RadMaster®
User Manual

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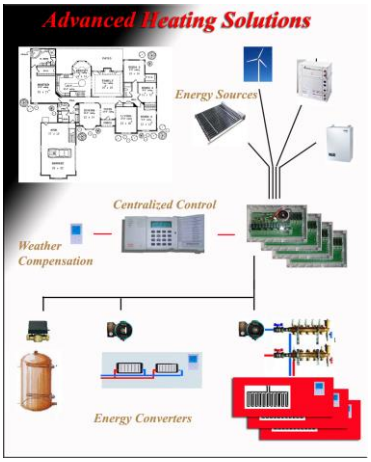
Introduction

The Radmaster® System is a domestic energy management system that manages multiple energy sources, such as boilers, geothermal pumps, and solar panels, through to multiple energy exchangers, such as underfloor heating, radiators and domestic hot water in a single package.



End-User Highlights

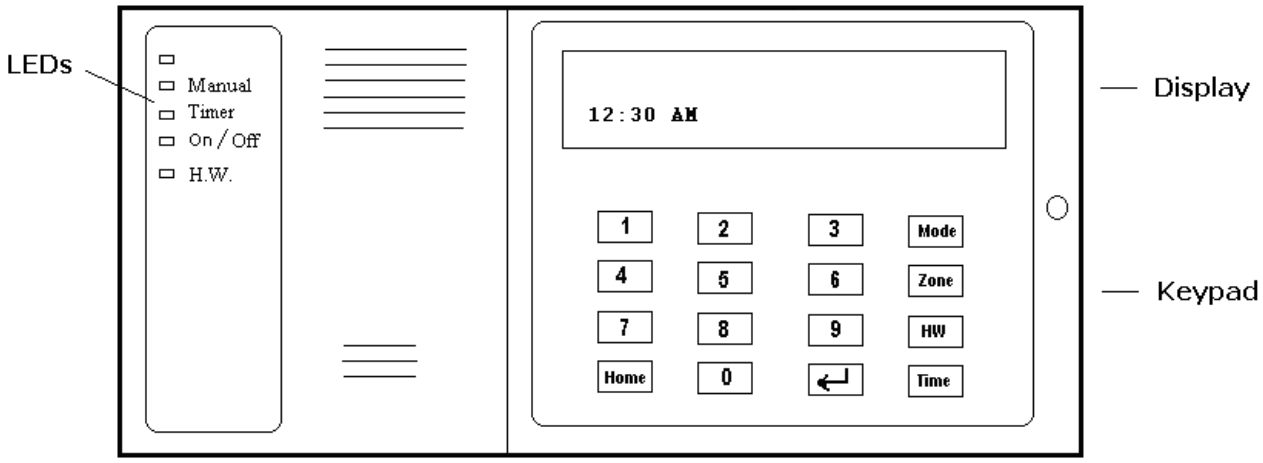
Up to 32 Zones	Applicable to Domestic & Commercial applications
Full Feature Zone Control	7day/24 hour Scheduler; Temperature Control; Pre-Heat; Advance; Lockout; etc.
Central Control	Complete Environment Control from a Single Point
Simple to Use	Most Operations Require a Single Key press
Energy Monitoring	Energy Usage & Cost Monitored on a per Zone Basis
Boiler Modulation	Modulates the Boiler cycling as the system Load changes.

Technical Highlights

Configurable	Relays Configured for Pumps; Actuators; Valves etc.
Fault Tolerant Design	Thermostat Failures do not Interrupt System Operation
Programmable	The Most Complex of Application can be Readily & Simply Designed
Extensible	4 to 128 Relays; 5-40 Inputs; 1 to 8 Analog Outputs
Adaptable	Outputs: 24VDC; 240A/C; Volt-Free
Assign Priority	Most Efficient Energy Source is Assigned Highest Priority etc.
Single Data Cable	Easy to Install; Reduced Cabling; Reduced Errors
Weather Compensation	Programmable per Application
Extensive Diagnostics	Identifies Location of Wiring Faults, Manual Override etc.
Simulation	Application Designs can be Tested Prior to Installation
Document Generation	2nd Fix Drawings & Configurations
Document Archive	Documents can be Readily Archived & Retrieved

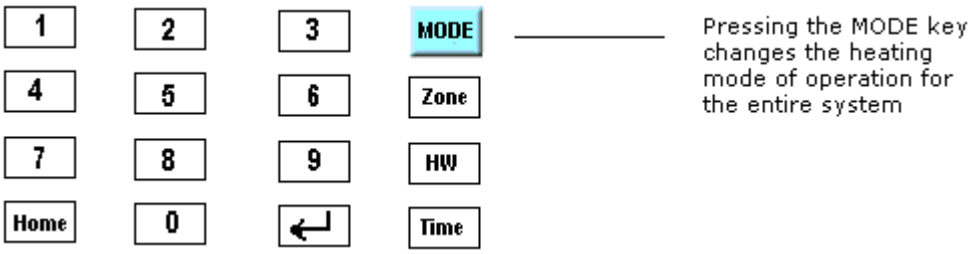
Console

The console is the central point of control for the system.

