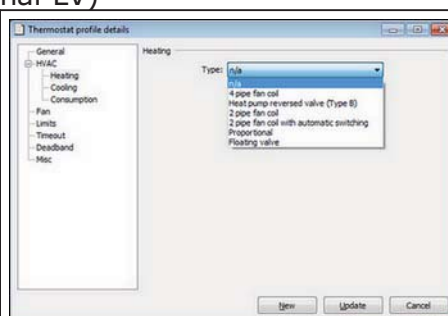


Figure 53

2. At **Cooling**, make the applicable choice in the drop-down-menu; the available alternatives are shown in Figure 54. For *2-pipe fan coil with automatic switching*, further settings can be made; click [here](#) for details.

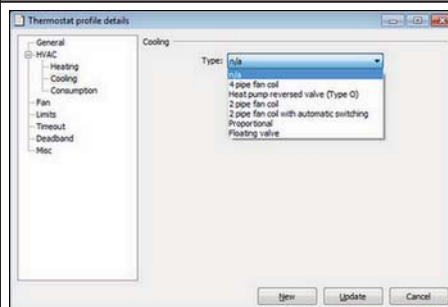


Figure 54

3. The **Consumption** alternative is only applicable if the *Integrated Room Control dashboard* is used. If this is the case, enter applicable values for the three cases 'Cooling', 'Heating' and 'Fan only'; see examples in Figure 55.

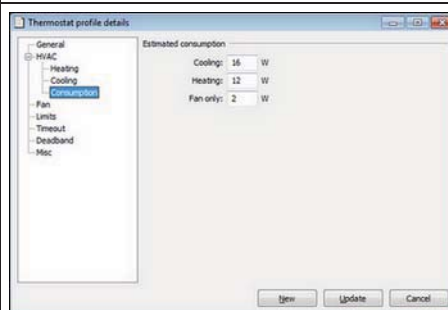


Figure 55

If '2-pipe fan coil with automatic switching' is chosen at **Type**, the alternatives **Pipe sensor** and **Trigger level** will be shown.

1. If the pipe sensor is a bimetal switch (open or closed depending on the temperature it senses), choose at **Pipe sensor** the applicable one of 'Cooling' and 'Heating'.
2. If the pipe sensor is an *1k NTC resistor*, a **Trigger level** (in the range 0-100%) for switching between heat and cool should be entered. When the temperature reaches the switch-over-temperature (default 3 °F; this is chosen under the **Deadband** alternative in the **Thermostat profile details** dialog, see Figure 57), it is checked whether the pipe sensor has reached the trigger level so that the thermostat can change mode from heating to cooling or vice versa.

Note: When '2-pipe fan coil with automatic switching' is chosen as HVAC type, the cooling relay (Y) is the only relay that applies, forced by the thermostat.

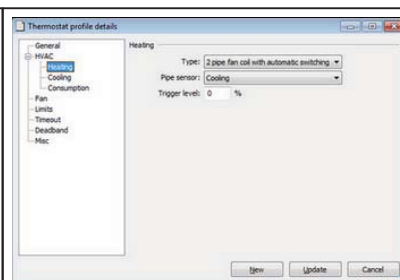


Figure 56

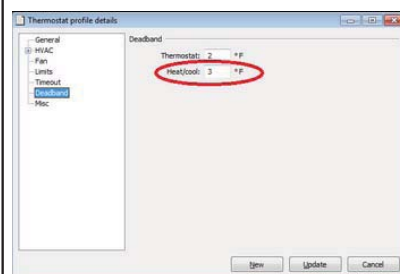


Figure 57

3.4.3 Fan

1. At **Control**, choose whether the control should be
 - manual; default
 - auto; this choice will disable the fan button on the thermostat
2. **Max fan cool** is the maximum setting that the customer can make via the thermostat. Choose between
 - low
 - mid
 - high; default

Note: The ability to control fan speeds depends on the capability of the air handler as some systems do not have three fan speeds.

