

AQUATROL Zone Synchronizing Boiler Reset Controls

AQ251

USER OPERATION AND MAINTENANCE



thermostats in the home can display the actual outdoor temperature when an outdoor sensor is connected to the AQ251 Control Panel.

⚠ WARNING

Only trained, experienced, licensed service technicians should service this Control Panel. The front cover of the AQ251 Control Panel should not be removed, as this will expose the user to potentially dangerous line voltage (120V) electricity.

Congratulations!

The AQUATROL AQ251 installed on your heating system is the most powerful, yet user-friendly hydronic heating control system available on the market for residential and light commercial installations.

This instruction sheet contains all the information you need to program the comfort settings of the AQ251 and to customize its operation for your home or business. For detailed information on the operation of this control, please consult the trained hydronic heating professional that installed the AQ251 control.

APPLICATION

The AQ251 series of AQUATROL® Boiler Reset Controls provides simplified, energy-efficient outdoor temperature compensated control of single-temperature, residential hydronic heating systems. The AQ251 easily converts a single zone heating system into a room-by-room comfort control system, or upgrades a basic, relay-logic zoning system to intelligent “Zone of Greatest Demand” control with outdoor reset for increased energy efficiency and with reduced boiler cycling.

AQ251 boiler controls can ensure ample supply of hot water for both space heating and priority generation of domestic hot water for bathing, dishes and laundry.

When AQ1000 communicating thermostats are used with the AQ251 Zoning Modules, they can use the same wiring as existing thermostats. Night setback operation can be programmed from the AQ251 panel. Thanks to the network communication capability of the AQ251 controls, AQ1000

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This AQUATROL AQ251 Control Panel was installed by a trained hydronic heating contractor. To service this product, or for any questions relating to its installation, please contact:

Installing contractor: _____

Address: _____

Phone: (_____) _____



Table 1. AQ251 Models

Model	Function	DHW	Zones	Zone Control
AQ25142B	Reset Boiler Control Panel with integrated zoning	Selectable DHW priority, with optional priority override	2 – 16, in sets of 4	Line voltage circulators or 2-wire zone valves
AQ25144B	Reset Boiler Control Panel with integrated zoning	Selectable DHW priority, with optional priority override	2 – 16, in sets of 4	24 Vac zone valves with end switches
AQ25110B	Reset Boiler Control Panel with no integrated zoning	Selectable DHW priority, with optional priority override	1	None; user can add zoning with Expansion Zoning Panels (sold separately)

AQ251 Approvals and Standards:

Canadian Standards Association: Certified, File No. LR76030

Replacement Parts and Accessories:

- AQ1000: non-programmable zone thermostat
- AQ15100B: Replacement Boiler Reset Control Module
- AQ15740B: 4-zone valve expansion module
- AQ15540B: 4-zone pump expansion module
- AQ10X38: 24 Vac 38 VA transformer
- AQ12C10: Replacement sensor, outdoor
- AQ12C11: Replacement sensor, supply and return on boiler loop
- AQ12C20: Replacement floor / slab sensor

Keypad

The 7- button keypad provides the following functions.

- Menu** Press this button to access the User Menu. When pressed while in a sub-menu, the sub-menu's values are saved before going up one level in the current menu.
- Home** Press this button to leave the User or Installer Menu and return to the Home Page display screen.
- OK** Press this button to enter a sub-menu of the active menu item. A menu item is active when the indicator arrow (←) is positioned beside the item.
- ▲ and ▼** Press these buttons to scroll up/down in the menu items. Pressing one of these buttons automatically exits the edit mode, and the selection moves to the previous or next menu item.
- and +** Press these buttons to decrease/increase the value of a selected menu item, or to scroll through a list of pre-defined options.
 - If the menu item being modified is a number, the displayed value will decrease/increase by pressing these buttons. When holding the - or + button for more than a second, the values automatically decrease/increase at a faster pace, similar to setting the time on a digital clock radio.
 - If the menu item is an option, pressing these buttons scrolls through the list of available options one at a time.

FAMILIARIZATION WITH CONTROL

User Interface

The AQ251 User Interface consists of an LCD screen (16 characters by 3 rows) and a 7 button keypad for navigating the menus as illustrated in Fig. 1.

