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# Controls User Manual

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HPAH™ and DXAH™  
Heat pump air handler  
with iStat6 electronic controller

**Vortex Source Systems**

Cambridge, Ontario

Phone: 888-781-8151

Fax: 888-670-2544

[info@vortexsource.com](mailto:info@vortexsource.com)

[www.vortexsource.com](http://www.vortexsource.com)

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This document describes proper setup and use of the electronic controller for the Vortex HPAH™ and DXAH™ air handler with the iStat6 controller. Although the system will function when left at factory default settings, it is recommended that the installer read through this short manual in order to ensure the system has been setup to match the required heating and cooling loads and air-conditioning equipment installed, and to take advantage of the various features available.

## Controller Basics

The controller automatically adjusts blower motor speeds and engages relays for control of the system components. Through its LCD display and keypad, important system parameters may be configured and operating conditions may be monitored.

When the controller keypad has not been pressed for a few minutes, the backlight will turn off and the display may go blank. Simply press any one of the buttons to wake up the controller. By default, the controller will display a short message describing the operating status of the system. *Table 1* provides a list of the different possible status messages and their meaning. There are also a number of small icons that may appear around the edges of the display according to the current operating status. *Table 2* gives an explanation of the different icons.

Table 1 - status messages

Message	Meaning
NO CALL	System is not currently receiving a call, all functions are off.
FanOnly	There is currently a call for continuous fan only and no heating or cooling
AuxHeat	Auxiliary (or Emergency) Heat is on.
HeatPmp	The heat pump is on.
HP + Aux	Heat pump and auxiliary heat are both on.
TST ERR	Thermostat error – auxiliary is on at the same time as O (reversing valve) for HP cooling. Check wiring & ensure heat pump thermostats are used
FROZEN	Supply air is too cold, freeze protection has been activated. Compressor calls will be suspended until temperature rises and time delays are satisfied
TEST	Pressing the button on the bottom of the control will operate the fan and auxiliary pump for 20 seconds to verify operation. After 20 seconds, it returns to normal.

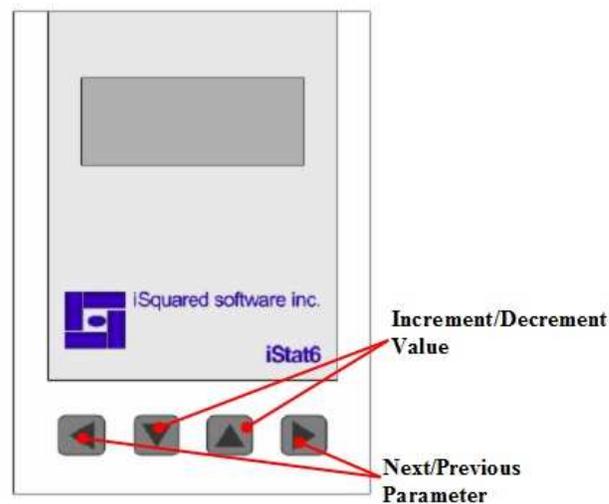
Table 2 - display icons

Icon	Meaning
Flame	auxiliary heat is on
Sun	Heat pump is on
Snowflake	system is in cooling mode (rev. valve)
4-blade fan	blower is running at or below 50%
8-blade fan	blower is running above 50%

## ***Controller Keypad***

By using the *option* and *setting* keys, different parameters and their current settings may be displayed and modified. Use the outer *option* keys to scroll through the available parameters, and use the inner *setting* keys to modify the parameter's current setting (if available). By default, the control will remain in 'user' mode, in which a limited selection of parameters may be accessed. By entering 'admin' mode, additional parameters may be made available. Please exercise caution while in 'admin' mode, as these settings are meant to be accessed by the experienced user or installing contractor. A description of each of the modes is found below.

### **iStat6 User Interface**



### ***USER MODE***

This is the basic display and operating mode, in which only a limited selection of parameters may be displayed. Refer to *Table 3* for a description of each item displayed.