3. **Max fan heat** is the maximum setting that the customer can make via the thermostat. Choose between
 - low
 - mid
 - high; default

Note: The ability to control fan speeds depends on the capability of the air handler as some systems do not have three fan speeds.

4. If applicable, mark the checkbox 'Fan on when satisfied'. This is applicable if the background sounds in the room should for guest comfort reasons not change.

Note: The 'Fan on when satisfied' function will only apply to an occupied room.

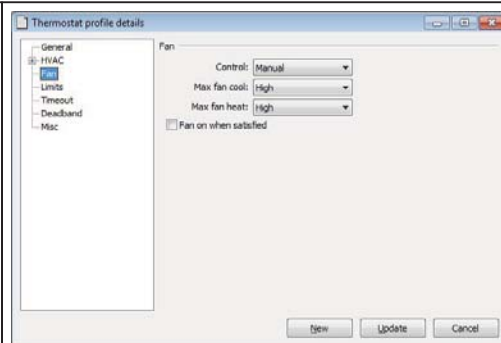


Figure 58

3.4.4 Limits

Note: For more information about 'unoccupied' and 'unsold', see section *Basic EMS logic in Daily use manual Orion EMS*.

1. At **Setback type**, choose
 - *static*; default (the *static setback* temperatures are configured in the system and do not change based on the guest settings)
 - *dynamic* (the *dynamic setback* temperatures are configured as a set number of degrees above or below the guest setting)
2. If 'Static' is chosen at **Setback type**: enter the applicable number of degrees at **Upper limit** (default is 78 °F) and **Lower limit** (default is 68 °F) for setback if a room is unoccupied.

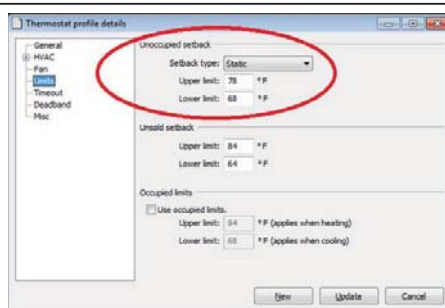


Figure 59

3. If 'Dynamic' is chosen at **Setback type**: enter the applicable number of degrees offset at **Upper limit** (default is 4 °F offset) and **Lower limit** (default is 4 °F offset) for setback if a room is unoccupied.

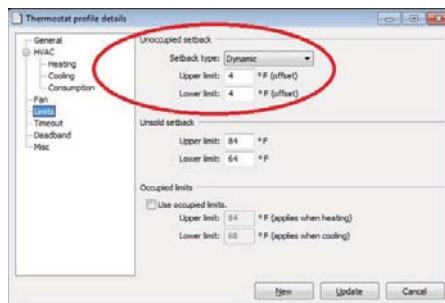


Figure 60

4. At **Unsold setback**, enter the applicable number of degrees as **Upper limit** (default is 84 °F) and **Lower limit** (default is 64 °F) for setback if a room is unsold.

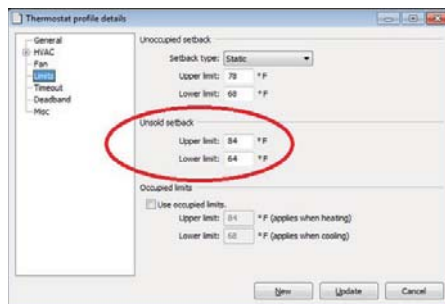


Figure 61

5. At **Occupied limits**, it is possible to limit the allowed temperature range when the room is occupied. If this is the case, mark the checkbox 'Use occupied limits' and enter the values for **Upper limit** (default is 84 °F) and **Lower limit** (default is 68 °F).