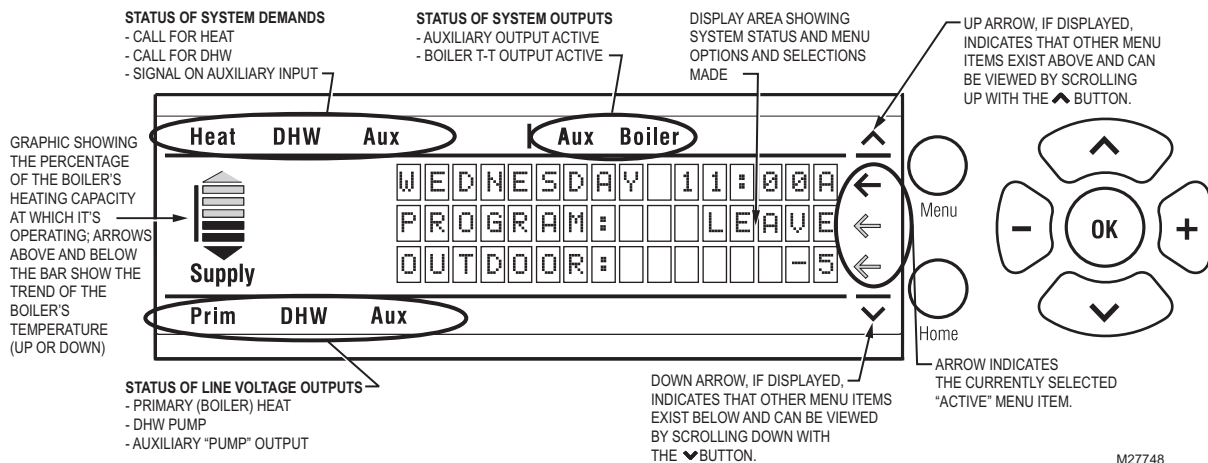


Fig. 1. LCD Dot Matrix Display Layout.

LCD Display Panel Layout

The LCD on the AQ251 Control Panel is used to:

- Monitor system status and performance.
- Select and/or modify control settings for the hydronic system.
- Diagnose and troubleshoot system problems.

The layout of the display is logical and simple to navigate. The information displays so that you can see at a glance the system's operating temperatures, as well as the status of the system equipment, such as a call for heat, DHW pump ON, Boiler T-T terminals energized, etc. Fig. 1 on page 2 illustrates the layout and features of the LCD display panel and keypad.

LCD Display Navigation

This section describes how the keypad is used to navigate the LCD display and menus.

- The LCD displays up to three lines of text at a time. For menus with more than three lines, use the up and down buttons (▲ or ▼) to scroll through the menu options.
- As the menu is scrolled up or down, the indicator arrow (←) shows which menu item is active.
- If the active menu item is part of a list of predefined options (e.g., Day of the Week) press the – or + button to scroll through the available options until the preferred option is displayed. The option is automatically saved when the indicator arrow is scrolled away from the value being edited.
- If the active menu item requires you to define a value (e.g., a setpoint), use the – or + button to decrease or increase the value until the desired value is displayed. The selection will be saved when the indicator arrow is scrolled up or down.

NOTES:

1. When setting times for the setback schedule, you must use the – or + button to change the time.
 2. The OK button, when pressed, defaults the time setting to "--:--" (midnight).
- If the active menu item leads to a further sub-menu, pressing the OK button displays the sub-menu options on the LCD. Scroll through this sub-menu to position the indicator arrow (←) beside the desired menu item to input or modify. Choose one of the options provided or input the desired value for the menu item. When satisfied, scroll to another item and your selection will be saved.
 - To define or modify another item within the same menu, scroll the up and down buttons (▲ or ▼) until the indicator arrow (←) is beside the desired option. Use the – or + buttons to set the value for that item.
 - To move back (up) one level within a menu, press the Menu button.
 - To return to the Home Page display, press the Home button.

NOTE: The AQ251 automatically returns to the Home Page display after 60 minutes of inactivity on the keypad.