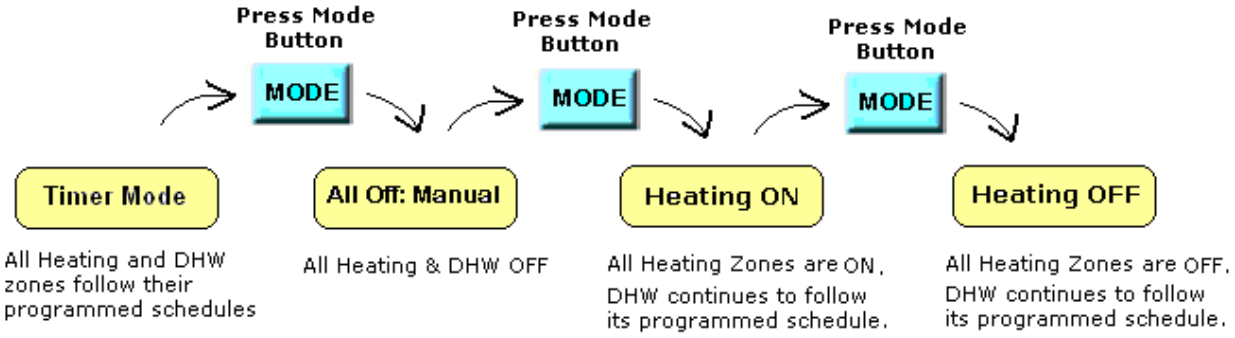


System Heating Mode

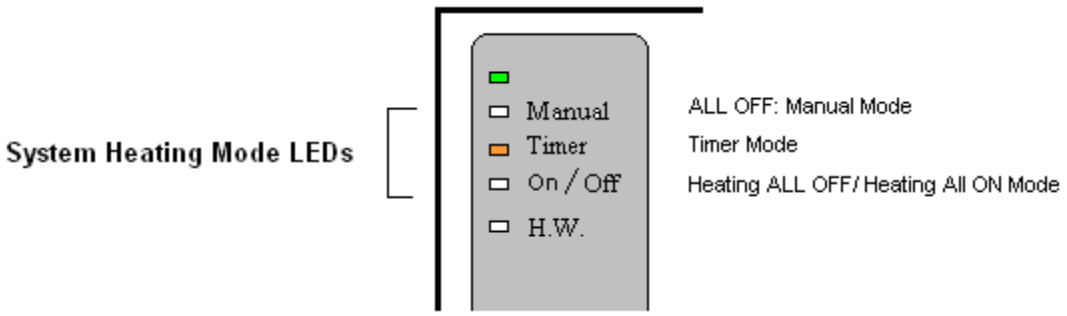
There are **four system heating modes** of operation. The MODE key is used to toggle between these modes.



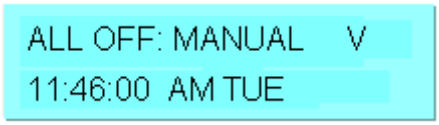
There are **four heating modes** as illustrated below:



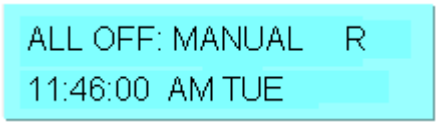
An LED on the console indicates the current system heating mode.



The system will be set to the **ALL OFF:Manual** when in vacation mode. This is indicated by a "V" on the display (see *Time of Day and Vacation).*



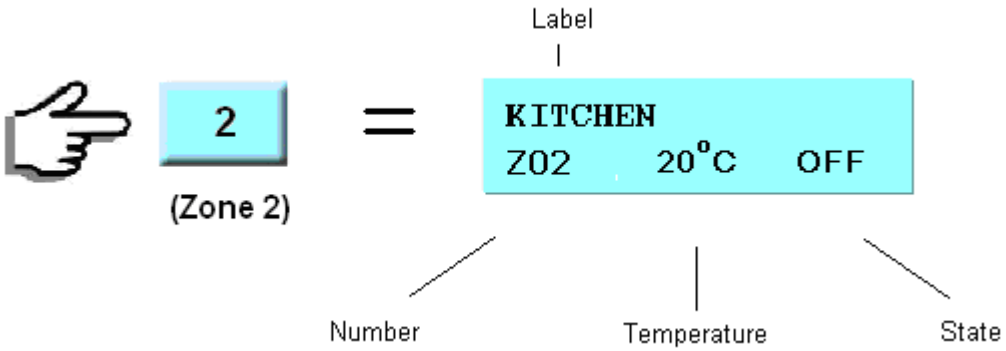
"Remote" vacation mode (set by a telephone interface) is indicated "R" on the display



Manual override of a zone (see next chapter, *Zone Temperature & State*) is disabled in the vacation modes.

Zone Temperature & State

A zone's temperature and state (ON/OFF) may be viewed by entering the zone number. For instance, pressing the numerical "2" key (zone 2) displays the kitchen air temperature (20°C) and indicates that heating in the kitchen is currently OFF.



"ZONE ##" will be displayed in the place of the label if un-programmed (see *Zone Label Editing*).

The  key toggles the zone state between OFF/ON.

If a zone state is toggled while in the system is in **TIMER mode**, the state will revert to its programmed scheduled state at the next state transition. For instance, if the heating in the kitchen in schedule to be ON from 1PM to 5PM and is manually turned ON (by toggling the state) at 11AM, the heat will remain ON until 5PM.

If a zone state is toggled while in the system is the **Heating ALL OFF or Heating ALL ON** mode, the zone state will remain constant until action is taken by the user. For example, if the heating in the kitchen is turned ON while in **ALL OFF:Manual** mode, the kitchen will remain ON until the zone is manually turned OFF (by toggling the state) or until the system mode is changed (e.g. to TIMER mode).

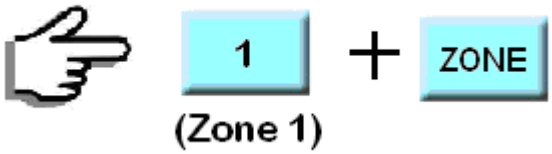
Likewise, if a zone state is toggled while in the system **ALL OFF:Manual** mode, the zone state will remain constant until action is taken by the user.

"?" is constantly displayed in place of the temperature if communication with the sensor cannot be established.

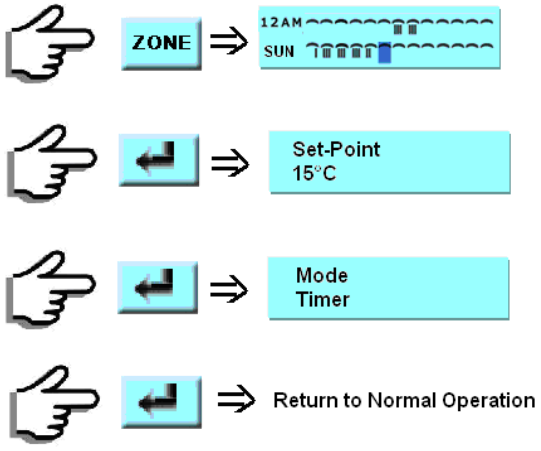
Zone 1 is dedicated to Domestic Hot Water (DHW).

