HOT WATER HEAT PUMPS LTD

Advancing Water Heat Pump Technology   **SINCE 1980**

HOT WATER HEAT PUMPS LTD

E45 Series Controllers

E45 Series Controllers

Page	Controller	Description	Temperature	De-Ice	HP/LP	Time Clock
4–7	E45-1	Heat and Chill				
8–10	E45-5	Heat OR Chill				

Technical Index

1. Temperature display range:
   -50°C – 150°C (The resolution is 0.1°C)
   -58°C – 302°F (The resolution is 0.1°F)
2. Power supply: AC 220±10%
   (Refer to the wiring diagram)
3. Operating environment:
   temperature -30°C – 80°C, humidity≤85%
4. Relay contact capability: 8A/250VAC
   (pure resistive load)
5. Temperature sensor: NTC R25=5kΩ,
   B(25/50)=3470K
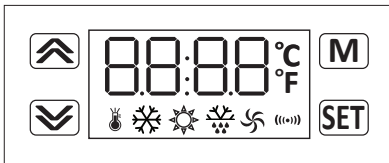
Indicator Light	Light Function	Flashing Function
🌡	Changing current water temperature	N/A
❄	Chilling Mode	Waiting on time delay
☀	Heating Mode	Waiting on time delay
❄	Defrost Mode	
🌀	N/A	N/A
((•))	N/A	Alarm

If Set, default password = 0077

Change Set Point Temperature:
- Press and hold [SET] for 3 seconds, display will change from reading current water temperature to reading the current set point.
- Press and release the up or down arrow buttons to alter temperature or press and hold to change rapidly.
- Press [SET] to confirm the new value and resume normal operation.

Check current defrost sensor temperature: (De-ice capable models only)
- Press and hold the Down arrow, this will display what the sensor is currently reading.
- Release the Down arrow to return to normal display.

Entering advanced menu:
- Press and hold the [M] button for 5 seconds
- Navigate the F numbers using the Up and Down arrows
- Use [SET] to enter into the options for the F number you wish to alter.
- Change the value with the Up and Down arrows
- Press [SET] to confirm the new value or press [M] to cancel the change and return to the F menu.

Model E45-1

Detailed Parameters

F11: Temperature at which the heat pump will stop at and has a range which is dictated by the values in F14 and F13.

F12: (Differential) Number of degrees + / - from set point (F11) before the heat pump will start.

F13: Maximum water temperature that can be set in F11 parameter.

F14: Minimum water temperature that can be set in F11 parameter.

F18: (Defrost Sensor Calibration) Adjusts the offset reading for the defrost sensor probe in situations of reading higher or lower than actual temperature (or consult HWHP about relocating sensor).

F19: (Water Sensor Calibration) Adjusts the offset reading for the water sensor probe in situations of reading higher or lower than actual temperature.

F21: (Compressor Time Delay) Minimum time to start after heating signal has been called for.

F29: Set the controller mode between heating or cooling

F30: Minimum number of minutes between defrost cycles.

F31: Temperature at which the Defrost Cycle will trigger.

F32: Temperature at which the Defrost Cycle will terminate.

F33: Time delay in minutes at which the Defrost Cycle will initiate once triggered by F31 setting.

F34: Maximum number of minutes the Defrost Cycle will run for.

F37: Defrost Modes
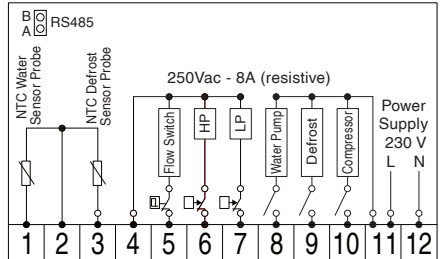
F37				
Value	Description	Running State	Comp Output	Defrost Output
0	RV is off – heating	Heat	Yes	No
	RV is on – defrosting	Defrost	Yes	Yes
1	RV is on – heating	Heating	Yes	Yes
	RV is off – defrosting	Defrost	Yes	No
2	Bypass Valve defrost	Heat	Yes	No
		Defrost	Yes	Yes
3	Electric heat defrost	Heat	Yes	No
		Defrost	Yes	Yes
5	Passive defrost 1	Heat	Yes	Yes
		Defrost	No	Yes
6	Passive defrost 2	Heat	Yes	No
		Defrost	No	No

RV=Reversing Valve

F51: Flow Switch mode options (note: Flow switch will allow comp delay count down if made without break within 1 minute of pump starting, and calling for heating or cooling).