### ***ADMIN MODE***

This is the advanced display and configuration mode. It is intended only for the properly trained contractor. To enter 'admin' mode, press any button to illuminate the display backlight, then press and hold the two *option* (outer) buttons at the same time ('user' will be displayed at first, hold until 'admin' is displayed and release). You can now scroll through the display items by using the outer two *option* buttons, and adjust certain values using the inner two *setting* buttons. To return the control to 'user' mode simply wait a few minutes or press and hold both *option* buttons.

Use *Table 4* as a quick reference on the items available in this mode. Detailed descriptions on important parameters are found below.

## ***Initial Controls Setup***

When first powering up the air handler during commissioning, enter ‘admin’ mode on the controller and adjust the following settings to match the installed equipment.

Model	Max. Tonnage	Max. Airflow (cfm)
HPAH30	2	800
HPAH63	3	1200
HPAH100	5	1800

**ContFan** – the amount of airflow used for a continuous fan call, as a percentage of the maximum system airflow. The default setting is 50%.

**Heat Pump Fan Speeds** – Heat pump heating and cooling fan speeds for first and second stage as a percent of maximum: HPH1Fan, HPH2Fan, HPC1Fan and HPC2Fan.

**Auxiliary Heat Fan Speeds** – Auxiliary heating fan speeds for first and second stage as a percent of maximum: Aux1Fan and Aux2Fan.

**HP Pre** – Length of time in seconds that the fan will run at half speed at the start of each heat pump cycle. Default is 10 seconds. This can improve comfort by pre-heating/cooling the coil.

**HP Post** – Length of time in seconds that the fan will run at half speed at the end of each heat pump cycle. Default is 30 seconds. This can improve efficiency by delivering residual heat/cool in the coil to the rooms.

**Aux Pre** – Length of time in seconds that the fan will run at half speed at the start of each auxiliary cycle. Default is 30 seconds. This can improve comfort by pre-heating the coil.

**Aux Post** – Length of time in seconds that the fan will run at half speed at the end of each auxiliary cycle. Default is 30 seconds. This can improve efficiency by delivering residual heat to the rooms

## **Cycle Timer (Pump Exerciser)**

The HPAH includes an optional cycle timer or pump exerciser feature which may need to be enabled depending on the hot water source and local regulations. When enabled, the cycle timer will run the heating circulating pump for 30 seconds every 24 hours. This is only for the auxiliary coil.

**PumpExr** – Pump Exerciser (Cycle timer) mode. Set to 1 to enable, 0 to disable. Pump exerciser is disabled by default.

### **Two-Stage Heat Pump**

An output is available on the low-voltage terminal strip for the control of a two-stage air-conditioner. When a call is present, the heat pump compressor will initially be activated in first stage (low). If the call continues beyond time **HP2Time**, second stage compressor and air flows will be activated for the remainder of the call.

**HP\_2STG** – Turn ON if a 2-stage heat pump is present.

**HP2Time** – The time, in minutes, in which 2<sup>nd</sup> stage is activated, set by default to 20 minutes. Decreasing this value will cause 2<sup>nd</sup> stage to be activated sooner, leading to full capacity.

### **Freeze Protection**

In order to prevent the auxiliary coils from freezing during cooling, the air handler includes a freeze protection feature. If the measured supply air temperature drops below the freeze protection temperature **FRZ\_TMP**, the signal to the heat pump contactor is interrupted. In order to prevent short-cycling of the compressor, this feature includes two settable delay intervals: **FrzDly1** sets the amount of time the supply air temperature has to remain below **FRZ\_TMP** before the alarm is triggered; and **FrzDly2** sets the amount of time until the compressor is allowed to come back on, once the supply air temperature has returned to above **FRZ\_TMP**. **Note:** This feature will only turn off the HP compressor signal. It will not protect the home or air handler from freezing house temperatures or improper fresh air connections such as from a heat recovery ventilator.