Zone Configuration

A zone's schedule, set-points and operating parameters are accessed by entering the zone number followed by the ZONE key.

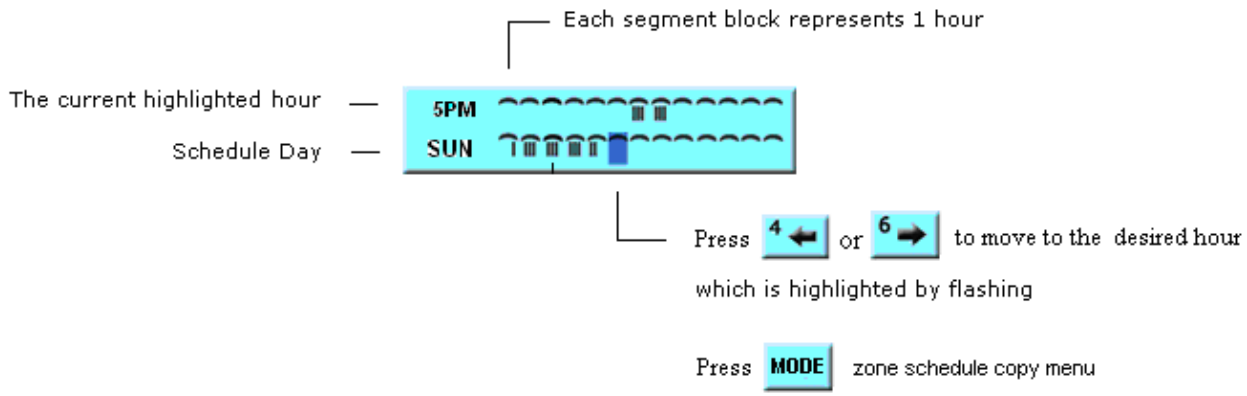


The ↵ key moves the user from zone schedule to set-point to operating parameter. The HOME key may be pressed at any time to return the user to the HOME screen (normal operating screen).

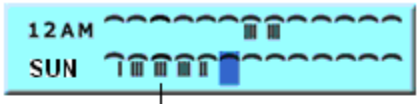


Zone Schedule

Each zone maintains a 7day/24 hour timer schedule.



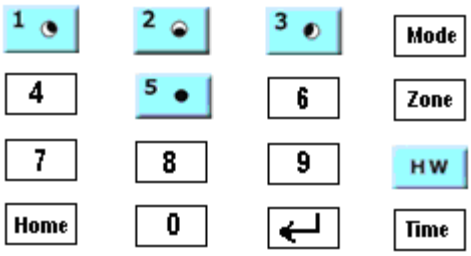
The 5 key toggles heating ON/OFF for a whole hour. The 1, 2, and 3 keys toggle heating ON/OFF for the 1st, 2nd and 3rd 20 minutes of an hour respectively.



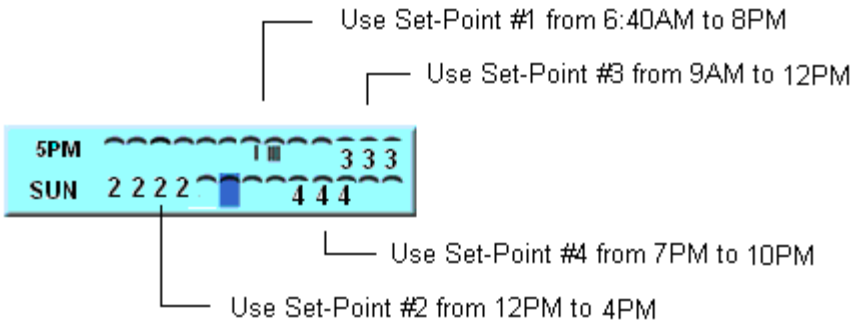
Press 1 to time heat for 1st 20 minute period	Shown as
Press 2 to time heat for 2nd 20 minute period	Shown as
Press 3 to time heat for 3rd 20 minute period	Shown as
Press 5 to time heat for the entire hour	Shown as

Schedule Radiator Space Heating Alternate Set-points

Press the HW key to selects alternate set-point (2 through 5) for a **Radiator Space Heating** type zone. These set-points apply to a whole hour.



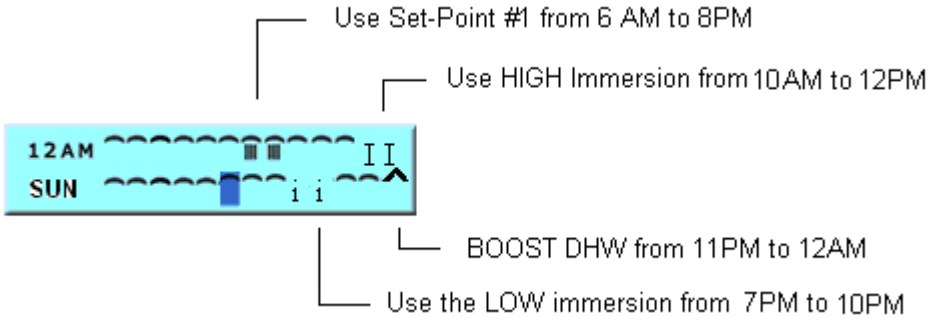
For instance, set-points #1 through #4 are used in the following radiator heated zone



The cc765 Radiator Sensor Has **only** two additional set-points (Sp2 and Sp3).

Schedule DHW Boost & Immersion

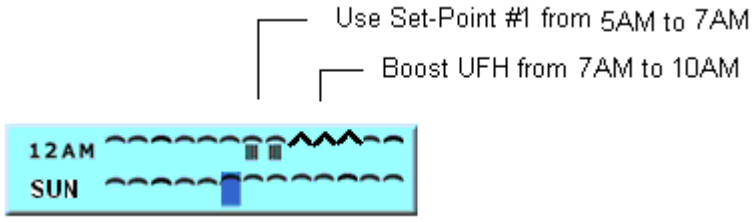
For a **DHW type zone** (zone 1), the HW key schedules BOOST (^) or Immersion (i) or High immersion (I). For example:



DHW BOOST sets the set-point to 70°C.

