



TRIAD Boiler Systems, Inc.

**Series 8900 DHW Control Panel
Operation and Installation Manual**

**For Domestic Hot Water or
Low Temperature Applications**

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SECTION 1: INTRODUCTION

This manual explains the operation, installation and control of domestic hot water TRIAD Boilers using the Series 8900 DHW Control Panel. This manual provides information needed to operate the panel and fine tune the system depending on the hot water requirements.

The panel comes complete with a sensor, sensor housing, wall mount control panel housing with lock, and a 5 year limited warranty. All functions are microprocessor controlled for reliability, repeatability, and flexibility.

We have taken care to make this manual as easy to understand as possible, and to anticipate common questions that might be asked. However, please feel free to call us or your TRIAD Manufacturer's Representative with questions, ideas, or suggestions.

KEYPAD WITH ENTRY PROCEDURES

The control panel is operated by Entry Codes, which are simple two digit numbers that provide the panel instructions. The control panel has a keypad and a set of 6 display LED's. A code is entered by simply pressing any of the two digits on the keypad, which will then cause two LED's on the far left of the panel to light up in the order of the keys pressed. You must wait for the Entry Code in the display to begin flashing before entering the desired temperature, value, code, etc.

1	2	3
4	5	6
7	8	9
*	0	#

The simple steps are as follows:

1. Press the appropriate two digit Entry Code.
2. Wait for the Entry Code in the display to begin flashing.
3. Enter the desired temperature, value code, etc.
4. Press the pound sign # to save the displayed entry.

Press the star sign * to abort an unwanted entry to prevent it from being saved and to revert back to the last display code viewed. To discontinue the entry procedure, press the star sign to start over.

STARTUP PROCEDURES:

To bring the Series 8900 DHW Control Panel online, the following three steps must be completed:

1. Code 61 is used to lock or unlock the system. Press 61, and when it begins to flash, enter 6682 and the display will indicate unl (unlocked) and then press #. If loc (locked) is displayed, press 61 again for unl to display.
2. Enter the code settings through the keypad.
3. Calibrate the sensors.

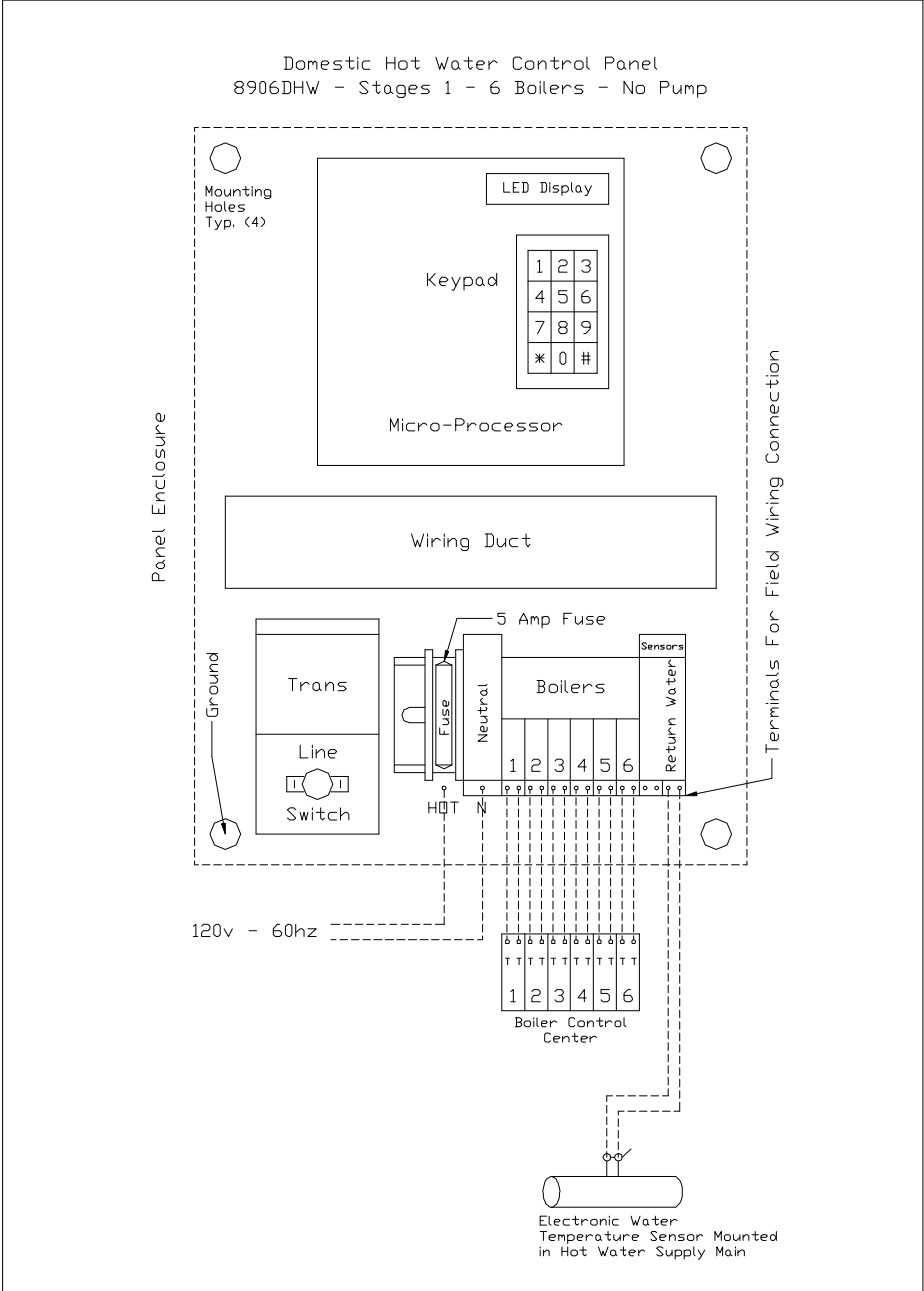
System shut down and start-up should be done through the keypad only, (by using Code 62) and NOT by shutting off power to the control panel. If the power to the panel is off for more than 30 days, all control settings will be lost. In the event of temporary power loss the panel has two built-in rechargeable batteries that will maintain the settings for up to 30 days. THE FIRST TIME THE PANEL IS TURNED ON THE BATTERIES WILL REQUIRE 48 HOURS TO TRICKLE CHARGE. The only time power to the panel should be shut off is when service is being performed.