HOME PAGE DISPLAY

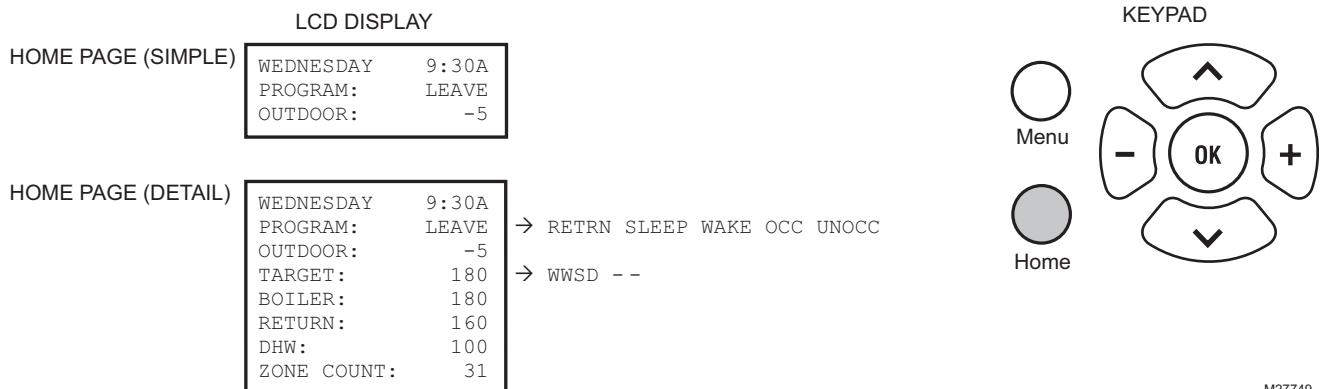
The Home Page is the default view displayed on the AQ251 Control Panel's LCD screen.

There are two Home Page views - Simple and Detail.

- Simple view shows 3 lines of text and is a brief description of the system operation.
- Detail view includes the same 3 lines plus 10 lines of additional information. Detail view is the factory default.

The choice of the Simple or Detail Home Page view is made from the USER MENU > PREFERENCES/TIME menu option.

The Home Page display information for the Simple and Detail views is illustrated in Fig. 2.



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Fig. 2. Home Page displays (Simple and Detail).

Programming Instructions

Program the AQ251 by using the keypad and LCD display to select parameters from the User Menu. Refer to Fig. 1 on page 2 for an illustration of the LCD screen and keypad.

NOTE: The figures in “User Menu Structure” on page 8 provide a graphical layout of the AQ251’s User and Installer menus.

When a new AQ2000 component is connected on the AQUATROL network, it will be seamlessly integrated in the system after a few seconds. If one or more components are disconnected or stop providing data to the network, a message will appear on the System Status display until the fault is corrected.

User Menu Overview

The User Menu is intended for use by the building owner to choose the LCD display preferences, Zone Settings (including setpoint temperatures and setback times for each zone), and temperatures for the WAKE, LEAVE, RETRN (return), and SLEEP programs.

The Home Page and User Menu allow the building owner to:

- View the status of the system.
- Set up preferences for how the system information is displayed.
- Set target temperatures for each zone (requires AQ1000 thermostats).
- Program times of the day when the system will set back the temperatures for all zones (requires AQ1000 thermostats).

NOTE: If there are any problems with the system’s operation, the AQ251 displays error codes on the System Status display of the LCD panel. For details on these, refer to “Troubleshooting” on page 6.

TO ACCESS THE USER MENU:

Press the Menu button on the keypad at any time to access the User Menu.

User Menu Settings

The User menu has five sub-menus.

- “System Status”
- “Preferences/Time”
- “Zone Settings (requires AQ1000 thermostats)”
- “Program Settings”
- “Statistics” on page 5

To make changes to the parameter settings in the User Menu, refer to “LCD Display Navigation” on page 3.

SYSTEM STATUS

This is a detailed list of activities going on in the heating system (e.g., call for heat, DHW disabled), and provide the building owner with a quick snapshot of the heating system’s operation, primarily for purposes of troubleshooting and system diagnostics.

PREFERENCES/TIME

The preferences that the building owner can change in this sub-menu are:

- The temperature scale for the display (Fahrenheit or Celsius) for both the AQ251 control’s LCD and the zone thermostats.

- The time display in 12 hour (e.g., 7:00 PM) or 24 hour format (e.g., 19:00).
- Date and time of day – allows building owner to reset day and time of day in the event of a power outage of more than 4 hours (refer to Troubleshooting section).
- The Home Page display view, Simple or Detail. The factory default is Detail.
- The LCD Backlight – illuminated permanently (ON) or set to automatically turn off backlight after 1 hour (AUTO).

POWER FAILURE

If a power disruption lasts for more than 4 hours, the message PLS SET DAY/TIME displays and optionally, the AQ251’s backlight flashes repeatedly. This displayed message continues until the DATE and TIME OF DAY are updated. See “Power Disruption Greater Than 4 Hours” on page 6.