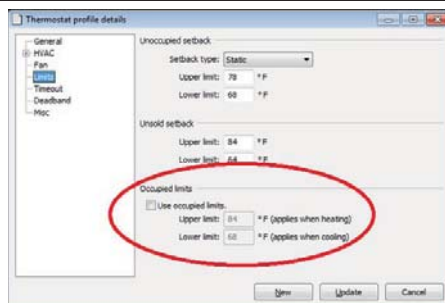


Figure 62

3.4.5 Timeout

1. At **Ext. door timeout**, choose between
 - *normal*; default
 - *short*; 20 seconds
2. At **Room not occupied**, enter the applicable number of minutes (default is 8) after which timeout should occur. If 'Normal' is chosen at **Ext. door timeout**, the HVAC will turn off if the exterior door is left open for this period of time.
3. At **Room not sold**, enter the applicable number of hours (default is 16) after which an unoccupied room should enter the unsold mode.
Note: If the PMS system sends a check-out command, the **Room not sold** parameter will be overridden and timeout will immediately take place.

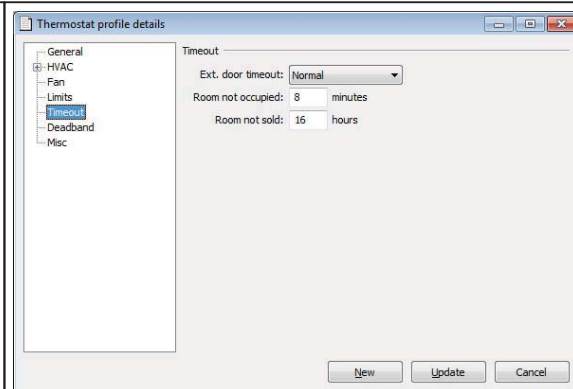


Figure 63

3.4.6 Deadband

1. At **Thermostat**, enter the applicable number of degrees; default is 2 °F.
2. At **Heat/cool**, enter the applicable number of degrees; default is 3 °F.

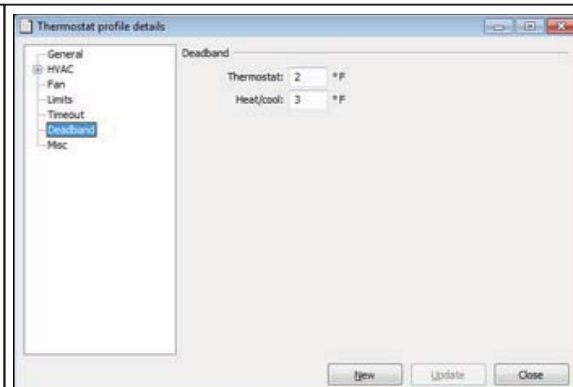


Figure 64

3.4.7 Misc

1. If the checkbox **Freeze guard** is marked (default is marked), there will be an alarm and the HVAC will start heating if the temperature in any room with a thermostat goes below 39 °F (4 °C).

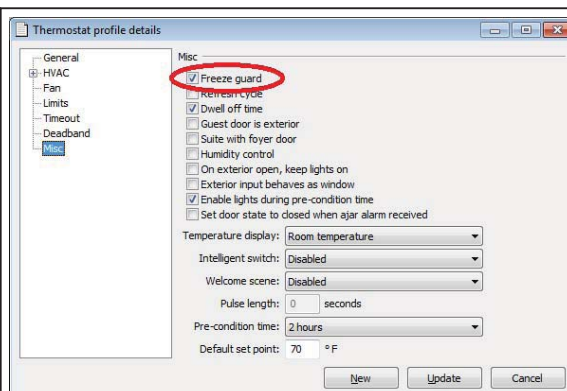


Figure 65

2. If the checkbox **Refresh cycle** is marked (default is unmarked), the Orion EMS system will in setback control run the A/C unit every 25 minutes for a period of 2 minutes to re-circulate the air in the room; only for cooling mode.