Lock the system when you are completed with the initial settings, or any time you change the settings. The system display readings are always available, even with the keypad locked.

IF THE PANEL DOES NOT POWER UP, OR THE RED DISPLAY LED'S ARE NOT ON, REFER TO THE WIRING DIAGRAM AND INSTALLATION INSTRUCTIONS. ALSO, REFER TO "SENSOR TROUBLESHOOTING" at the back of this manual.

In the event of power loss or damage to the control panel the boilers will revert to self control. At that point each boiler will cycle on and off according to its high limit control. TRIAD recommends that in this situation the high limits be set at approximately 180°F.

WIRING DIAGRAM



SERIES 8900 DHW SPECIFICATIONS:

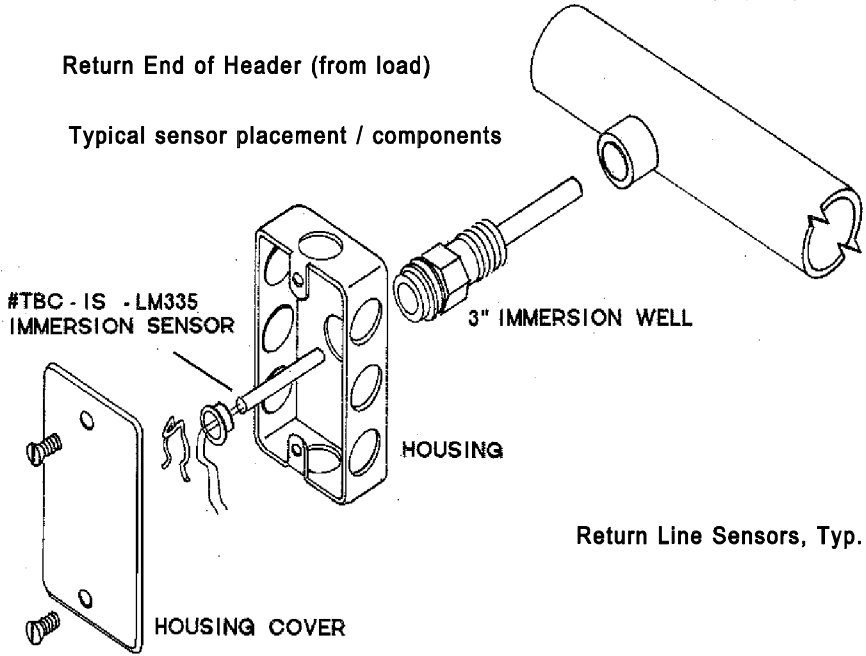
Sensor Specifications:

