Home Comfort Thermostat – Product Specification

2011 eComfort Thermostat

Revision History

Version	Date	Prepared By	Changes
X1		Shain Breland	Initial draft
X2	1/31/2012	Andy Lin	Update highlighted in yellow.
X3	15Feb12	Viper/SB	Multiple additions
X4	25Jul12	SB	Removed proprietary comm info for FCC submittal

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1. Purpose

This document establishes the performance, design, test, and acceptance requirements for the 2011 ecomfort Thermostat. Any deviations from this specification must be obtained, in writing, from Hunter Fan Company Engineering. If requesting a component change to the specification, a sample of the new component must accompany with the request.

2. Scope

Thermostat is a control device that connects to a HVAC system. It controls the heating and cooling cycles of the HVAC system based on user's input settings. This thermostat is designed to be compatible with both the conventional HVAC systems (separated heating and cooling source) and heat pump systems. The design is capable of controlling up to 2 stages of heating and 2 stages of cooling. This series of thermostat is wirelessly connected to the internet via a gateway device that will attach to the user's home router. The thermostat is capable of being controlled through a computer or mobile phone application through the Internet.

3. APPLICABLE DOCUMENTS

3.1. Codes Agency Standards

3.1.1. UL standard
N/A
3.1.2. CSA standard
N/A
3.1.3. FCC Standard
FCC Part 15

3.2. Hunter Fan Standards

3.2.1. F4045 Packaging Construction
3.2.2. Spark tester

- No functional, performance and reliability degradation on the product

3.3. Third Party Standards

3.3.1. EMC Performance
IEC 61000-4-2, Electrostatic Discharge Immunity (ESD)

- +/- 8KV direct contact
- +/- 15KV air discharge

IEC 61000-4-3, Radiated radio-frequency electromagnetic field immunity

- 3V/m

IEC 61000-4-4, Electrical fast transient/burst immunity

- 1KV

IEC 61000-4-5, Surge immunity

- 2KV common mode, 1KV differential mode

IEC 61000-4-6, Conducted disturbances immunity, induced by radio-frequency fields

- 3V/m

IEC 61000-4-11, Voltage dips, short interruptions and voltage variations immunity