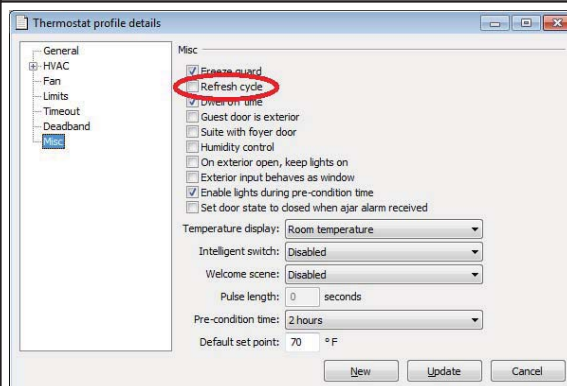


Figure 66

3. If the checkbox **Guest door is exterior** is marked (default is unmarked), the door to the room will be treated as an exterior door. If the door is opened, the HVAC will turn off either when the door has been open for 20 seconds (*short timeout*) or when the door has been open for the *unoccupied timeout*. This depends on whether *short* or *normal* has been chosen under the **Timeout** tab in the **Thermostat profile details** dialog.

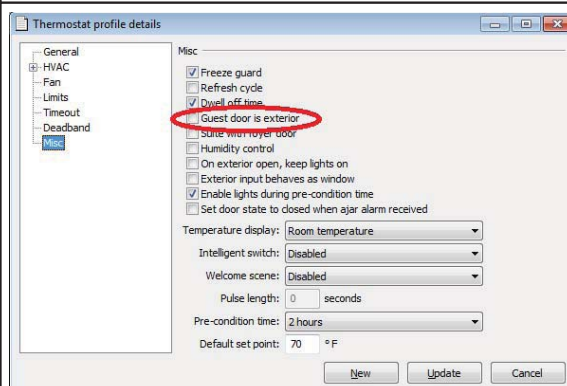


Figure 67

4. If the checkbox **Suite with foyer door** is marked (default is unmarked), the thermostat will in non-suite mode not react on the foyer door.

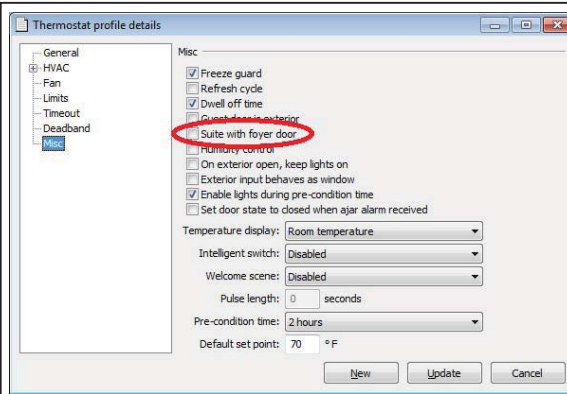


Figure 68

5. If the checkbox **Humidity control** is chosen (default is unmarked), the thermostat will implement control measures if the humidity in the room gets too high. **Note:** The control measures will only be implemented when the room is unoccupied or unsold.

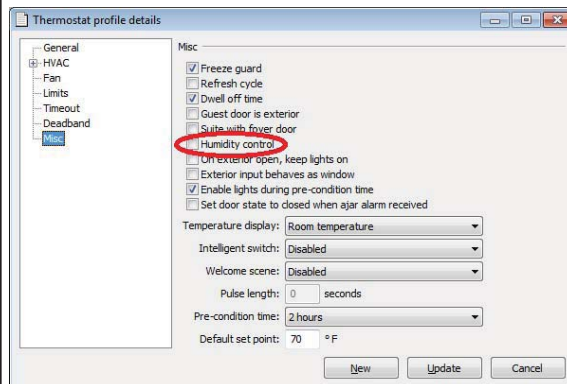


Figure 69

6. If the checkbox **On exterior open, keep lights on** is marked (default is unmarked), the lights will be left on if the *exterior door timeout* has been triggered by
- the wired input for *exterior door open* on the thermostat
- OR**
- a non-wired door switch configured as *exterior*