Sensor Input Range	-55°F to +230° F
Sensor Accuracy	Within + or – 1 degree Fahrenheit
Sensor Response	Full Scale Linear DC Voltage
Sensor Resolution	1°F
Power Requirements	5VDC (Supplied by Control Panel System)
Temperature Exposure Limits	-55°F to +280° F
Sensor Materials	Brass enclosed with pig tail leads
Housing Materials	3" Brass Immersion Well with Steel Electrical Junction Box, UL Listed and CSA approved.
Maximum Lead Length	250 feet. (Low Voltage 18 AWG Wiring)
Connection to Pipe	3.4" MNPT
Weight	1 lb.
Overall Dimensions	7" L x 4" W x 2" D

Control Specifications:

Dimension	14" H x 12" W x 4.5" D
Weight	20 lbs, including wall mount cabinet
Housing	Key lock front door, dust and splash resistant all painted steel construction.
Control Range	100°F to 230°F
Control Accuracy	Within 2°F
Measurement Range	-40°F to 230°F
Control Relays (Boiler Stages)	6, 12, 18, or 24 boilers can be staged. If a hot water pump is being controlled, then 5, 11, 17 or 23 boilers can be staged.
Avg. Power Consumption	3VA
Battery Protected Memory	Battery Back up for 30 days. Trickle charge over 18 hour cycle.
CPU	Industry standard Z80, 4MHz
Firmware	Proprietary TRIAD Boiler Systems Inc. Ver TRIM V3.1
Operating System Memory	8K EPROM
Serial Interface	1200 Baud standard TTL signal level. Can be interfaced with modem or direct connect to IBM compatible PC
Sensor Input Channels	One for Hot Water Supply Line/or Storage Tank
Relay Type	Coil 12VDC/"Dry Contact"
Relay Ratings	30VA, 24VAC
Power Requirements	120 VAC, 1Ph, 5 amps
Batteries	Two 1.2V sealed nickel-cadmium rated at 720 hrs. Standard charge 15 hrs at 18mA.
Display	Light Emitting Diodes

RETURN WATER LINE IMMERSION SENSOR:



LIMITED FIVE -YEAR FULL TERM WARRANTY

The Manufacturer warrants the equipment described as the Series 8900 Control Panel to be free from defects in material or workmanship under normal use and service. The Manufacturer's obligation under this warranty shall be limited to repairing or replacing any part of said panel, which the Manufacturer's examination shall disclose to its satisfaction to be thus defective, for a period of One (1) Year after date of original installation provided proper evidence of such installation is recorded at the factory and installation is in accordance with TRIAD design.

The Manufacturer further agrees that if the Series 8900 Circuit Board(s) shall be disclosed to the manufacturer's satisfaction to be defective under normal use and service during a period of Five (5) Years after date of original installation, a replacement Circuit Board will be furnished the owner free of charge, exclusive of any applicable federal, state or local taxes.

All repairs and/or replacements furnished shall be F.O.B. TRIAD's factory. The Manufacturer shall not be liable for freight, drayages installation and/or other labor costs and any other costs or expenses involved with direct replacement of the defective parts. Defective part failures covered by this warranty should be promptly reported to the Manufacturer. This Warranty voided if Panel sustains an excessive surge in primary or secondary voltage.

This Warranty is in lieu of all other warranties expressed or implied and of all other obligations or liabilities on the part of the Manufacturer, and the Manufacturer neither assumes nor authorizes any other person(s) to assume for it any obligation or liability in connection with the sale of said equipment or any part thereof. This Warranty will not apply to said equipment or any part thereof which has been subject to any accident, negligence, misapplication, alteration, abuse or misuse. Nor does it apply outside the boundaries of the United States.