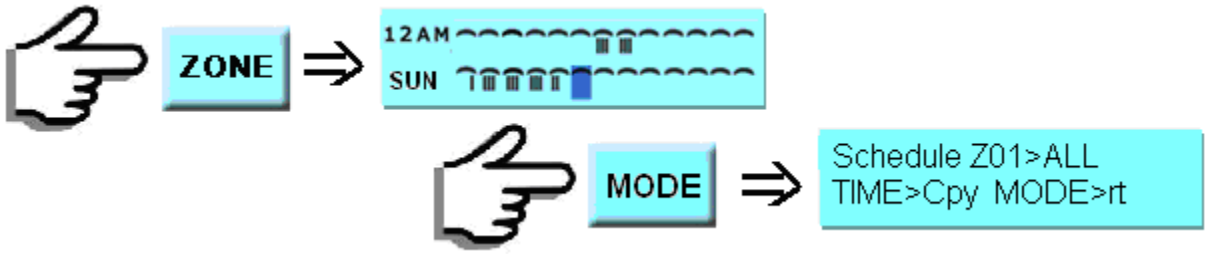
Schedule UFH Boost

For an **UFH type zone,** the HW key schedules BOOST. For example:

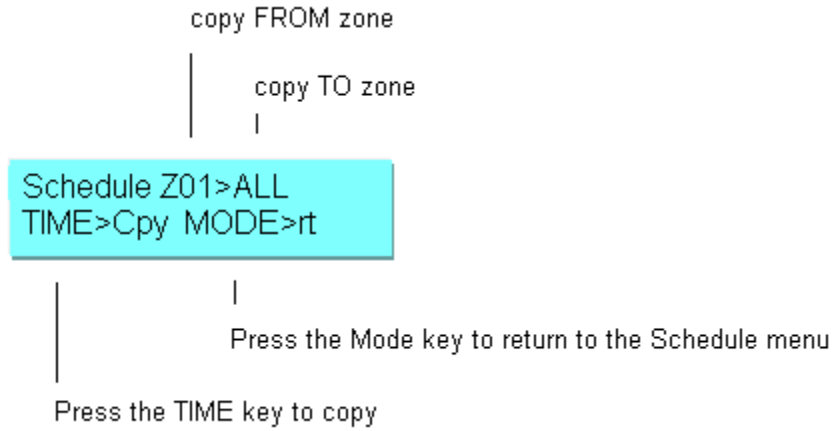


Copy Zone Schedule

A zone schedule may be copied from one zone to another or, from one zone to all zones. The copy function copies the zone schedule for the current day only, not for every day. The zone schedule copy menu is entered by pressing the MODE key while in the zone schedule menu.



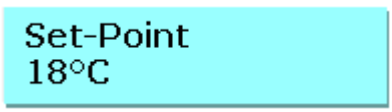
Press the ZONE key change the "From Zone" number. Press 2 and 8 keys to change "To Zone" number. Press the TIME key to start the copy function and the MODE key to return to the schedule menu.



Note: The copy function will only copy a zone schedule to a zone of the same type. In other words, a schedule for a DHW type zone will not copy to a radiator type zone.

Zone Set-Points

Set-points regulate the temperature in a zone. A Radiator type zone has up to 5 set-points. An underfloor heating type zone has a single set-point and a boost. A Domestic Hot Water type zone has a single set-point.

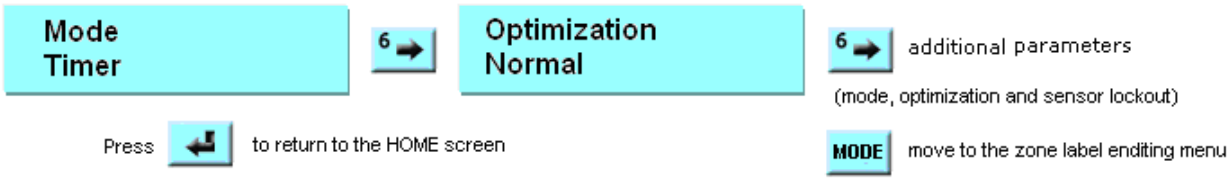


Press the 2 key to increment the set-point and the 8 key to decrement set-point. Press 6 move the next set-point.

Set-point	Description	Rad	UFH	DHW
Set-Point	The desired temperature when the zone is ON (UFH/RADS 10-30°C; DHW 0-80°C)	√	√	√
Set-Point 2	Additional Set-point for setting the desired temperature when the zone is ON (10-30°C)	√		
Set-Point 3	Same as Set-Point 2	√		
Set-Point 4	Same as Set-Point 2	√		
Set-Point 5	Same as Set-Point 2	√		
Set-Point OFF	The desired temperature when the zone is OFF (0-8°C)	√		
Set-Back	Set-Back only applies to only UFH zones. The Set-Back value is subtracted from the Set-Point in order to set the desired temperature when the zone is OFF. (3-8°C)		√	
Boost Heat	Boost Heat only applies only to UFH and DHW zones. (1-5°C)			
	<u>UFH zone type</u> When the zone is in the BOOST mode (See Zone Scheduler) the Boost Heat value is added to the Set-Point in order to set the desired temperature.		√	
	<u>DHW zone type</u> BOOST sets the required DHW temperature to 70°C (See Zone Scheduler).			

Zone Parameters

Zone parameters allow the user to control certain heating and operation functions within a zone



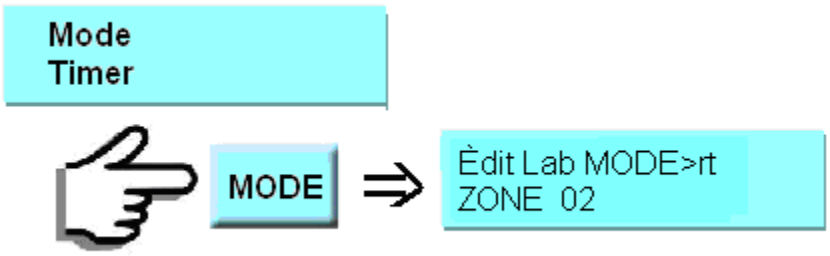
Press the 2 and 8 to change the parameter setting. Press 6 move the next parameter. Press the MODE key to edit the zone Label.