**FRZ\_TMP** – The freeze protection setpoint temperature. Default value is 3 °C. Lowering this value will decrease sensitivity of the freeze protection feature.

**FrzDly1** – Amount of time (in minutes) to wait before acknowledging a freeze protection condition. Default setting is 3 minutes. Increasing this value will decrease sensitivity of the freeze protection feature.

**FrzDly2** – Amount of time in minutes to wait before bringing the HP compressor back on, once the measured supply air temperature has returned to a safe value. Default setting is 2 minutes.

### ***Troubleshooting***

**Warning:** The homeowner can diagnose many issues from the main controller on the front of the air handler but any diagnostics or servicing inside the air handler (blower compartment) should only be performed by a qualified service person. **High voltages are present.**

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**No Display** – If pushing one of the four front buttons does not refresh the display, there may be no power to the air handler, or the transformer has failed or the controller has failed.

**Thermostat calls** – The status screen (default) will show heating, cooling or continuous fan calls detected from the thermostat (Table 1). Using the outer keys, the user can scroll through the screens to see individual thermostat calls and fan speed (Table 3).

If a thermostat is calling but not detected by the control:

1. Check the thermostat and its connections
2. Check thermostat wiring at the thermostat and air handler.
3. Check the 8gang relay indicator lights.



W1, W2, Y1, Y2, O and G1 are connected directly from the thermostat terminal strip. The 8 gang relay converts 24vac thermostat signals to digital signals for input to the iStat6 controller. If the lights are on but the controller does not respond, the problem is the wiring to the control or the control has failed.

**No Auxiliary Heating – Try Test Mode first** – pushing the button on the bottom (underneath) of the control will run the auxiliary pump and fan for 20 seconds. Pipes should get warm and fan should run. No pump – check the pump relay for a 24vac signal from the control, wiring and pump.

**No HP Cooling/Heating** - Check for 24vac at the terminal strip Y1-OUT. If not, check wiring to and from control and control.

**No Blower** - The fan can be tested from 0-100% by placing the primary thermostat in FAN ON (or jumper R to G) with no heat or cool call. Then, adjust **ContFan** up and down within ADMIN mode. It should modulate smoothly from 1% to 100% and off completely at 0%. If it fails to run, check wiring from controller to motor speed control, motor speed control, wiring to motor and motor.

### **Blower motor never fully stops, even with no demand signal**

Ensure control displays NO CALL. If not, check thermostat settings and thermostat wiring.

### **Too much airflow, causing noise**

This can occur due to undersized ductwork, dirty filter or improper setup of the air handler heating/cooling loads. Check airflow % settings. Installing a 2-stage heat pump will reduce the airflow most of the time (first stage).

## Alarm message “TST ERR”

There is a simultaneous call for auxiliary heating (W) and cooling (O), indicating an error with thermostat wiring or setup. Ensure that the thermostat is wired as per the Installation Instructions, and configured for heat pump systems, either single or 2 stage.

## Not enough humidity removal in cooling mode

Reduce cooling speeds HPC1Fan and HPC2Fan.

## Supply or return air temperature (SA\_TMP or RA\_TMP) reads -50 °C

This indicates the supply air temperature sensor is not properly connected to the controller. Ensure that the sensor is connected as per the wiring diagram found in the Installation Instructions and that no wires have become loose. **RA\_TMP** is not used and can be ignored. A failed supply air temperature sensor will put the system into freeze protection.

## Freeze protection errors (alarm message “FROZEN”)

This usually occurs when there is inadequate airflow for a given system.