SECTION 2: INSTALLATION AND SETTINGS

CONTROL PANEL LOCATION AND MOUNTING:

The panel must be installed indoors, mounted to a solid wall, and away from extreme heat (> 125°F) or cold (< 40°F), water, or physical shocks. It is preferable to locate it near a 110 VAC power source, near eye level, with 24" of clearance to allow the front door to open fully. Make sure the unit is installed as level as possible, with 3/16" bolts that will securely hold the 20 lb unit in place. See Diagram 1.

SENSOR LOCATION AND MOUNTING:

Material required includes high temperature pipe dope, 3/4" FNPT bushing, 18 gauge solid copper wire, and conduit or tie downs.

Locate a position on the hot water supply main beyond the hot water storage tank(s) but before any branches or "T's". Or locate the sensor so it is in contact with the hot water in a storage tank. The location should afford accessibility. The leads should be protected from water and excessive vibration. Do not locate the sensor more than 250 feet from the control panel. The leads can extend beyond 250 feet by bundling two sets of extension wires coming from each of the sensor leads.

Do not run sensor wires parallel to power lines or telephone lines. Use conduit and wiring per local code.

Install a 3/4" FNPT bushing, which can be located at the top or side of the mains pipe, or near the bottom third of the hot water storage tank. Insert the immersion well into the electrical junction box. Insert the temperature sensor into the immersion well, leaving the pig tail leads in the electrical junction box. Apply pipe dope to the male threads on the immersion well and thread tightly into the 3/4" bushing.

Attach low voltage solid copper wire, 18 gauge or heavier, noting and maintaining polarity. Feed wire through 1/2" conduit, or secure with tie downs, and run it back to the control panel. See Diagram 2 and 3.

OUTDOOR AIR TEMPERATURE SENSOR:

None Required. Simply jumper the terminals on S1 with wire. Improper operation will result if a sensor is attached to these terminals.

POWER SUPPLY WIRING:

Connecting the panel to a power source of 120VAC is accomplished by field wiring (14 gauge minimum) to the leads provided. Please note that the required amperage is 5 amps. Conduit and wiring requirements must follow local code. See Diagram 3.

BOILER CONTROL WIRING:

Follow the boiler wiring shown and refer to the TRIAD Boiler wiring diagram in the Boiler Operations and Maintenance Manual to identify the control wiring on the boiler. Wire these control connections according to local electrical code. See Diagrams 5, 6 and 7.

Wire AC power to the boiler according to the Boiler Operation and Maintenance Manual supplied with the boiler.

SENSOR CALIBRATION

Correct calibration of the sensor is very important so the control panel receives the accurate information necessary to properly control the building temperature.

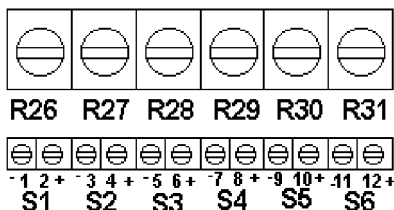
Temperatures are monitored by passing a very weak electrical current through the sensor and back to the control panel. The resistance to this current changes when the temperature around the sensor changes, which is interpreted by the panel as an increase or decrease in temperature.

The supply line temperature sensor used in this control panel has a linear output. Calibration to a single point will ensure accuracy throughout its range. The sensor and the panel must be re-calibrated whenever a new sensor or panel is installed.

Calibrating the sensors requires an accurate digital thermometer, a small non-magnetic flat screwdriver, a medium non-magnetic flat screwdriver, and a small crescent wrench.

PLEASE NOTE THAT THE SERIES 8900 DHW CONTROL PANEL MUST BE TURNED ON FOR AT LEAST 15 MINUTES BEFORE ATTEMPTING CALIBRATION.

Remove the main circuit board cover by loosening the two screws on either side of the cover and pulling it straight off. The sensors should be wired up to the sensor terminal strip.



Press entry Code 12 to display the Return Water Line temperature reading from the sensor. Then take a reading of the water in the supply line or tank with the thermometer and compare it to the reading on the control panel.

Carefully rotate the screwdriver slot on the potentiometer R27 until the temperature shown on the display (Code 12) matches that shown on the thermometer. The sensor is now calibrated.

It is important that you also become comfortable with the correct way to set Code 40, which determines the firing sequence of the boilers. See Section 7 for detail on this.

RECOMMENDED SETTINGS

The periods in which the boilers are on should occur with a minimum cycle of 30 minutes. The total “on” time is controlled by comparing the Supply Line Temperature and the Rate of Change Factor. If the Supply Line Temperature is below the control panel setting, the boilers will be staged on until the correct temperature is reached. The Rate of Change Factor determines the speed at which the boilers are turned off or on.