Parameter	Description	
Mode	There are 3 modes of operation:	
	TIMER	Zone follows programmed scheduling.
	DISABLE	The zone is disabled. Heating will only come ON if the temperature falls below the frost protection set-point. The sensor display is BLANK.
	STOP	The zone is overridden. Heating will only come ON if the temperature falls below "OFF" Set-point. The "SB" flashes at the sensor to indicate that the zone is in the STOP mode.
Optimization	Optimization ensures that a desired zone temperature is achieved when it is scheduled to come ON.	
	NORMAL	Zone follows programmed scheduling.
	CURVE 1	Zone is pre-heated for 1 hour before the scheduled ON time. Fitting Curve 1 is applied.
	CURVE 2	Zone is pre-heated for 2 hour before the scheduled ON time. Fitting Curve 2 is applied.
	CURVE 3	Zone is pre-heated for 4 hour before the scheduled ON time. Fitting Curve 3 is applied.
	AUTO	The system learns thermal inertia of the zone and adjusts the pre-heat start time accordingly. Fitting Curve 2 is adjusted.
Sensor	**ON**	Sensor buttons will NOT respond when pressed.

Lockout	**OFF**	Sensor buttons will respond when pressed.

Zone Label Editing

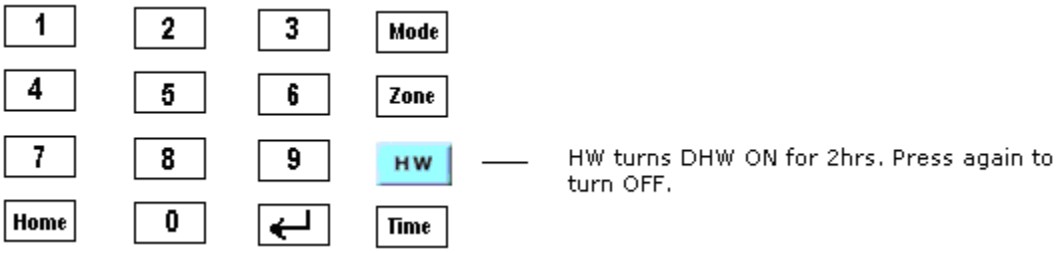
The default zone labels (e.g. “ZONE 05”) may be modified by the user through the zone label editing menu. The zone label editing menu is entered by pressing the MODE key while in the zone parameter menu. The label for zone 1 (DHW) cannot be changed.



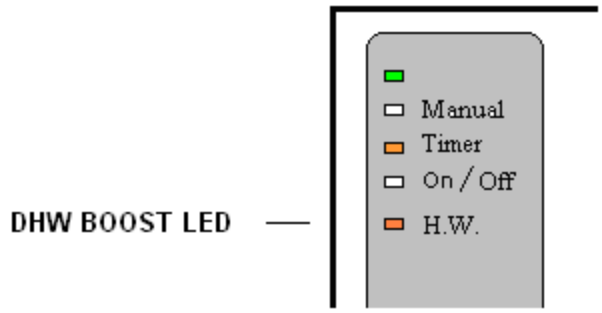
Press 4 and 6 to move the cursor between characters. Press 2 and 8 keys to change a character. Press 0 to enter a SPACE. Press 1 to change the character to “A”. Press 5 to toggle between uppercase and lower case.

DHW Boost (HW Key)

The HW key turns the DHW Boost ON for 2 hours. Boost is active for 2 hours.



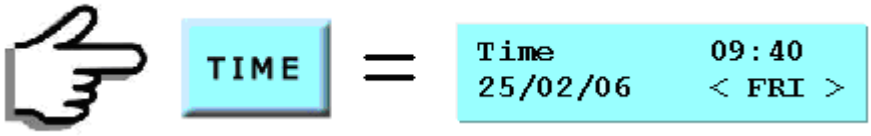
An LED on the console indicates the state of the DHW boost.



The DHW Boost Key brings on the immersion.

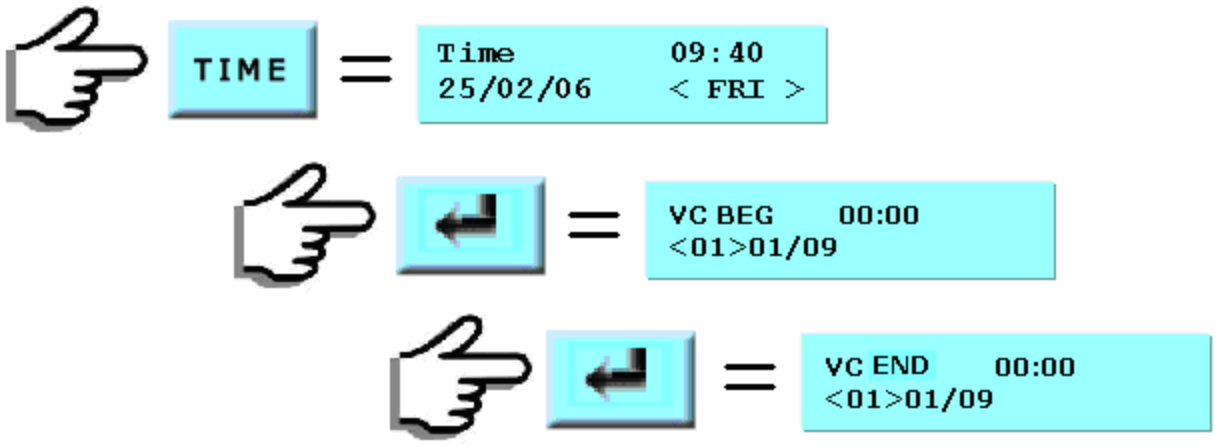
Time of Day and Vacation

Press the TIME key to enter the "Time of Day" display.