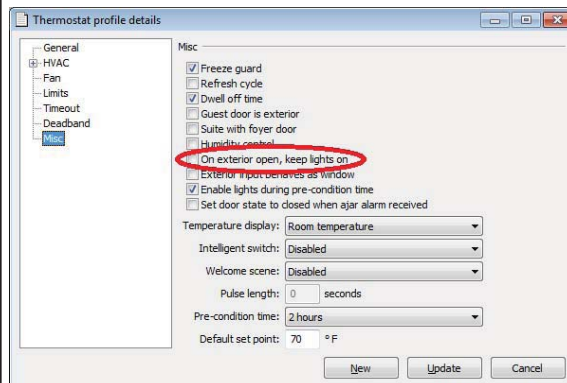


Figure 70

7. If the checkbox **Exterior input behaves as window** is marked (default is unmarked), the HVAC will be shut off after a configured time (*short* or *normal*), but the thermostat does not change the occupancy status. The exterior door timeout is triggered by the wired input for *exterior door open* (EX1) on the thermostat.

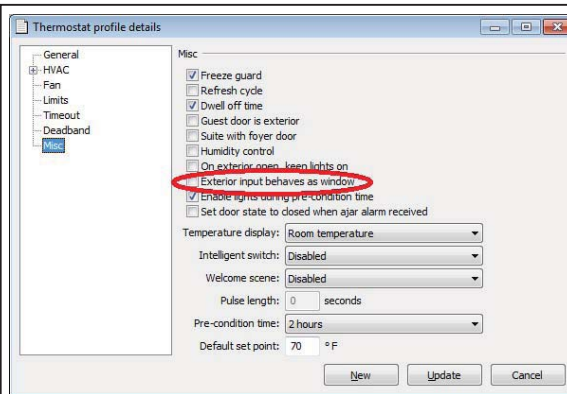


Figure 71

8. If the checkbox **Enable lights during pre-condition time** is marked (default is marked), the lights are enabled according to the chosen [intelligent switch](#) setting during the [pre-condition time](#).

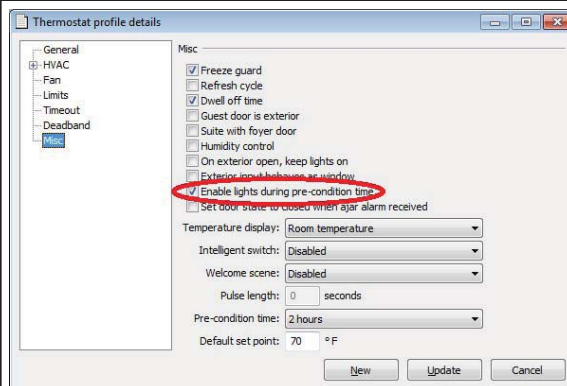


Figure 72

9. If the checkbox **Set door state to closed when door ajar alarm received** is marked (default is unmarked), the door state is set to *closed* once the *door ajar timeout* has been triggered. This allows the thermostat to go to occupied state even if the door is not physically closed.
Note: This checkbox is applicable if you have a malfunctioning door switch.

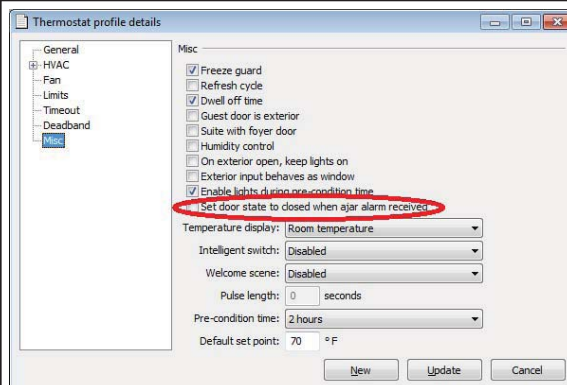


Figure 73

10. At **Temperature display**, choose between
- room temperature; default
 - set temperature, i.e. the temperature which has been set on the thermostat by the guest