3.3.2. IPC Standards

- IPC 610 standard for PCB layout

3.3.3. NEMA Standards

- NEMA DC3 standard

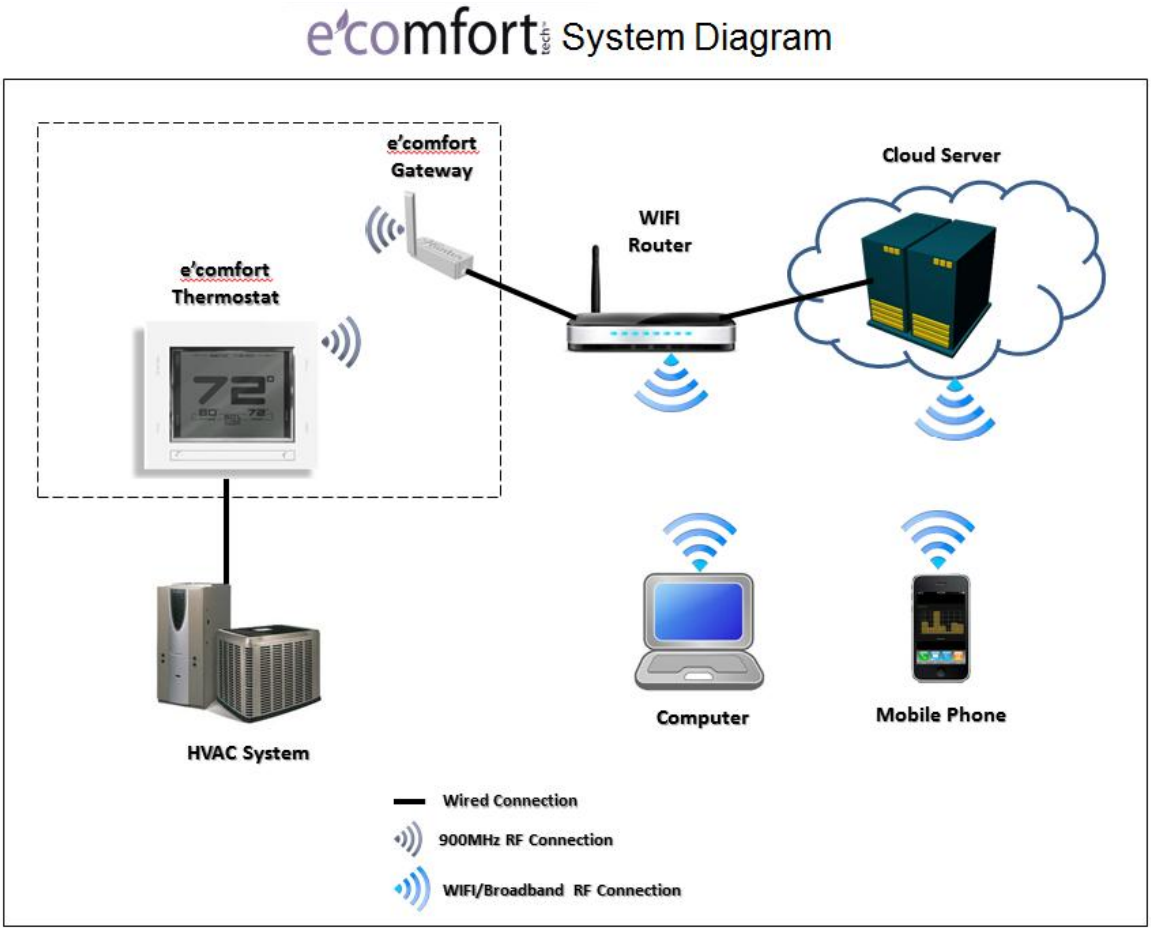
3.3.4. Energy Star Program

- Energy Star Program Requirements, Version 1.1

3.3.5. ASTM D4169, Packaging test requirement

- Acceptance Criteria 3, package is intact and product is damage-free.

4. E'comfort System Overview



E'comfort system is an Internet connected energy management system allows users to control and manage their HVAC system via locally on the thermostat or via web applications through a computer or mobile devices.

- The e'comfort thermostat connects to HVAC systems via traditional wired connections. It controls the HVAC system's heating and cooling cycles via user inputs or automated set points adjustment through Hunter/Ecofactor's proprietary cloud computing algorithm.
- The thermostat communicates to an e'comfort gateway via a proprietary 900MHz radio frequency communication protocol for data exchange to the cloud servers. The gateway is connected to a WIFI router via wired Ethernet connection. The gateway also requires an AC power adapter for power supply.
- Cloud computing servers are utilized to collect thermostat data and also allow users to logon to the servers via web applications to program and manage the thermostat from a computer or mobile device. Internet access is required for users to program and manage the thermostat through a computer or mobile device.

5. THERMOSTAT PERFORMANCE REQUIREMENT

5.1. HVAC System Compatibility

The thermostat is compatible with 24VAC multistage conventional heating and cooling systems, 24VAC multistage heat pump systems, and Gas Millivolt systems. It is designed to work with systems that have full 24VAC power supply (both hot and common wires are available for thermostat connections) and systems that do not. For systems that do not have full 24VAC available, battery power supply is used. The thermostat design is capable of controlling up to 3 stages of heating and 2 stages of cooling. The number of stages for each model varies, see the model features list for individual requirements.

The thermostat design is not designed to work with 120VAC or 230VAC line voltage systems.

5.1.1. Connection Terminals

Terminals: Rh, R/Rc, C, Y, Y2, W, W2/E, W3, O, B, G, L, H, A

Terminal	Heat Pump Connections	Conventional Heat/Cool System Connections
Rh	N/A	Heating transformer
Rc/R	24VAC Power supply	Cooling transformer
C	24VAC Common	24VAC Common
Y	Compressor stage 1	Cooling stage 1
Y2	Compressor stage 2	Cooling stage 2
W	N/A	Heating stage 1
W2/E	Auxiliary Heat / Emergency Heat	Heating stage 2
W3	N/A	Heating stage 3
O	Reversing valve powered by cool mode	N/A
B	Reversing valve powered by heat mode	N/A
G	Fan	Fan
L	System monitor	N/A
H	Humidifier/De-humidifier control	Humidifier/De-humidifier control
A	N/A	General terminal for 3 wire zoned hot water system

Figure 1: Connection Terminal

5.1.2. Conventional Heat/Cool Systems

Conventional Heat/Cool Systems consider as heat only, cooling only and heat/cool systems. The heat/cool systems consist of separated air conditioning unit for cooling and furnace system for heating.

System Type	Rc/R	Rh	C	Y	Y2	G	W	W2	W3	H	A
2-wires Heat Only	J1	J1, YES	n/a	n/a	n/a	n/a	YES	n/a	n/a	IA	n/a
3-wires Heat Only	J1	J1, YES	n/a	n/a	n/a	YES	YES	n/a	n/a	IA	n/a
3-wires Cool Only	J1, YES	J1	n/a	YES	n/a	YES	n/a	n/a	n/a	IA	n/a
4-wires Heat/Cool Single Stage System	J1	J1, YES	n/a	YES	n/a	YES	YES	n/a	n/a	IA	n/a
5-wires Heat/Cool Single Stage System	YES	YES	n/a	YES	n/a	YES	YES	n/a	n/a	IA	n/a
2Heat/2Cool Multi-stage System	YES	YES	IA	YES	YES	YES	YES	YES	n/a	IA	n/a
3Heat/2Cool Multi-stage System	YES	YES	IA	YES	YES	YES	YES	YES	YES	IA	n/a
3-wires Zoned Hot Water System	J1	YES	IA	n/a	n/a	YES	YES	n/a	n/a	IA	YES

Figure 2: Conventional Connection Terminal Requirement

Note:

J1 – a jumper wire connection between the Rc/R and Rh terminal for power supply from the HVAC system.
YES – HVAC system wire connection to the terminal.
IA – If Available, wire connection to the terminal if available from the HVAC system.
n/a – Not Applicable for the HVAC system

5.1.3. Heat Pump Systems

Heat Pump systems are considered as systems using compressor output for both heating and cooling.