ZONE SETTINGS (REQUIRES AQ1000 THERMOSTATS)

Settings in this sub-menu define:

- The temperature setpoints (target temperatures) for each zone in the heating system
- The temperature setback for each zone in the heating system. This is the desired temperature drop when the heating system enters the setback program SLEEP or LEAVE.
- The maximum and minimum setpoints that can be entered by a user at a thermostat screen for each zone.
- Whether each zone can be set independently by the AQ251 (i.e., some zones can be locked while others are unlocked) depending on whether or not the keyboard on a thermostat is locked. When locked, no changes can be made to a zone’s setpoint temperature through the thermostat. Changes can still be made through the Zone Settings menu on the AQ251 control panel.

PROGRAM SETTINGS

Using the Program Settings sub-menu, the building owner can define the time of day when the entire heating system will change programs (e.g., from SLEEP to WAKE).

The AQ251 has provision for four different schedule periods per day. They are defined as WAKE, LEAVE, RETRN (return), and SLEEP:

- WAKE: Period when you awaken and want your home at a comfortable temperature.
- LEAVE: Period when you are away from home and want an energy-saving temperature.
- RETRN: Period when you return home and want your home back to a comfortable temperature.
- SLEEP: Period when you are asleep and want an energy-saving temperature.

There are three modes of operation – Automatic, Occupied and Unoccupied:

- AUTO: In AUTO mode, the AQ251 follows the WAKE, LEAVE, RETRN, and SLEEP programs.
- OCC: In OCC mode, the AQ251 holds the temperature of OCCUPIED programs (WAKE and RETURN). This might be used if the occupancy pattern of the building

changes temporarily, requiring the temperature to be at a comfort level 24 hours/day.

UNOCC: In UNOCC mode, the AQ251 holds the temperature of UNOCCUPIED programs (LEAVE and SLEEP). This might be used if the building will be unoccupied for an extended period of time, such as a vacation period.

There are two ways to set the schedule program times for WAKE, LEAVE, RETRN, and SLEEP:

- One day at a time
- All days at the same time

1. One day at a time programming:

- Select EDIT DAILY from the Program Settings sub-menu.
- A list of four program times per day displays, showing the factory pre-set times for all programs:

MON	WAKE	6:00A
MON	LEAVE	8:00A
MON	RETRN	4:30P
MON	SLEEP	10:00P
TUE	WAKE	6:00A
TUE	LEAVE	8:00A
TUE	RETRN	4:30P
TUE	SLEEP	10:00P
...		
SAT	WAKE	6:00A
SAT	LEAVE	--:--
SAT	RETRN	--:--
SAT	SLEEP	10:00P
SUN	WAKE	6:00A
SUN	LEAVE	--:--
SUN	RETRN	--:--
SUN	SLEEP	10:00P

- Any of the times can be changed by scrolling to that line and pressing the + or – button until the desired program time is displayed.

2. Programming all days at the same time:

- Select EDIT ALL DAYS from the Program Settings sub-menu.
- A sub-menu displays where you can change the WAKE program time for all days, the LEAVE program time for all days, etc.
- When all four programs have been set, select the COPY TO ALL DAYS option. This displays the prompt: COPY TO ALL DAYS - ARE YOU SURE?. Select Yes by positioning the indicator arrow at YES and press the OK button.
- Next, the same list of days as EDIT DAILY (described in step 1) displays, except that all days now show the times for the WAKE, LEAVE, RETRN, and SLEEP programs that you set in the EDIT ALL DAYS menu.
- If you do not want all days of the week to have the same program schedule (e.g., weekdays different than weekends), you can now scroll down and change the program times for certain days by positioning the indicator arrow beside the program time to change and using the + or – button to increase or decrease the scheduled program time.

When the program times have been set for all days, press the Home button to leave the programming menus and return to the Home Page display. All settings take effect immediately.

NOTES:

1. Schedule times are in 15-minute intervals.
2. To have the AQ251 ignore a program change (and therefore keep the previous program's setpoint temperature), position the cursor beside the period to be ignored and press the OK button. The AQ251 will display "--:--" beside that program and, when operating, will continue with the previous program's setpoint until the next program change.

STATISTICS

This sub-menu provides information about system activity and mix valve cycle counts. See Fig. 3 on page 8 for an illustration of the statistical data that can be displayed.

TROUBLESHOOTING

Power Disruption

The AQ251's system and thermostat (zone settings) parameters are stored in non-volatile memory and are updated as they change.