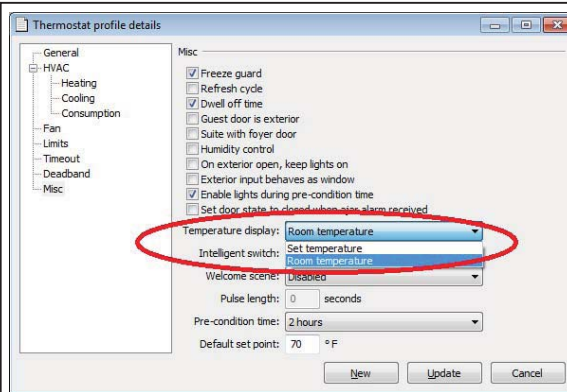


Figure 74

11. At **Intelligent switch**, choose between
- disabled; default
 - use RV output
 - use G2 output

The intelligent switch is an output for lighting control which works according to the occupancy status. If intelligent switch is applicable, normally 'Use RV output' should be marked unless the air handler is a heat pump. In the latter case, mark 'Use G2 output' instead.

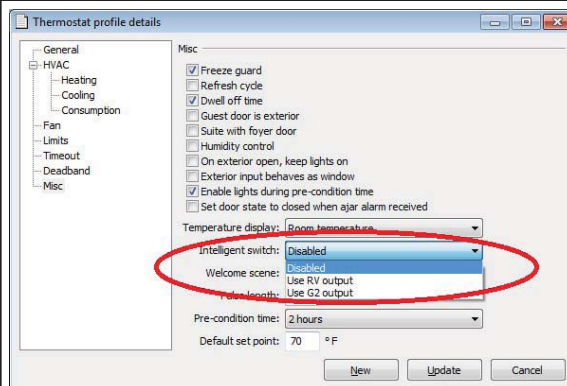


Figure 75

12. If desired, it is possible to have a *welcome scene* which is activated when the occupancy state for a room changes from *unsold* to *unoccupied*. The available alternatives for welcome scene are (default is 'disabled'):

- disabled
- use RV output
- use G2 output
- use solid state relay; only applicable for Orion Thermostat-Zen-HV

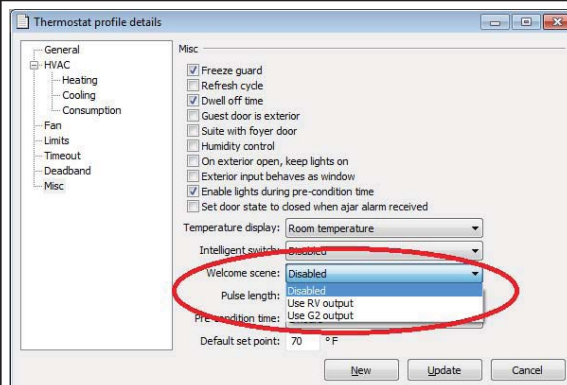


Figure 76

13. At **Pulse length**, the welcome scene can be set up to have a pulse length:
- 0 = welcome scene always off
 - chosen length in the interval 1-255 seconds

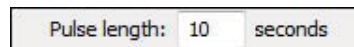
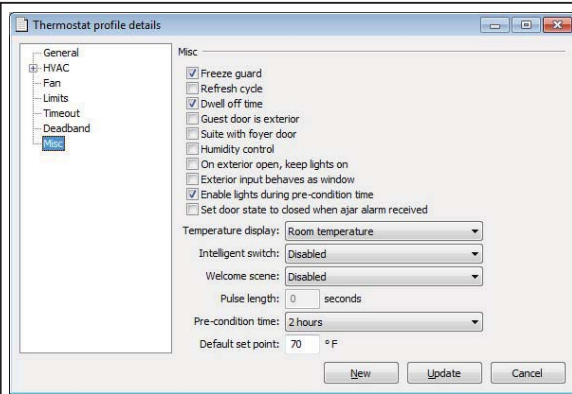