Connection Terminal Requirement

System Type	Rc/R	Rh	C	Y	Y2	G	O	B	W2/E	L	H
Single-stage System	J1, YES	J1	IA	YES	n/a	YES	IA*	IA*	n/a	IA	IA
Single-stage System with Auxiliary Heat	J1, YES	J1	IA	YES	n/a	YES	IA*	IA*	YES	IA	IA
Single-stage System with Auxiliary / Emergency Heat	J1, YES	J1	IA	YES	n/a	YES	IA*	IA*	YES	IA	IA
Multi-stage System	J1, Yes	J1	IA	YES	YES	YES	IA*	IA*	n/a	IA	IA
Multi-stage System with Auxiliary / Emergency Heat	J1, Yes	J1	IA	YES	YES	YES	IA*	IA*	YES	IA	IA

Figure 3: Heat Pump Connection Terminal Requirement

Note:
J1 – a jumper wire connection between the Rc/R and Rh terminal for power supply from the heat pump system.
YES – heat pump system wire connection to the terminal.
IA – If Available, wire connection to the terminal if available from the HVAC system.
IA* - If Available, reversing valve power wire from the heat pump system. Use only either O or B wire from the system, not both wires at the same time.
n/a – Not Applicable for the HVAC system

5.2. Thermostat Power Supply

The thermostat is designed to accept 24VAC power from the HAVC system if available or batteries power supply installed by user.

If the HVAC wiring system has the 24VAC hot and common wires available for connections to the thermostat, the thermostat would use the 24VAC as the main power supply and use the user installed batteries as back up power supply. If there is no common wire available from the system, the thermostat would use the battery power as the main power supply.

The batteries have to support minimum 12 months of normal thermostat operations.

5.3. System Configurations by User

5.3.1. System Type Selection

User to configure the thermostat to be operation compatible with a conventional HVAC system or a heat pump system via a hardware slide switch on the back of the thermostat.
Conventional System Setting – for HVAC systems have separated heating and cooling systems, a gas or electric furnace system for heating and a compressor air conditioning system for cooling.

Heating Pump System Setting – for HVAC systems use the same compressor system for heating and cooling by reversing the heat/cool exchange flow.

5.3.2. Furnace Type Selection

User to configure the thermostat to be operation compatible with a gas/oil burner furnace (HG) or electric powered furnace (HE),

HG Setting – for systems that does not have a fan relay to be controlled through the thermostat. Fan output is controlled by the furnace. This is typically on gas/oil burner type of furnace.

HE Setting – for systems that have a fan relay and are controllable by the thermostat. This is typically on electric type of furnace.

5.4. System Operation Modes

The following system modes are selectable by user.

Emergency Heat Mode – the thermostat is set to operate in emergency heating / auxiliary heating mode, this is only applicable to heat pump systems.
(Need to verify if this feature is needed and is in the design.)

Heat Mode – the thermostat is set to operate in heating mode.

Off Mode – the thermostat turns all the relay outputs off to the connection terminals.

Cool Mode – the thermostat is set to operate in cooling mode.

Auto-system Changeover – the thermostat automatically switch over between heat mode and cool mode base on temperature and span (dead band) setting.

5.5. Fan Operation Modes

The following fan operating modes are selectable by user.

On Mode – the system fan is turned on regardless of system operating mode.

Auto Mode – the system fan is turned on when heating or cooling is running. The fan is off when the heating or cooling is off.

5.6. Safety Features

5.6.1. Heating Auto-cutoff

Software auto-cutoff of the heating outputs if room temperature is over 95F.

5.6.2. Cooling Auto-cutoff

Software auto-cutoff of the cooling outputs if room temperature drops below 45F.

5.6.3. Low Battery Warning and Shut Down

- 2 Stages low battery detection
- First Stage – alert user (Blinking Battery on the LCD) to change the batteries, system continue to operate normally for 1 month minimum.
  Voltage range: TBD
- Second Stage – alert user (Blinking Battery Icon on LCD, everything else blank) to change the batteries, system shut down all the relay outputs.
  Voltage range: TBD

5.6.4. Relay State Feedback

- Relay feedback circuits to monitor all the relay contact status.
- If the relay contact is not in the correct state, the thermostat would try to correct its status for 4 tries in one minute. If it could not be corrected after 4 tries, alert user to check the thermostat and HVAC system.
- The thermostat resend signals to try to correct the relay status every 10minutes.