When a power disruption or loss of power occurs, the system configuration is retained in memory.

When power is restored, the AQ251 Control Panel enters auto-detection mode, reads its previously-stored settings, and initializes all AQUATROL network components according to their saved parameters.

POWER DISRUPTION GREATER THAN 4 HOURS

If a power disruption lasts for more than 4 hours, the AQ251 will have discharged its internal super capacitor, and the DATE and TIME OF DAY settings will need to be reset.

Upon restart, the AQ251 displays its clock settings as: YEAR = 2008, MONTH = JAN, DATE = 1. The message PLS SET DAY/TIME displays. This displayed message continues until the DATE and TIME OF DAY are updated.

NOTE: If the power failure parameter is set to Backlight (USER MENU > PREFERENCES/TIME), the LCD backlight flashes repeatedly, along with the message.

The AQ251 remains permanently in OCCUPIED (or Comfort) mode until the DAY and TIME OF DAY are updated.

System Status and Error Codes

System status alerts and error messages display on the System Status Page. These messages are shown in Table 2.

Table 2. LCD Status Notices and Error Messages.

LCD Display	Parameter	Meaning
A/C MIN. OFF TIME	n/a	The A/C compressor is disabled, because the minimum OFF time has not yet elapsed.
A/C MIN. ON TIME	n/a	The A/C compressor is active and the minimum ON time has not yet elapsed.
AUX IN EM. SHUT	n/a	Auxiliary Input's Emergency Shut Down is active.
BOILER:	EM SHUT	Boiler is disabled, because the AQ251 is in Emergency Shut Down mode.
	FRZ PROT	Boiler freeze protection activated: <ul style="list-style-type: none"> • Communication between Control Module and Zoning Module has been lost for more than 1 minute or • Boiler supply temperature is less than 50°F (10°C)
	HEAT DHW	Boiler is active to serve DHW.
	HEATING	Boiler is active to serve zones.
	IDLE	Boiler is not active.
	INIT	Boiler contacts (terminals 22 and 23) on the AQ1520, which are connected to the boiler's T-T terminals, have been shorted and the boiler is beginning its firing sequence.
	INST PURG	Boiler is active while the AQ251 is conducting the PURGE operation in the Installer Setup.
	NSTALL	Boiler is in ready mode during Installer Setup.
	PMP EXER	Boiler is disabled while the AQ251 is exercising all pumps and valves connected to the AQUATROL network.
	POST PURG	Boiler is active with Post Purge operation and is sending the purged water to the Boiler (Primary) loop.
PURGE DHW	Boiler is active with Post Purge operation and is sending the purged water to the DHW tank.	
CALL FOR COOL	n/a	At least one zone with a programmable thermostat requires cooling.
CALL FOR DHW	n/a	The DHW requires heat.
CALL FOR HEAT	n/a	At least one zone requires heat.
CWSD ACTIVE	n/a	Zone calls for cooling are not served because CWSD (Cold Weather Shutdown) is in progress.
DHW DISABLE	n/a	DHW call is not served because it is disabled.
LOST ZONE A-1 ... LOST ZONE D-16	n/a	Lost communication with a zone (A-1 to A-16, B-1 to B-16, C-1 to C-16, or D-1 to D-16).
NO DHW PROBE	n/a	No DHW sensor connected or it is defective.
NO OUTDOOR PROBE	n/a	No outdoor sensor connected or it is defective.

Table 2. LCD Status Notices and Error Messages. (Continued)

LCD Display	Parameter	Meaning
NO RETURN PROBE	n/a	No return sensor connected or it is defective.
NO SUPPLY PROBE	n/a	No supply sensor connected or it is defective.
SHORT CYCLE PROT	n/a	There is a call for heat, but less than two minutes have elapsed since the last firing of the boiler (prevents short cycling).
VALVE INIT	n/a	Motorized mixing valve controlling the secondary loop is being initialized and repositioned (opening or closing) to meet the secondary loop target temperature.
WATER READY	n/a	Boiler Supply Water temperature is at or above the target temperature calculated by the AQ251.
WWSD ACTIVE	n/a	Zone calls for heat is not served because WWSD (Warm Weather Shutdown) is in progress.

When a new AQ2000 component is connected on the AQUATROL network, its settings are communicated to the AQ251's Boiler Control Module (AQ1520M0) within 10 seconds of being connected. If the component is an AQ1000 thermostat, the setpoints for that zone thermostat can be modified from the Boiler Control Module as soon as it is recognized by the Control Module.