When system operation shifts from Comfort Mode to Setback Mode, the Hot Water Temperature Control Setting is decreased to save fuel during those times when the building is unoccupied or has very little hot water demand.

COMFORT MODE:**OUTSIDE CUTOFF TEMPERATURE SETTING:**

Triad recommends an initial setting of >55° F. When S1 is shorted, the control panel believes the outside air temperature is -40° F, which fools the panel into thinking there is always a call for heat. Thus, the panel will only rely on the Supply Water Temperature Control Setpoint and the Supply Water Temperature sensor input for staging the boilers to achieve the setpoint.

MINIMUM WATER TEMPERATURE SETTING:

Typically this setting should be <110° F. This should be lower than the anticipated setback temperature.

MAXIMUM TEMPERATURE SETTING:

Set this to the temperature desired for the hot water storage tank, but typically <140° F

RATE OF CHANGE SETTING:

This is the speed at which the panel cycles through a boiler firing sequence to decide whether more boilers should be turned on or off. A high number (2.00 maximum) results in shorter firing cycles (less efficient) but quicker responses to changes in hot water demand. A low number (0.01 minimum) results in longer cycles (more efficient), but slower responses to changes in hot water demand. A lower number can also result in larger “over-shooting” and “under-shooting” of the setpoint. TRIAD recommends starting at 0.5. If hot water runs out during peak demand periods, increase the rate of change factor. If the boilers frequently short cycle, and there is always plenty of hot water, adjust the factor down.

SETBACK MODE:

OUTSIDE CUTOFF TEMPERATURE SETTING:

No change.

COMPENSATION FACTOR:

No Change.

LENGTH OF MORNING BOOST:

The recommended initial setting is 60, so when the system returns to the Comfort Mode from the Setback Mode, the boilers will be activated and remain on for 60 minutes, or until the Hot Water Temperature Setpoint is achieved.

HOT WATER HEATING SETBACK TIME AND GUIDELINES

Setback savings may be attainable when the building is empty or all occupants are asleep. Do not be too aggressive about setback functions. The schedules of the occupants can be unpredictable, and comfort should never be compromised.

In buildings that lack occupancy for regular time periods, the benefits of setback are obvious. However, remember that the hot water storage tank must have adequate time to return to a normal temperature after the setback period. Be conservative with the initial settings to prevent occupant complaints.

THE ORDER OF BOILER STAGING:

Number the boilers according to the boiler control relay terminal, and then select the sequence in which they will be staged. Initially, boiler 1 is stage 1, boiler 2 is stage 2, etc. In the display, the first two digits are the stage and the last two digits designate the boiler number.

SECTION 3: ENTRY CODES

Below is a quick reference table showing the codes used to set up the control panel's basic operation. The codes should be entered in the order listed below, then perform the sensor calibration exercise.

CODE	FUNCTION
60	This code starts the sequence for the "60" codes.
62	This code displays the System Mode, which tells us that the boiler system is either ready to heat or is shut off. Press 62 then press 0 (for System Off) or 1 (for System On).
63	This code manually overrides the control panel to control the boilers directly. Press Code 62 first, and enter 0, then press Code 63 and enter the number of the boiler you want to fire.
65	This code allows for the panel to control the system primary pump. After entering code 65, entering 0 shuts the pump off, entering 1 starts the pump, and entering 2 automatically cycles the pump. In the automatic cycle mode, the pump starts and stops along with the boilers according to the system shutdown temperature chosen in code 21. Please note that the pump starter must have an Automatic Reset.
66	This code controls the temperature setback feature. When 66 is entered, the display will show 0 or 1. Press 0 to turn it off, or press 1 to turn it automatically on.
67	This code displays the 24 hour (military) clock. Press 67, enter the hour and minutes, and press # to save. Remember to reset this for Daylight Savings Time.
68	This code displays the day of the week and the day of the month. Press 68, enter the day of the week and press #, then enter the day of the month, 01 to 31, and press #.
69	This code displays the month and year. Press 69, then enter Month, 1 to 12, and the year, 01, 02, 03, etc. Then press #.
81	This code selects setback override in minutes, with a range of 1 to 240 minutes.
20	This code starts the sequence for the 20 codes.
21	Because this is a DHW panel, set this code at 55° F, which will fool the panel into assuming there is a constant "call for heat" so the panel uses the Return Water Temperature to stage the boilers
22	This code sets the Minimum Supply Water Temperature. TRIAD recommends a setting of 110° F, even though the system can handle a range of between 50° F to 190° F.
23	<u>Ignore this code.</u>