- Ensure that the air filter is not plugged and all ductwork is open
- Ensure supply air temperature sensor is located after cooling coil and in the supply air stream, not touching the coil, heat source, plumbing, etc.
- Ensure the cooling setpoint temperature **CoolTmp** is not set too high
- Decrease sensitivity of the freeze protection feature (see Freeze Protection above)

Table 3 User Mode (default)

Line 1	Line 2	Set.	Type	Description	Default
HP AirH	#####	D	Display	Display status of system	NO CALL
W1_Aux	(0)Off/(1)On	D	Input	Thermostat auxiliary heating W1 (ON/OFF)	
W2_Aux	(0)Off/(1)On	D	Input	Thermostat auxiliary heating W2 (ON/OFF)	
Y1_HP	(0)Off/(1)On	D	Input	Thermostat heat pump Y1 (ON/OFF)	
Y2_HP	(0)Off/(1)On	D	Input	Thermostat heat pump Y2 (ON/OFF)	
SA_TMP	###.# C	D	Input	Supply air temperature	
RA_TMP	###.# C	D	Input	Return air temperature (display only, not used)	
FAN_Spd	##### %	D	calc	Fan speed as a percentage	
HPAH	##.## REV	D	Display	Program name and revision number	2.00

\* note: "D" in set. indicates variable is for display only and is not settable

Table 4 Admin Mode

Line 1	Line 2	Set.	Type	Description	Default
HP AirH	####	D	Display	Display status of system	NO CALL
W1_Aux	(0)Off/(1)On	D	Input	Thermostat auxiliary heating W1 (ON/OFF)	
W2_Aux	(0)Off/(1)On	D	Input	Thermostat auxiliary heating W2 (ON/OFF)	
Y1_HP	(0)Off/(1)On	D	Input	Thermostat heat pump Y1 (ON/OFF)	
Y2_HP	(0)Off/(1)On	D	Input	Thermostat heat pump Y2 (ON/OFF)	
SA_TMP	###.# C	D	Input	Supply air temperature	
RA_TMP	###.# C	D	Input	Return air temperature (display only, not used)	
FAN_Spd	#### %	D	calc	Fan speed as a percentage	
ContFan	#### %		Setting	Continuous Fan airflow as a percent of maximum.	50
HPH1Fan	#### %		Setting	Heat pump heating 1 <sup>st</sup> stage fan speed as a % of max.	50
HPH2Fan	#### %		Setting	Heat pump heating 2 <sup>nd</sup> stage fan speed as a % of max.	100
HPC1Fan	#### %		Setting	Heat pump cooling 1 <sup>st</sup> stage fan speed as a % of max.	50
HPC2Fan	#### %		Setting	Heat pump cooling 2 <sup>nd</sup> stage fan speed as a % of max.	100
Aux1Fan	#### %		Setting	Auxiliary heating 1 <sup>st</sup> stage fan speed as a % of max.	50
Aux2Fan	#### %		Setting	Auxiliary heating 2 <sup>nd</sup> stage fan speed as a % of max.	100
HP Pre	#### sec		Setting	Time fan runs at half speed at beginning of heat pump call in seconds	10
HP Post	#### sec		Setting	Time fan runs at half speed at the end of a heat pump call in seconds	30
Aux Pre	#### sec		Setting	Time fan runs at half speed at beginning of auxiliary heat call in seconds	30
AuxPost	#### sec		Setting	Time fan runs at half speed at the end of auxiliary heat call in seconds	30
PumpExr	(0)Off/(1)On		Input	Daily pump exerciser ON/OFF	OFF
HP_2STG	(0)Off/(1)On		Text Setting	Is the heat pump 2 stage?	0
HP2Time	#### min		Setting	Time to activate 2nd stage cooling in minutes.	20
FrzTemp	#### C		Setting	Freeze alarm setpoint temperature	2
FrzDly1	#### min		Setting	Freeze Delay 1 - wait time to activate freeze alarm	3
FrzDly2	#### min		Setting	Freeze Delay 2 - wait time to restore operation after a freeze alarm	2
HPAH	##.## REV	D	Input	Program name and revision number	2.00
Modbus	####		Setting	Modbus address	137