5.6.5. Compressor Short Cycle Protection

- Timer delay for compressor starting in short cycles. Protection to extend compressor life.
- Timer Delay: 3.5 minutes

5.7. User Features

All user settings to be stored in non-volatile memory, EEPROM, so the settings are retained in the event of power supply lost.

5.7.1. Program Type

- Up to 7 Day Programmable
- Up to 4 program periods per Day – At Home, Away, At Home, Asleep
- Program Time Resolution: 1 minute steps for both heating or cooling program
- Set Temp Memory: Independent storage for Heating Program and Cooling Program
- Default set temperatures comply with Energy Star Program Requirements (Ver 1.1) for Programmable Thermostats
- Use Table 2 settings as pre-programmed default settings

Need to define per Maya GUI.

5.7.2. Temperature Range

- Room Temperature
  Display Range: 32°F – 99°F
  Resolution: 1°F (0.5°C)
- Control Temperature
  User Control Range: 45°F – 95°F (7°C – 35°C)
  Resolution: 1°F (0.5°C)

5.8. Electrical Requirement

5.8.1. System Block Diagram

- Output Load: 20-30VAC, 50/60 Hz, 0.1-1.5Amp
- 2Amp max. per terminal, 4Amp max. for overall load
- Controls up to 3 stages heating and 2 stages cooling
- Output for humidifier/de-humidifier control

5.8.2. Power Supply

- 24VAC, 50/60Hz or Alkaline Batteries as primary power source
- If full 24VAC is available (both hot and common wires available), use 24VAC as primary power supply
- If full 24VAC is not present, use batteries as primary power supply
- Battery type & quantity: AA Battery, Qty = 4
- Battery life: supports 1 year minimum of normal operation based on Energizer E91 AA battery

5.8.3. MCU Type

- PIC24FJ64GA310 MCU with 64kB Flash Memory and built-in LCD controller

5.8.4. Temperature Measurement

- Sensor: Thermistor
- Measurement range for display: 32°F – 99°F (0°C – 37°C in Celsius)
- Measurement resolution: 0.1°F
- Display resolution: 1°F (0.5°C)
- Measurement accuracy: +/- 1°F
- Sampling frequency: 4 times per minute

5.8.5. User Input

- **Local Input at Thermostat**
    - 6 push button switches: normally open, push to close tact switch
    - "System" Button: push button input to cycle through 4 system modes (Heat, Off, Cool, Auto)
    - "Fan" Button: push button input to cycle through 2 fan modes (Auto, On)
    - "Hold" Button: push button input to override thermostat scheduled set points
    - "Away" Button: push button input to toggle and activate Home or Away mode to temporary override the thermostat schedule.
    - "Up" Button: for thermostat set point changes or screen navigation
    - "Down" Button: for thermostat set point changes or screen navigation

- **Remote Input and Control**
    - User is able to remote control the thermostat through web applications from a computer or mobile phone with access to the Internet.
    - Web Application Control Functions
        - See Web Application Specification for details.

5.8.6. LCD

- Type: TN, Positive, Black on Gray
- Display Size: See the latest LCD Module Specification and mechanical drawings for details
- Viewing direction: 12 O'Clock
- Quality grade: Standard
- Reflector: Transflective