24	This controls the Rate Of Change Factor, which determines how quickly the boilers are brought on line or dropped off line. The Rate Of Change Factor simply indicates the <u>speed</u> of the counter in code 17 (which counts to 100 and is described in Section 6). The range of code 24 is between .01 to 2.00 seconds. For example, a setting of 1.00 will be a 100 second delay, a setting of 2.00 will only be a 50 second delay, because the timer is counting up to 100 by two's (twice as fast). TRIAD recommends starting with setting at .10.
26	This code tells the panel how many boilers it will control, up to a maximum of 24.
27	This code sets the Maximum Return Water Temperature, with a range of 100° F to 225° F. To activate, press 27, input the desired Design Return Water Line Temperature, and press #. TRIAD recommends a setting of around 140° F. When in Setback Mode reduce this set point to 120° F.
28	<u>Ignore this code.</u> It has no impact because this is a domestic hot water panel.
30-37	This code allows for temperature set-back when the building is empty. Code 30 sets back the temperature for the same time for all 7 days of the week, and codes 31 through 37 will set back the temperature on a specific day or days, with 31 for Monday, ending with 37 for Sunday. Typical setback is around 20° F. Enter code 30 first, and then use the other numbers to override only the specific days you need to change.
40-42	These codes determine the boiler firing sequence. <u>Please read section 7 for a complete description of this function prior to setting the control panel.</u>

SECTION 4: MONITORING CODES

Monitoring codes display the information programmed into the control panel, such as what temperatures it was asked to maintain, what temperature setbacks it was instructed to use, and any other customized settings.

The difference between Monitoring Codes and Entry Codes is that Entry Codes allow us to enter items such as the time, dates, setback, etc. through the keypad, while Monitoring Codes allow us to display what was entered.

CODE	DISPLAY
10	This code begins the automatic monitoring of the first nine codes. When code 10 is entered, the control panel will sequence through codes 11 to 19, displaying each for 3 seconds before moving to the next one.
11	This code displays the Outside Air Temperature, which should always read -40° F.
12	This code displays the current Return Water Line temperature.
13	This code displays the day of the week and the 24 hour military time clock, alternating between the two.
14	This code calculates the required Return Water Line Temperature using the Outside Temperature, the Ratio that was entered, and other information within the processor. Codes 12 and 14 are usually very close.
15	In this code, the panel checks the values of Codes 11, 12, 27, and 28, to calculate the Outdoor Reset Ratio. This automatic function can be overridden via code 23.
16	This displays the heating system status by using twelve horizontal display LED's that indicate which functions are operating. Each light correlates to a function, as shown below:

BOILER ON NA SYSTEM PUMP	SYSTEM MODE NA SYSTEM ON	AUTO SETBACK NA NA	NA NA SETBACK OVERRIDE
--	--	--	--
--	--	--	--

17	This code allows you to monitor the computer. When viewed, this code will be counting up to 99.00. When 99.00 is reached a boiler is either brought on line or dropped off line. The <u>speed</u> at which the computer counts up to 99.00 is based on the Rate Of Change Factor entered in code 24.
18	This shows the last boiler that has come on, and for how many minutes it has been running.
19	This indicates which boiler(s) are currently running. It rotates as you watch, showing each boiler number.

90	This code, and the ones that follow, are all time clocks, providing elapsed running time since the boilers were originally installed. Press Code 90 to start the display.
91	This code allows you to pick which boiler to check the elapsed time on. To view boiler # 5 enter 91, and then 5. Then the panel will automatically go to code 92.
92	This code shows the total number of <u>hours and minutes</u> that a boiler has run since it was installed up to a maximum of 23 hours, 59 minutes. When 24 hours have accumulated one day is automatically added to code 93. Press # to view code 93.
93	This code shows the total number of <u>days</u> a boiler has run since it was installed up to a maximum of 9999.