Value	State	Alarm Code [FL] F51
0	Disabled	No flow control and no Alarm.
3	Enabled	Display [FL] on contact break, resume normal display when contact is made.
5	Enabled	Display goes blank when contact breaks, resumes temperature display when contact is made

F52: High Pressure Safety Switch

Value	State	Alarm Code [HP] F52
0	Disabled	No high pressure control and no Alarm (HP not used).
3	Enabled	Display [HP] on contact break, resume normal display when contact is made (auto reset)
4	Enabled	Display [HP] on contact break, does not auto resume when contact is made. User interaction required, press [SET] key to resume (manual reset).

F53: Low Pressure Safety Switch

Value	State	Alarm Code [FL] F51
0	Disabled	No Low Pressure control and no Alarm (LP not used).
3	Enabled	Display [LP] on contact break, resume normal display when contact is made (auto reset)

F54: Advanced High Pressure Safety Switch

Value	State	Alarm Code [FL] F54
No	Disabled	Follow F52 Standard High Pressure Safety Switch
Yes	Enabled	Display [HP] on contact break. If contact breaks for less than 3 times within 60 minutes, resume normal display when contact is made (auto reset). If contact breaks for 3 times within 60 minutes, it does not auto resume when contact is made. User interaction is required. Press [SET] key to resume (manual reset).

F80:   Password prevents alteration of the configuration menu by pressing [M].

To enter a password use the down arrow button 0000 will be displayed, press set and the first 0 will flash, up and down arrow to alter this value between 0 and 9, press set and the second 0 will begin flashing, up and down arrow to alter this value between 0 and 9, press set and the third 0 will begin flashing, up and down arrow to alter this value between 0 and 9, press set and the fourth 0 will begin flashing, up and down arrow to alter this value between 0 and 9, press set and the display will go back to the menu displaying F86. The password is now set and will be required to alter the set point temperature or enter the menu system.

Value	State	Alarm Code [FL] F51
OFF	Disabled	No password lock out (Factory setting)

F81:   Temperature units of measure

Value	Description F81
C	Temperatures are displayed in Degrees Celsius (Factory setting).
F	Temperatures are displayed in Degrees Fahrenheit.

F84:   Number of times the compressor has started.
F85:   Displays number of hour's compressor has run.
F86:   Default value is No, Yes to reset F85.
F87:   Number of hours the compressor will run for before it is stopped, this needs to be reset for the heat pump to run again.

Alarm Codes:

Code	Cause
A21	SHr means water temperature sensor short OPE means water sensor connection is open
A22	SHr means defrost temperature sensor short OPE means defrost sensor connection is open
FL	No water flow or flow switch failure F51 (Mode 3 only)
HP	High Pressure Safety Switch triggered
LP	Low Pressure Safety Switch triggered
A99	Compressor run time expired

	E35		Factory Defaults	
Code	Parameter Name	Range	Pool	Underfloor
F11	Temperature Set Point	F14 to F13 (°C)	28	35
F12	Temperature Differential	0.1 to 20.0 (°C)	0.5	2.0 to 5.0
F13	Maximum Temperature Setting	20.0 to 150.0 (°C)	40	45
F14	Minimum Temperature Setting	-50.0 to 20.0 (°C)	10	10
F18	Defrost Temperature Offset	-20.0 to 20.0 (°C)	0	
F19	Water Temperature Offset	-20.0 to 20.0 (°C)	0	
F21	Compressor Time Delay	0 to 10 (minutes)	5	
F29	Controller Mode	Auto, Heat, Cool	Heat	
F30	Defrost Cycle	Off/1 to 999	15	
F31	Defrost Start Temperature	-20.0 to 20.0 (°C)	-5	
F32	Defrost End Temperature	0.0 to 100.0 (°C)	15	
F33	Defrost Start Time	1 to 99 minutes	0	
F34	Maximum Defrost Duration	Off/1 to 99 (minutes)	10	
F37	Defrost mode	0, 1, 2, 3	1	

		E35	Factory Defaults	
Code	Parameter Name	Range	Pool	Underfloor
F51	Flow switch control mode	0, 3, 5	5	
F52	High Pressure control mode	0, 3, 4	3	
F53	Low Pressure control mode	0, 3	3	
F54	Advanced High Pressure Control Mode	Yes/No	No	
F71	Controller Address	1 - 247	1	
F72	Baudrate	300 - 9600bps	9600	
F73	Data Bit	5 - 8	8	
F74	Strap Bit	1 - 2	1	
F75	Check Bit	None / Odd / Even	N	
F80	Password	Off/1 to 9999	Off	
F81	Temperature Unit	C or F	C	
F84	Compressor Start Counter	0 to 9999 displayed	–	
F85	Compressor Hour Counter	0 to 9999 displayed	–	
F86	Compressor Hour Counter Reset	No, Yes = reset	–	
F87	Limited Compressor running time	0 to 9999 hours	–	