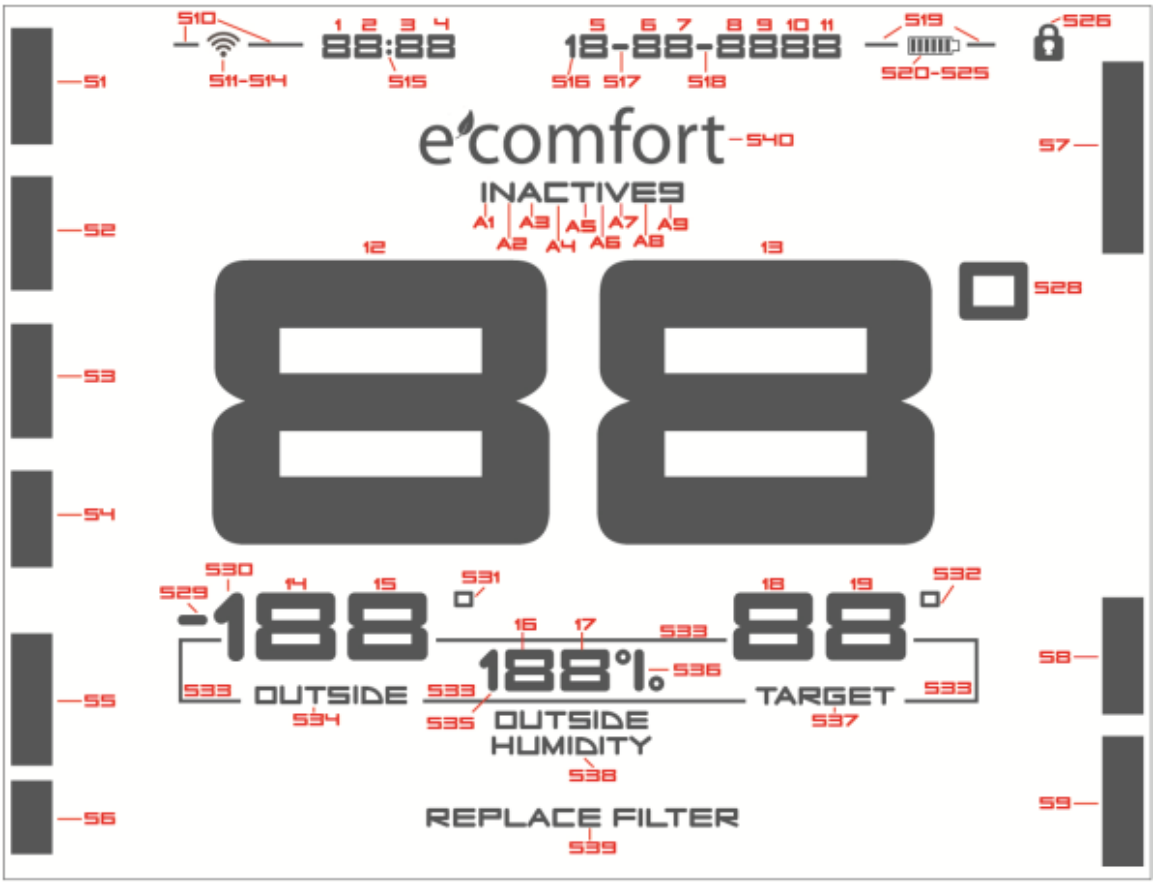


Figure 4: LCD Segments

- S1 – S40: Individually controlled segments
- 1 – 19: 7-segment digits
- A1 – A9: 14-segment alpha-numeric characters
- Total segments count: 299 segments
- See LCD image layout drawing for actual segment size and locations.

5.8.7. LCD Backlight

- LED Backlight: White Color
- Backlight automatically turns on when any key was pressed. It stays on until no key has been pressed in the last 10 seconds, unit will return back to home screen if no key is pressed within 30 seconds.

5.8.8. Output Switching Technology

- Electronic controlled latching relay
- AXICOM, V23079-B1208-B301, latching with 2 coils, 2A UL rated contact, DPDT, or equivalent

- Relays for assignment:
  - RLY1 – Cooling Stage 1
  - RLY2 – Cooling Stage 2
  - RLY3 – Heating Stage 1 & A Terminal for 3-wires Zoned Hot Water System
  - RLY4 – Heating Stage 2 & Auxiliary / Emergency Heat

RLY5 – Heating Stage 3 (Not used on 2012 model)
RLY6 – Fan control
RLY7 – Auto-change over
RLY8 – Humidity control (Not used on 2012 model)

5.8.9. Output Terminals

Screwless Terminals from Golden Resources Metal Industrial or equivalent
Terminals: Rh, R/Rc, Y, G, W, L, O, B, Aux/E/W2, Y2, C, A, W3, H
Terminals shuld be color coded per the color scheme below
Terminal Layout:

Heat Pump System ID	Terminal	Conventional Systems ID	
	T1	Rh	Mounting Plate Hole For Wiring
R	T2	Rc	
Y	T3	Y	
G	T4	G	
	T5	W	
L	T6		
O	T7		
B	T8		
Aux/E	T9	W2	
Y2	T10	Y2	
C	T11	C	
	T12	A	
	T13	W3	
H	T14	H	

Figure 5: Output Terminals

5.8.10. Non-volatile Memory

- EEPROM memory to store user settings.
- All user settings and real time clock to be stored in the EEPROM prior to the event of lost power supply to the unit.
- User settings and the time would be restored during the next power up cycle. In certain cases these settings are pushed down form the internet to the Tstat.

5.9. Mechanical Requirement

All components need to fit and function according to the design intend and the drawing descriptions. Any deviation from the requirements is considered a critical defect and must be authorized by Hunter Fan Company.