Figure 77

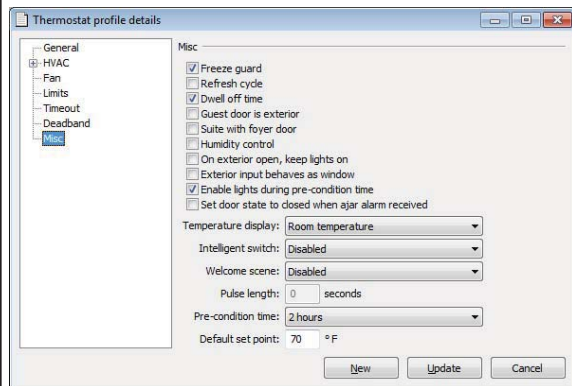
14. **Pre-condition time** is the number of hours the thermostat shall run at the [default setpoint](#) after check-in. If no entry has been done when this time expires, the unoccupied setback will be assumed. The *pre-condition time* can be 1-12 hours or 'disabled' (default is 2 hours).



The screenshot shows the 'Thermostat profile details' dialog box with the 'Misc' tab selected. The 'Pre-condition time' is set to 2 hours. Other settings include: Freeze guard (checked), Refresh cycle (checked), Dwell off time (checked), Guest door is exterior (checked), Suite with foyer door (checked), Humidity control (checked), On exterior open, keep lights on (checked), Exterior input behaves as window (checked), Enable lights during pre-condition time (checked), and Set door state to closed when ajar alarm received (checked). The temperature display is set to Room temperature, Intelligent switch is Disabled, Welcome scene is Disabled, Pulse length is 0 seconds, and Default set point is 70 °F.

Figure 78

15. **Default set point** is the temperature which the thermostat is set to until a guest changes the temperature. The thermostat will also return to the **Default set point** after check-out.



The screenshot shows the 'Thermostat profile details' dialog box with the 'Misc' tab selected. The 'Default set point' is set to 70 °F. Other settings are identical to Figure 78: Freeze guard (checked), Refresh cycle (checked), Dwell off time (checked), Guest door is exterior (checked), Suite with foyer door (checked), Humidity control (checked), On exterior open, keep lights on (checked), Exterior input behaves as window (checked), Enable lights during pre-condition time (checked), and Set door state to closed when ajar alarm received (checked). The temperature display is set to Room temperature, Intelligent switch is Disabled, Welcome scene is Disabled, Pulse length is 0 seconds, and Pre-condition time is 2 hours.

Figure 79

3.5 To install a motion sensor

The motion sensor is used to detect motion in the room and send this information via the ZigBee endnode to the room controller (thermostat). The device is designed to be ceiling or wall mounted and is powered by 3AA batteries. No physical connections are required; thus making the installation simple. **Note:** *Orion Thermostat-Zen-HV* has a built-in motion sensor which can be enabled or disabled according to the customer's choice. Even if the built-in motion sensor is enabled, it can in some cases (depending on the thermostat location in the room) be applicable to also have an external motion sensor as the one described in this section.



Figure 80

The motion sensor is a battery operated device that may be installed on the ceiling or wall. The mounting bracket is installed with two screws as shown in Figure 81.

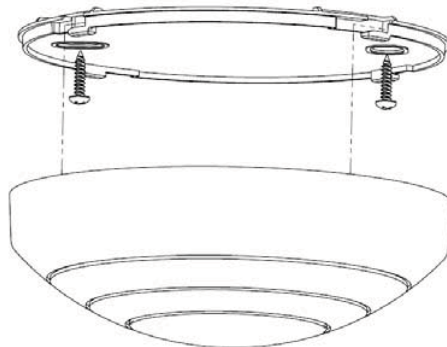


Figure 81