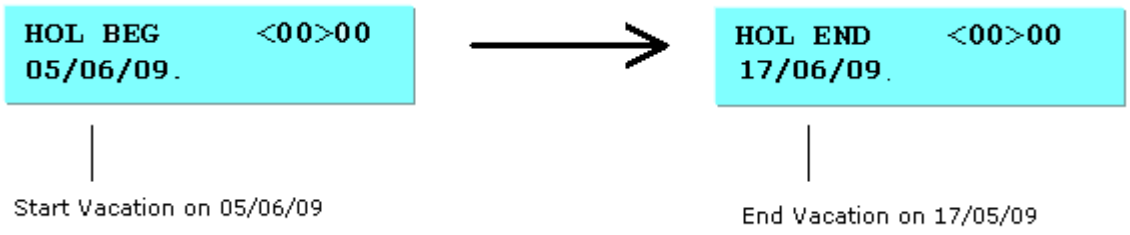


Press 4 and 6 to move the cursor and 2 and 8 to change the value. Press the HOME key to exit.

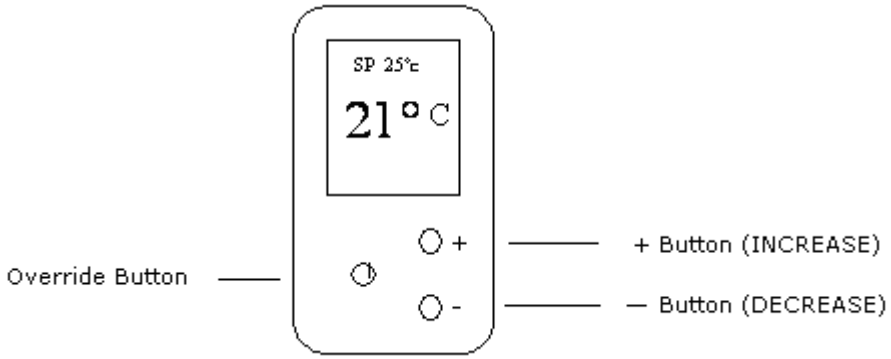
Press the ↵ key again to move from the TIME menu to the Vacation Begin menu and from the Vacation Begin menu to the Vacation End menu.



The Begin and End Date set the vacation period during which time the Heating and DHW are turned OFF.

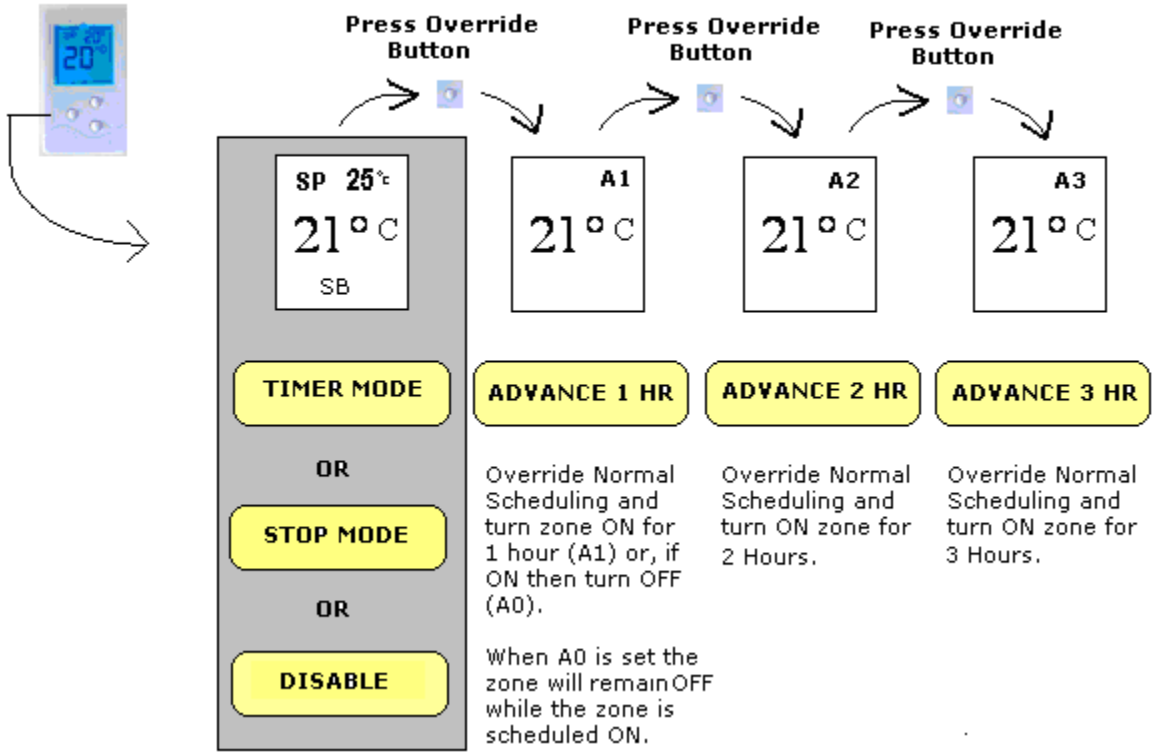


Radiator Zone Sensor



The zone sensor has three buttons: a Mode Button, a + Button and a – Button. The Mode Button overrides the normal Timer, Stop and Disable mod. :

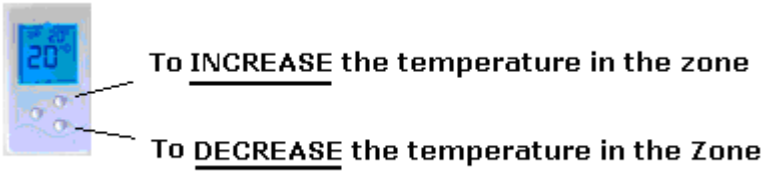
To OVERRIDE the programmed sensor mode (TIMER, STOP & DISABLE) State



If the zone sensor is ON the Override button will force the sensor to the OFF state. “A0” will be displayed. The Sensor will remain OFF until the zone is switched from the ON to the OFF state by the programmed schedule or manually at the console.