5.9.1. Housings, Mounting Plate, and Pushbutton Caps

5.9.1.1. Mounting Plate

Material: ABS PA757
Size: See mechanical drawing for details
Finishes: Cirrus White Q716-3-5, Fine Matte
Silkscreen Printing: TBD
Embedded with Bubble Leveler

5.9.1.2. Back Housing

Material: ABS PA757
Size: See mechanical drawing for details
Finishes: Cirrus White Q716-3-5, Fine Matte
Silkscreen Printing: TBD

5.9.1.3. LCD Holder

Material: ABS PA757
Size: See mechanical drawing for details
Finishes: Cirrus White Q716-3-5, Fine Matte
Silkscreen Printing: TBD

5.9.1.4. Front Housing

Material: ABS PA757
Size: See mechanical drawing for details
Finishes: Cirrus White Q716-3-5, Fine Matte
Silkscreen Printing: TBD

5.9.1.5. Front Bezel

Material: ABS PA757
Size: See mechanical drawing for details
Finishes: Cirrus White Q716-3-5, Fine Matte
Silkscreen Printing: TBD

5.9.1.6. Pushbutton Caps

Material: ABS PA757
Size: See mechanical drawing for details
Finishes: Cirrus White Q716-3-5, Fine Matte
Silkscreen Printing: TBD

5.9.2. Bubble Leveler

Material: TBD

Size: TBD

5.10. Environmental Requirement

5.10.1. Temperature

- Operating: 0°C – 40°C
- Storage: -20°C – 60°C

5.10.2. Humidity

- Operating: 5% - 85% RH (at 0°-40°C), non-condensing
- Storage: 5% - 95% RH (at -20°C – 60°C), non-condensing

5.10.3. Reliability

- Design for greater than 5 years of life
- No more than 1% field failure during life.

6. SOFTWARE

6.1. Software Features and Functions

6.1.1. Language

Language: English

6.1.2. Temperature Control Range

- Range: 45°F – 95°F
- Resolution: 1°F

6.1.3. Temperature Span Settings

- Span: 1°F2°F or 3°F(default), - All is user settable from confriguation website and mobile device applications.

6.1.4. Control Timers and Counters

6.1.4.1. Residual Cooling Timer

Setting: 0 (disabled), 30 (default), 60 or 90 seconds
Resolution: 1 second
When the compressor is shut off in cooling mode, the fan will continue to run on the set time from the timer.
(Need to verify if this feature is needed and is in the design.)

6.1.4.2. Filter Counter

A (30-360) days count up counter to turn on “Filter Change Indicator” to notify user to change system filter. The system will flag the “filter-Change” at that time.
Counter Resolution: Hours

6.1.5. Program and Overrides

6.1.5.1. Temporary Override (Hold-Mode)

Temporary change of the set point temperature until the next program starts or user canceled.

6.1.5.2. Permanent Override (Away-Mode)

Permanent bypass of the user programs until it is canceled by user.

6.2. Control Pattern

Heating and cooling control

Table 1 to 4 show the output status for different room temperature, differential and system. Note that they are intended to show the temperature relation. Other criteria such as operation mode, key / switch status, short cycle protection timer, residual cooling fan delay and brown out protection timer are not considered.

In the following tables:

Ts: Set temperature

Tr: Room temperature

d_1: First stage differential temperature

d_2: Second stage differential temperature

d3: Three stage differential temperature

NC: No Change

Room Temperature Conditions	Outputs						
	Y	Y2	W	W2/E	W3	O	B
$Ts + d_1 + d_2 =< Tr$	1	1	0	0	0	1	0
$Ts + d_1 =< Tr$	1	NC	0	0	0	1	0
$Ts =< Tr < Ts + d_1$	NC	NC	0	0	0	1	0
$Tr < Ts$	0	0	0	0	0	1	0

Figure 6: Cooling Control - Conventional Systems

* When cool mode is running, change the message line from “COOL RUNNING” to “COOLING STAGE 1” or “COOLING STAGE 1 & 2 “, depends on how many stages are running. (Need to verify if this feature is needed and is in the design.)

Room Temperature Conditions	Outputs							
	Y	Y2	W	W2/E	W3	O	B	A
$Ts =< Tr$	0	0	0	0	0	0	1	1
$Ts - d_1 < Tr < Ts$	0	0	NC	NC	NC	0	1	NC
$Ts – d_1 – d_2 < Tr =< Ts - d_1$	0	0	1	NC	NC	0	1	0
$Ts – d_1 – d_2 – d_3 < Tr =< Ts – d_1 – d_2$	0	0	1	1	NC	0	1	0
$Tr =< Ts – d_1 – d_2 – d_3$	0	0	1	1	1	0	1	0

Figure 7: Heating Control - Conventional Systems

* When heat mode is running, change the message line from “HEAT RUNNING” to “HEATING STAGE 1” or “HEATING STAGE 1 & 2 “ or “HEATING STAGE 1, 2 & 3”, depends on how many stages are running. (Need to verify if this feature is needed and is in the design.)

Room Temperature Conditions	Outputs						
	Y	Y2	W	W2/E	W3	O	B
Ts =< Tr	0	0	0	0	0	0	1
Ts - d_1 < Tr < Ts	NC	NC	0	NC	0	0	1
Ts – d_1 – d_2 < Tr =< Ts - d_1	1	NC	0	NC	0	0	1
Ts – d_1 – d_2 – d_3 < Tr =< Ts – d_1 – d_2	1	1	0	NC	0	0	1
Tr =< Ts – d_1 – d_2 – d_3	1	1	0	1	0	0	1

Figure 8: Heating Control - HP Systems With Electric Auxiliary

* When heat mode is running, change the message line from “HEAT RUNNING” to “HEATING STAGE 1” or “HEATING STAGE 1 & 2 “ or “HEATING STAGE 1, 2 & AUX”, depends on how many stages are running. (Need to verify if this feature is needed and is in the design.)