When an AQ thermostat is disconnected from the AQUATROL network, a message displays on the System Status page of the AQ251 indicating "Lost Zone A-xx", where "xx" is the specific identity, or address, of the lost zone. This helps the servicing contractor quickly identify the lost zone and fix its wiring, to re-establish communication with the Control Module.

USER MENU STRUCTURE

Press the Menu button on the keypad to display the User Menu. Fig. 3 illustrates all possible User Menu selections.

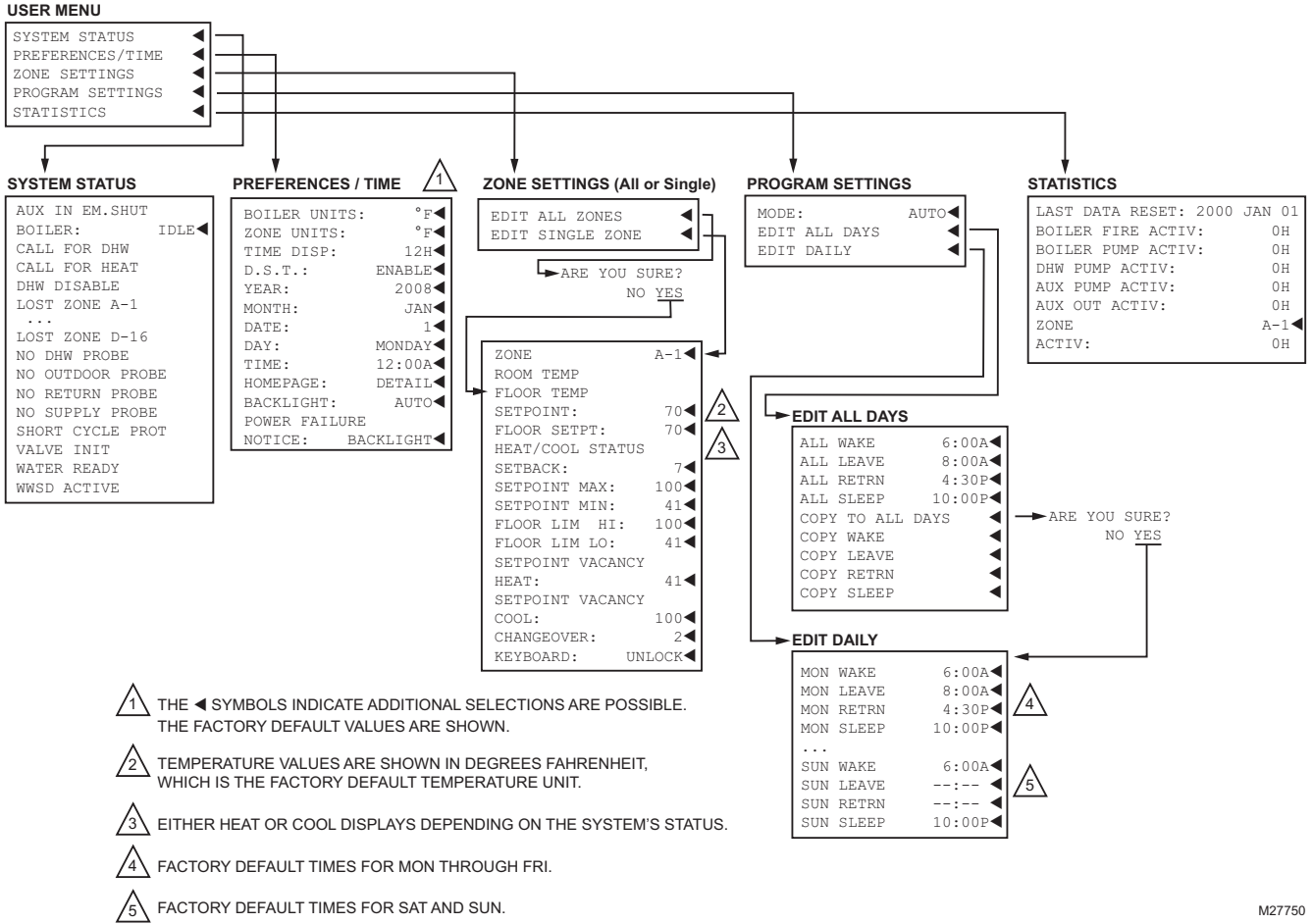


Fig. 3. User Menu Structure.

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