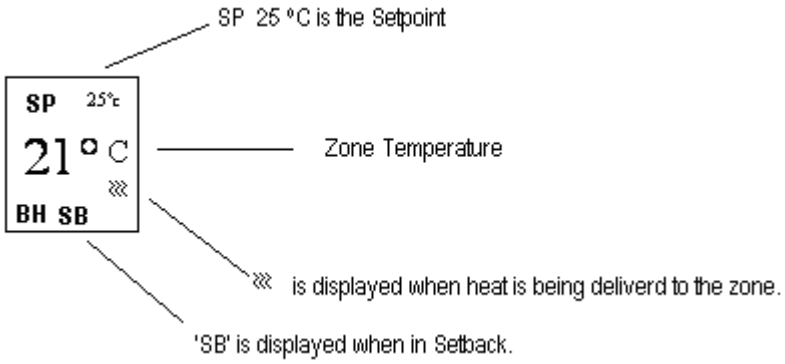
If the zone sensor is OFF the Override button will force the sensor to the ON state. “A1” will be displayed if the override button is pressed once. “A1” indicated that the override condition will remain for 1 hour. “A2” is displayed if override is pressed twice and “A3” if pressed three times. “A2” and “A3” represent 2 and 3 hours respectively.

Pressing the “+” and “-“ buttons will increment and decrement the set-point.

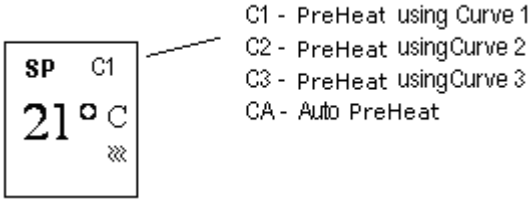


Changes to the temperature set-point will remain in effect until the zone changes state (from ON to OFF or, from OFF to ON).

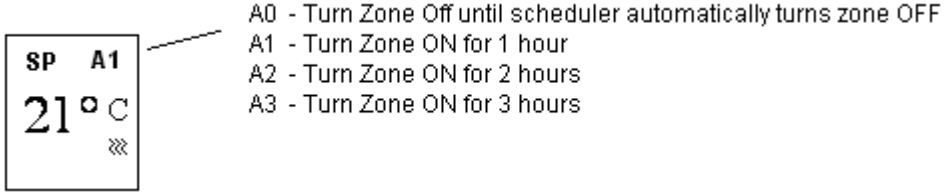
The following diagram identifies the various display symbols and their meanings.



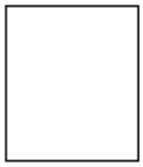
Symbols ‘C1’, ‘C2’, ‘C3’ and ‘CA’ are displayed when a zone is optomization.



The Symbols ‘A0’, ‘A1’, ‘A2’ and ‘A3’ are displayed when the activation override is enabled.



If the sensor is placed in the DISABLE mode the display is blanked.

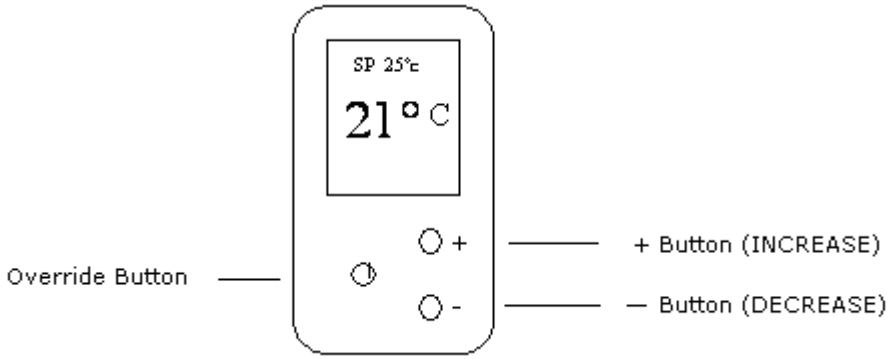


The diplay is blank

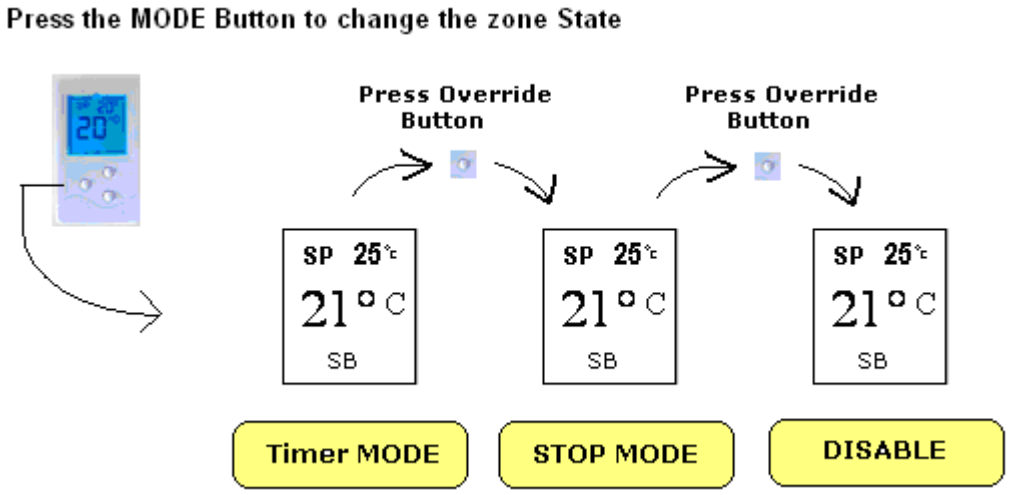
If the sensor is placed in the STOP mode the SB symbol is flashed.