Room Temperature Conditions	Outputs						
	Y	Y2	W	W2/E	W3	O	B
Ts =< Tr	0	0	0	0	0	0	1
Ts - d_1 < Tr < Ts	NC	NC	0	0	0	0	1
Ts – d_1 – d_2 < Tr =< Ts - d_1	1	NC	0	0	0	0	1
Ts – d_1 – d_2 – d_3 < Tr =< Ts – d_1 – d_2	1	1	0	0	0	0	1

Figure 9: Heating Control - HP Systems With Gas/Oil and no Auxiliary

* When heat mode is running, change the message line from “HEAT RUNNING” to “HEATING STAGE 1” or “HEATING STAGE 1 & 2 “, depends on how many stages are running. (Need to verify if this feature is needed and is in the design.)

Room Temperature Conditions	Outputs						
	Y	Y2	W	W2/E	W3	O	B
Ts =< Tr	0	0	0	0	0	0	1
$Ts - d_1 < Tr < Ts$	0	0	0	NC	0	0	1
$Ts – d_1 – d_2 < Tr =< Ts - d_1$	0	0	0	NC	0	0	1
$Ts – d_1 – d_2 – d_3 < Tr =< Ts – d_1 – d_2$	0	0	0	NC	0	0	1
$Tr =< Ts – d_1 – d_2 – d_3$	0	0	0	1	0	0	1

Figure 10: Heating Control - HP Systems With GAS/Oil and With Auxiliary

* Use the above the control pattern also if Emergency Heat terminal (E) is jumper connected with W2 and Emergency Heat mode is turned on.

* When Auxiliary heat mode is running, change the message line from “HEAT RUNNING” to “AUXILIARY HEAT RUNNING “, depends on how many stages are running. (Need to verify if this feature is needed and is in the design.)

6.2.1. Auto Season Changeover

Auto Season Changeover for Programmable models

Auto season changeover is enabled when the system is selected at AUTO. The thermostat will select heating or cooling automatically base on the program setpoint temperatures and the room temperature.
Refer to the following table, let k be the deadband temperature where k can be 3, 4, 5 or 6°F. Tsc is the cooling setpoint temperature of the current program and Tsh is the heating setpoint temperature of the current program. Ts is the setpoint temperature and Tr is the current room temperature. The table shows the conditions that the thermostat change system: Auto season changeover is not available when emergency heat is selected.

The conditions that the thermostat change system in Auto season changeover

Override conditions ▼	Program setpoints ▼	Room Temperature ▼	System change to … ▼
Program control or Home Today with setpoint not overridden	Tsc – Tsh ≥ k	Tr > Tsc or Tr = HI	Cooling
		Tsh ≤ Tr ≤ Tsc	NC
		Tr < Tsh or Tr = LO	Heating
	Tsc – Tsh < k	Tr > Tsh + k or Tr = HI	Cooling
		Tsc – k ≤ Tr ≤ Tsh + k	NC
		Tr < Tsc – k or Tr = LO	Heating
Home Today with setpoint temperature overridden	Don't care	Tr > Ts + k or Tr = HI	Cooling
		Ts – k ≤ Tr ≤ Ts + k	NC
		Tr < Ts – k or Tr = LO	Heating
Permanent, Vacation or Temporary holds.	Don't care	Don't care	NC

Figure 11: Auto System Changeover

6.2.2. Daylight Savings Time

Clock is set based on the user's offset selection via the website or mobile device interface. The default offset is set to -5 (EST).

6.2.3. **Fan Control**

This is controlled via the internet.

- ON – fan runs continuously
- AUTO – system controlled.

Thermostat status					Fan output
Fan mode ▼	System Type ▼	Fan Option ▼	System ▼	Output ▼	G ▼
ON	Don't care	Don't care	Don't care	Don't care	ON
AUTO	Non_HP	HE	COOL	ON	ON
				OFF	OFF
			OFF(*)	OFF	OFF
			HEAT	ON	ON
				OFF	OFF
		HG	COOL	ON	ON
				OFF	OFF
			OFF(*)	OFF	OFF
			HEAT	ON	OFF
				OFF	OFF
	HP	Don't care	COOL	ON	ON
				OFF	OFF
			OFF(*)	OFF	OFF
			HEAT	ON	ON
				OFF	OFF
			EM.HEAT	ON	ON
				OFF	OFF