Modbus Table

Address	Range	Read/Write	Unit	Parameters	Notes
00001	-	Read + Write	-	Compressor	These three signals are controlled by internal logic, normally is unable to write and change the signal.
00002	-	Read + Write	-	De-ice	
00003	-	Read + Write	-	Water Pump	
10001	-	Read Only	-	Reserved	
10002	-	Read Only	-	Reserved	
10003	-	Read Only	-	Flow Switch	
10004	-	Read Only	-	HP	
10005	-	Read Only	-	LP	
30001	-580 - 3020	Read Only	0.1 ºC /ºF	Water Temperature	
30002	-580 - 3020	Read Only	0.1 ºC/ºF	Evaporator Temperature	
30003	-580 - 3020	Read Only	0.1 ºC/ºF	Reserved	
40011 - 40089				F11 - F89	Please refer to E45 Menu (pg 6)
41001	0 - 9999	Read Only	-	Model	
41001	0 - 9999	Read Only	-	Software Version	
41101	0 - 1	Read / Write	-	Unit On/Off	0: OFF 1: ON
41102	0 - 5	Read Only	-	Controller Mode	0: Power Off 1: Standby 2: Chilling 3: Heating 4: De-icing 5: Alarm
41120		Write Only	-	Alarm Reset	Write any integer to reset
41121	0 - 1	Read Only		Water Temp Probe Alarm	
41122	0 - 1	Read Only		Evaporatorg Temp Probe Alarm	0: No Alarm 1: Alarm
41123	0 - 1	Read Only		Flow Switch Alarm	
41124	0 - 1	Read Only		HP Alarm	
41125	0 - 1	Read Only		LP Alarm	
41126	0 - 1	Read Only		End of Usage Period Alarm	

Address	Range	Read/Write	Unit	Parameters	Notes
41201	0 - 99	Read + Write	Year	Time Clock	
41202	1 - 12	Read + Write	Month		
41203	1 - 31	Read + Write	Day		
41204	0 - 23	Read + Write	Hour		
41205	0 - 59	Read + Write	Minute		
41206	0 - 59	Read + Write	Second		
41208	-	Read + Write	-	BCD Format Hour and Minute	(e.g. 0x1200 equals 12:00)

Model E45-5
(Auto Heat/Chill OR Heat OR Chill Only)

Detailed Parameters

F10: Temperature Dead Band for Heating and Chilling.

F11: Temperature at which the heat pump will stop, and has a range which is dictated by the values in F14 and F13.

F12: (Temperature Differential) Number of degrees +/- from set point (F11) before the compressor will start.

F13: Maximum temperature that can be set in F11 parameter.

F14: Minimum temperature that can be set in F11 parameter.

F18: (Defrost Sensor Calibration) Adjust the offset reading for the defrost temperature sensor probe in situations where the reading is higher or lower than the actual temperature.

F19: (Water Sensor Calibration) Adjust the offset reading for the water temperature sensor probe in situations where the reading is higher or lower than the actual temperature.

F21: (Compressor Delay Time) Minimum time to start after heating/ cooling signal has been called for.

F29: Set the controller mode between auto, heating, or cooling. 0: Auto Heat and Cool, 1: Heating Mode — Begins heating when temperature is below F11-F10-F12 and stops heating when temperature is F11-F10, 2: Cooling Mode — Begins cooling when temperature is above F11+F10+F12 and stops cooling when temperature is F11+F10.

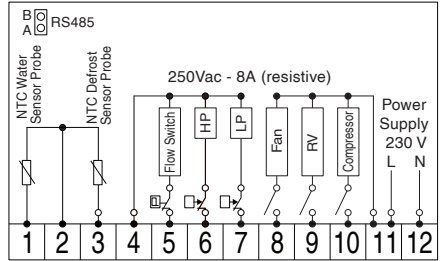F31: Temperature at which the Defrost cycle will trigger.

F32: Temperature at which the Defrost cycle will stop.

F33: Time delay in minutes at which the defrost cycle will start once triggered by the F31 setting.

F34: Maximum duration in minutes the defrost cycle will run.

F38: Fan status in defrost mode.