Flashing SB indicated the zone is in the STOP mode

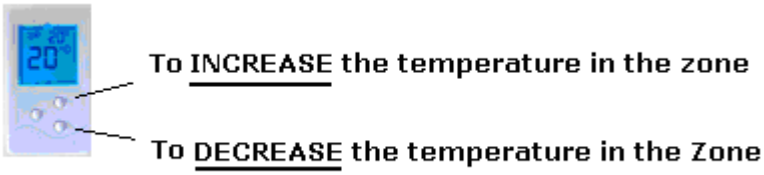
UFH Zone Sensor



The zone sensor has three buttons: a Mode Button, a + Button and a – Button. The Mode Button overrides the normal Timer, Stop and Disable mode:

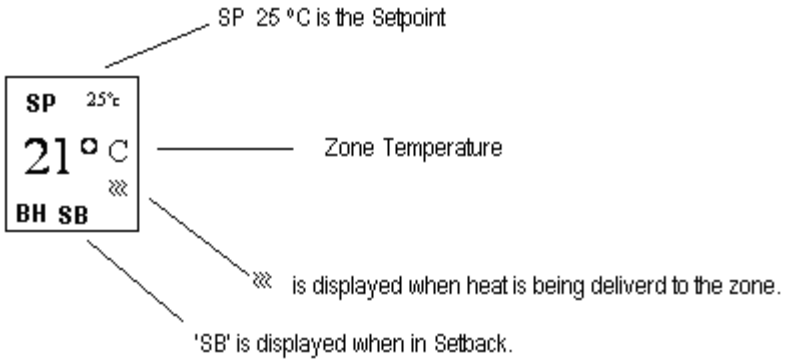


Pressing the "+" and "-" buttons will increment and decrement the set-point.

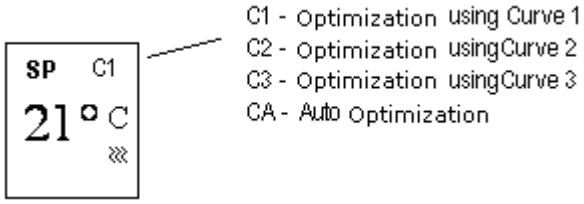


Changes to the zone mode and temperature are saved at the console.

The following diagram identifies the various display symbols and their meanings.

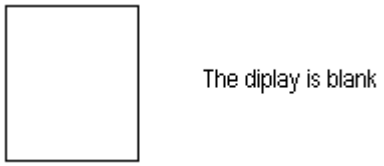


Symbols ‘C1’, ‘C2’, ‘C3’ and ‘CA’ are displayed when a zone is optimization.

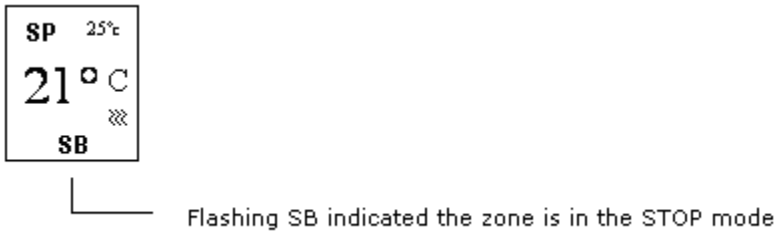


The temperature set-point also displayed, overlay the “C” symbol. This set-point is internally calculated to a 10th of a degree C but is rounded to a whole degree for display purposes.

If the sensor is placed in the DISABLE mode the display is blanked.



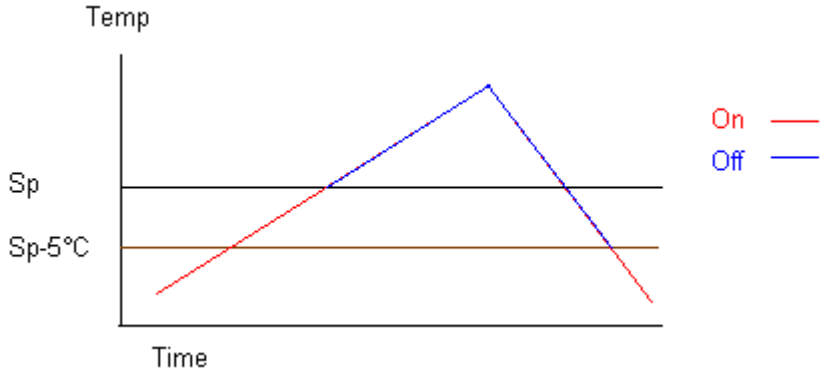
If the sensor is placed in the STOP mode the SB symbol is flashed.



Appendix – DHW Operation

			Set-Point		Heat Source		
			Programmable	**Boost Heat 70°C (Fixed)**	**Boiler**	**Imm Lo**	**Imm Hi**
HW Key	Front Panel LED		√		√	√	
Manual	Manual Override		√		√		
		Scheduler Symbol					
	Boiler		√		√		
Scheduler	Immersion Low	**i**	√			√	
	Immersion High	**I**	√				√
	Boost			√	√		

DHW has a 5°C Hysteresis



If the DHW is turned manually ON while either Immersion (low/high) is active (scheduled to be ON) then the DHW output will override the Immersion and bring on the boiler.

Appendix – Optimization

Optimization is the control of zone temperature in order to pre-heat according to a selected optimization curve. An optimization curve controls the temperature gradient prior to the scheduled ON time. Curves differ with respect to temperature gradient and duration.

Curve 1		*Curve 2*		*Curve 3*	
Time Offset (mins)	**Temp Offset (Deg C)**	**Time Offset (mins)**	**Temp Offset (Deg C)**	**Time Offset (mins)**	**Temp Offset (Deg C)**
20	0.5	20	0.5	20	0.5
40	1.0	40	1.0	40	1.0
60	1.5	60	1.5	60	1.5
		80	2.0	80	2.0
		100	2.5	100	2.5
		120	3.0	120	3.0
				140	3.5
				160	4.0
				180	5.0

Zone optimization may also be set to AUTO mode. In this mode the sensor uses curve 1 but adds an additional offset based on the delta T difference between the requested temperature and the actual temperature an ZONE ON time. If the actual temperature is less then the requested temperature then the AUTO offset is incremented by 0.5 Deg C. If the actual temperature is greater than the requested temperature then the AUTO offset is decremented by 0.5 Deg C. The AUTO optimization Curve is therefore:

Time Offset (mins)	**Temp Offset (Deg C)**
20	0.5 + AUTO OFFSET
40	1.0 + AUTO OFFSET
60	1.5 + AUTO OFFSET

The optimization ON temperature set-point is derived from the base set-point (sp1).