Figure 12: Fan Output

6.3. Software Requirement

6.3.1. Software Flowchart

TBD

6.3.2. Reset and Default Settings

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
PPD (*)	4	4	4	4	4	4	4
Program 1	Time: 6:00am	Time: 6:00am	Time: 6:00am	Time: 6:00am	Time: 6:00am	Time: 6:00am	Time: 6:00am
	Heat: 68°F (20°C) Fan Auto	Heat: 68°F (20°C) Fan Auto	Heat: 68°F (20°C) Fan Auto	Heat: 68°F (20°C) Fan Auto	Heat: 68°F (20°C) Fan Auto	Heat: 68°F (20°C) Fan Auto	Heat: 68°F (20°C) Fan Auto
	Cool: 78°F (26°C) Fan Auto	Cool: 78°F (26°C) Fan Auto	Cool: 78°F (26°C) Fan Auto	Cool: 78°F (26°C) Fan Auto	Cool: 78°F (26°C) Fan Auto	Cool: 78°F (26°C) Fan Auto	Cool: 78°F (26°C) Fan Auto
Program 2	Time: 8:00am	Time: 8:00am	Time: 8:00am	Time: 8:00am	Time: 8:00am	Time: 8:00am	Time: 8:00am
	Heat: 60°F (16°C) Fan Auto	Heat: 60°F (16°C) Fan Auto	Heat: 60°F (16°C) Fan Auto	Heat: 60°F (16°C) Fan Auto	Heat: 60°F (16°C) Fan Auto	Heat: 60°F (16°C) Fan Auto	Heat: 60°F (16°C) Fan Auto
	Cool: 85°F (29°C) Fan Auto	Cool: 85°F (29°C) Fan Auto	Cool: 85°F (29°C) Fan Auto	Cool: 85°F (29°C) Fan Auto	Cool: 85°F (29°C) Fan Auto	Cool: 85°F (29°C) Fan Auto	Cool: 85°F (29°C) Fan Auto
Program 3	Time: 4:00pm	Time: 4:00pm	Time: 4:00pm	Time: 4:00pm	Time: 4:00pm	Time: 4:00pm	Time: 4:00pm
	Heat: 68°F (20°C) Fan Auto	Heat: 68°F (20°C) Fan Auto	Heat: 68°F (20°C) Fan Auto	Heat: 68°F (20°C) Fan Auto	Heat: 68°F (20°C) Fan Auto	Heat: 68°F (20°C) Fan Auto	Heat: 68°F (20°C) Fan Auto
	Cool: 78°F (26°C) Fan Auto	Cool: 78°F (26°C) Fan Auto	Cool: 78°F (26°C) Fan Auto	Cool: 78°F (26°C) Fan Auto	Cool: 78°F (26°C) Fan Auto	Cool: 78°F (26°C) Fan Auto	Cool: 78°F (26°C) Fan Auto
Program 4	Time: 10:00pm	Time: 10:00pm	Time: 10:00pm	Time: 10:00pm	Time: 10:00pm	Time: 10:00pm	Time: 10:00pm
	Heat: 60°F (16°C) Fan Auto	Heat: 60°F (16°C) Fan Auto	Heat: 60°F (16°C) Fan Auto	Heat: 60°F (16°C) Fan Auto	Heat: 60°F (16°C) Fan Auto	Heat: 60°F (16°C) Fan Auto	Heat: 60°F (16°C) Fan Auto
	Cool: 82°F (28°C) Fan Auto	Cool: 82°F (28°C) Fan Auto	Cool: 82°F (28°C) Fan Auto	Cool: 82°F (28°C) Fan Auto	Cool: 82°F (28°C) Fan Auto	Cool: 82°F (28°C) Fan Auto	Cool: 82°F (28°C) Fan Auto

Figure 13: Program Defaults

System and user settings default

*TBD

7. FACTORY TEST AND DIAGNOSTIC MODE

7.1. Key Sequence to Enter

TBD

7.2. Diagnostic Sequence

TBD

8. FACTORY DEFAULT SETTINGS

System Switch: Off
Fan Switch: Auto

System Type Selection Switch: Conventional
Furnace Type Selection Switch: HG
Detailed user settings can be found in the ICD-Appendix.

9. PACKAGING REQUIREMENT

9.1. Packaging

Type: Natralock, single pack
Size: See packaging drawings for details
Master Carton Pack: 3 per box or 6 per box, see Packaging Accessories table for details.
Sensormatic Tag: in product
Tag Location: TBD

9.2. Packaging Accessories

Model Name	**ecomfort**
Model #	
English Manual	Yes
Spanish Manual	Yes
French Manual	No
Warranty Card	Yes
Starter Instruction Card	Yes
Mounting Kit (2 Walldog Equivalent all purpose screws + 1 jumper wire)	Yes
Wire Label	Yes
UPC Code	0 49694 44900 9
Master Pack QTY	3

Figure 14: Packaging Accessories

9.3. Product Labels

Date Code Label: WWYY format
Two Labels, one on product and one of Natralock packaging