F41: Fan operation modes.

Value	State	Alarm code [FL] F41
1	Fan starts delayed	Fan starts after the compressor and stops before the compressor
2	Fan starts ahead	Fan starts
3	Fan always runs	

F42: Time in seconds for fan start/delay for F41 in modes 1 & 2.

F43: Time in seconds for fan stop/delay for F41 in modes 1 & 2.

F51: Flow switch mode options (note: Flow switch will allow compressor delay countdown if made without a break within 1 minute of pump starting, and calling for heating or cooling).

Value	State	Alarm Code [FL] F51
0	Disabled	No flow control and no Alarm
1	Reserved	Not Used
2	Reserved	Not Used
3	Enabled	Display [FL] on contact break, resume normal display when contact is made
4	Enabled	Display [FL] on contact break; does not auto-resume when the contact is made. User interaction required. Press the [SET] key to resume (manual reset).
5	Enabled	The display goes blank when the contact breaks, and resumes temperature display when contact is made.

F52: High-pressure safety switch mode

Value	State	Alarm Code [HP] F52
0	Disabled	No high-pressure safety and no Alarm (HP not used)
1	Reserved	Not Used
2	Reserved	Not Used
3	Enabled	Display [HP] on contact break, resume normal display when contact is made (auto reset).

4	Enabled	Display [HP] on contact break, does not auto-resume when the contact is made. User interaction required. Press the [SET] key to resume (manual reset).

F53   Low-pressure safety switch mode

Value	State	Alarm Code [LP] F53
0	Disabled	No high-pressure safety and no Alarm (LP not used)
1	Reserved	Not Used
2	Reserved	Not Used
3	Enabled	Display [LP] on contact break, resume normal display when contact is made.
4	Enabled	Display [LP] on contact break; it does not auto-resume when the contact is made. User interaction required. Press the [SET] key to resume (manual reset).

F80:   To enter a password, use the down arrow button 0000 will be displayed, press set and the first 0 will flash, use up and down arrow to alter this value between 0 and 9, press set and the second 0 will begin flashing, use up and down arrow to alter this value between 0 and 9, press set, repeat same for third and fourth digit and press set. The display will go back to the menu displaying F80. The password is now set and will be required to alter the set point temperature or enter the menu system

Value	State	Alarm Code [LP] F80
0	Disabled	No password lockout

F81   Temperature units of measure

Value	Alarm Code [LP] F81
C	Temperatures are displayed in Degrees Celsius (Factory setting).
F	Temperatures are displayed in Degrees Fahrenheit.

F84:   Number of times the compressor has started.
F85:   Displays number of hour's compressor has run.
F86:   Default value is No, Yes to reset F85.
F87:   Number of hours the compressor will run for before it is stopped, this needs to be reset for the heat pump to run again.

Alarm Codes

Code	Cause
A21	SHr means the water temperature sensor is short OPE means the water temperature sensor is open
FL	No water flow or flow switch failure F51 (Mode 3 and Mode 4)
HP	High-pressure fault F52 (Mode 3 and Mode 4)
LP	Low-pressure fault F53 (Mode 3 and Mode 4)
A99	Compressor run time expired

Code	Parameter Name	Range	Default
F10	Temperature Dead Band Control	0 - 20 (ºC)	0
F11	Temperature Set Point	F14 to F13 (°C)	20
F12	Temperature Differential	0.1 to 20.0 (°C)	0.5
F13	Maximum Temperature Setting	-50 to 150 (°C)	60
F14	Minimum Temperature Setting	-50 to 150 (°C)	10
F18	Defrost Temperature Sensor Offset	-20 to 20 (ºC)	0.0
F19	Water Temperature Sensor Offset	-20 to 20 (°C)	0.0
F21	Compressor Time Delay	0 to 10 (minutes)	5
F29	Controller Mode (Auto, Heat, Cool)	0, 1, 2	0
F31	Defrost Start Temperature	-20 to 80 (ºC)	-5.0
F32	Defrost End Temperature	0.0 to 100.0 (ºC)	15.0
F33	Defrost Start Delay Time	0 to 999 (minutes)	0

Code	Parameter Name	Range	Default
F34	Maximum Defrost Time	Off / 1 to 99 (minutes)	10
F38	Fan mode during defrost	OFF/ON	OFF
F41	Fan Operation mode	OFF/1-3	2
F42	Fan start ahead time	0 - 999 Seconds	0
F43	Fan stop delay time	0 - 999 Seconds	0
F51	Flow switch control mode	0 - 5	3
F52	High-pressure control mode	0 - 4	3
F53	Low-pressure control mode	0 - 4	3
F71	Controller Address	1 - 247	1
F72	Baud Rate	300 - 9600bps	9600
F73	Data Bit	5 - 8	8
F74	Strap Bit	1 - 2	1
F75	Check Bit	None/Even/Odd	N
F80	Password	OFF/1 - 9999	OFF
F81	Temperature Unit	C or F	C
F84	Compressor Start Counter	0 to 9999 Hours	-
F85	Compressor Hour Counter	0 to 9999 Hours	-
F86	Compressor Hour Counter Reset	No, Yes = reset	No
F87	Limited Compressor running time	OFF/1 - 9999 Hours	OFF
F95	Not Used	-	-
F98	Not Used	-	-
F99	Not Used	-	-

Modbus Table

| Address	Range	Read/Write	Unit	Parameters	Remark
00001	-	Read	-	Compressor	
00002	-	Read	-	Defrost	
00003	-	Read	-	Fan	
10001	-	Read	-	Reserved	
10002	-	Read	-	Reserved	
10003	-	Read	-	Flow Switch	
10004	-	Read	-	HP	
10005	-	Read	-	LP	
30001	-580 - 3020	Read	0.1 ºC /ºF	Water Temperature	
30002	-580 - 3020	Read	0.1 ºC/ºF	Evaporator Temperature	
40011 - 40089				F10 - F87	
41001	0 - 9999	Read	-	Model	
41001	0 - 9999	Read	-	Software Version	
41102	0 - 5	Read	-	Controller Mode	0: Power Off 1: Standby 2: Chilling 3: Heating 4: De-icing 5: Alarm
41120		Write	-	Alarm Reset	Write any integer to reset
41121	0 - 1	Read		Water Temp Probe Alarm	
41122	0 - 1	Read		Evaporator Temp Probe Alarm	
41123	0 - 1	Read		Flow Switch Alarm	0: No Alarm 1: Alarm
41124	0 - 1	Read		HP Alarm	
41125	0 - 1	Read		LP Alarm	
41126	0 - 1	Read		End of Usage Period Alarm	

E45 Controller Installation

E45 Installation Sheet

1. If an existing controller hole is not present, cut out a rectangular hole 71mm x 29mm (W x H) into a sheet metal panel for the controller to sit in. This panel should be easily viewable.
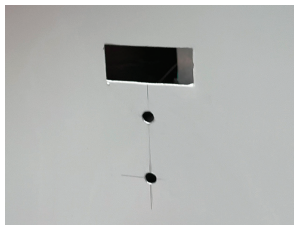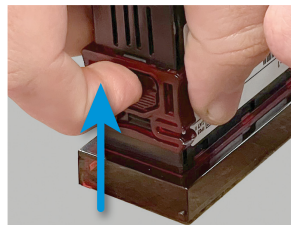

Figure 1: Cutout for E35 Controller.

2. Remove the ratchet clips from the controller by pressing down on the tab and sliding back until they are off the controller as shown by the arrow in **Figure 3**.
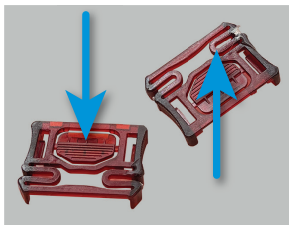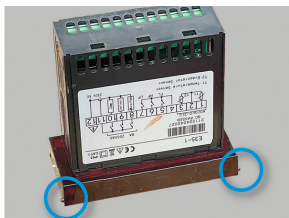

Figure 2: Ratchet clips. Press down where arrow is pointing to release.

Figure 3: Pull the clips in the direction shown by the arrow.

3. For controllers mounted on the outside of the heat pump: fit the red lid frame onto the controller. The circular dimples for the lid should be on top and close to the controller display.

Figure 4: Place frame onto controller and move towards the LED display. Dimples circled must be to the front and top of the controller.

4. Apply silicone to the frame, and slot it into the hole. Make sure that the silicone seals the controller and the heat pump surface.

Figure 5: Apply silicone around the frame as shown.

Figure 6: Push controller into the hole. Silicone will seal against mounting surface.

5. Slide ratchet clips back onto the controller and place tightly against the mounting surface.

Figure 7: With one hand pressing firmly on the face of the controller, push the ratchet clips and tighten the seal.

6. Wire up controller according to electrical diagram.

Note: Ensure that the installation is weather protected and properly sealed.

For further information please phone Hot Water Heat Pumps Ltd
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