You can clear the accumulated time for all boilers and start over at time zero by entering code 91, then entering 99, and pressing the # sign. This is useful when boiler maintenance is planned. By zeroing out the elapsed time after a maintenance procedure, you now have a timer that can count upwards to the point when maintenance must be done again.

NOTE: WHEN THE KEYBOARD IS LOCKED, ALL CODES CAN STILL BE VIEWED.

OTHER IMPORTANT ITEMS:

The panel has two rechargeable batteries that will retain all stored information for 30 days if the power goes out for any reason.

If the control panel fails for any reason, or is accidentally unplugged, the boilers automatically come on and are then controlled by their own high limit switches. Thus, the system will never be out of heat because of panel failure.

SECTION 5: SENSOR TROUBLESHOOTING

The wiring within the control panel from the Terminal Strip For Field Connections to the sensor input terminals on the circuit board are completed at the factory.

Inside the panel is a second set of wires from each sensor to the "Terminal Strip For Field Connections" that is generally completed by the electrical contractor.

Each pair of wires from a sensor is connected to the terminal strip inside the panel (for field wiring) and from there to the sensor input terminals on the circuit board. Below is a list of where the wires for each sensor are attached and the code that allows you to read the temperature.

SENSOR LOCATION	INPUT TERMINALS	ENTER CODE
Outside Sensor	S1	11
Hot Water Supply Sensor	S2	12

GENERAL TROUBLESHOOTING

If the display is showing **Error Code 230**, either the sensor is bad or a wire is broken. To check the wire between the input terminals on the circuit board and the sensor itself remove the circuit board cover and, using the chart above, identify the correct sensor. With a small screwdriver, loosen the two terminals and gently remove both wires. With an Ohm meter, check the resistance (continuity) between the two wires. No resistance (continuity) indicates a wire is broken. The second test is to attach a good sensor to the terminal strip in place of the one removed. If the display now reads a temperature then the old sensor is probably bad and should be replaced.

If the display is showing **Error Code -40**, the wires either have a short or the wires are reversed at the sensor input terminals. Each sensor has a positive wire and a negative wire that could have been reversed during installation. To test for this, remove the cover and reverse the wires. If the display now reads a temperature the problem is solved.

If the display still reads **Error Code -40** the wiring between the sensor terminal input and the sensor itself must be checked for shorts. Remove the wires from the terminal strip and, using an Ohm meter set at 1K, touch the Ohm motor leads together and adjust the needle to 1. Now touch the Ohm meter leads to the wires from the sensor. If the needle again goes to 1, or the end of the scale, the wires are shorted. If the needle only moves part way up the scale, the sensor is bad and must be replaced.

If you are adjusting a sensor potentiometer R26 through R31, and the display is not changing, make sure the correct monitor code for the sensor being adjusted has been entered. If the code is correct and the display still will not change, replace the sensor.

If the sensor has been replaced and the display continues to show the incorrect temperature, the control panel may be bad. Try a different sensor by switching them around on the terminal strip. If this still does not work, send the the board back to TRIAD for recalibration.

SECTION 6: ERROR CODES

Error codes are the way the control panel indicates if there are any system problems or faults.

DISPLAY	EXPLANATION
230	If this is displayed after entering any of codes 11, 12, 73, 74, 75, or 76, then you have an Open Sensor, which means the sensor is bad, or the wire connected to the sensor input terminal is broken. See Section No. 5, Sensor Troubelshooting to test.
-40	If this is displayed after entering any of codes 11, 12, 73, 74, 75, or 76 then you have either a bad sensor, or the polarity at the sensor input terminals is reversed. See Section No. 5. Sensor Troubelshooting to test.
CODE N.A.	This will display if you attempt to enter a code the panel does not recognize. Make sure you are using a valid code.
OUT OF RANGE	Some codes have limits. For example, code 26 tells the panel the number of boilers in the system. The maximum number it can operate is 24, so if 25 was entered the display would read "out of range".
PROG LOSE	This display, which means program lost, could be an indication of any of the following: <ol style="list-style-type: none"> 1. The first time the control panel is powered up PROG LOSE may flash. Press * (star) to reset the computer and then proceed with entering the codes. 2. If pressing * (star) does not clear the display, the E- PROM chip may be bad. Contact your TRIAD service representative or TRIAD Boiler Systems for a replacement. 3. If the replacement of the E-PROM chip does not solve the problem. the batteries may have gone bad. In this case the computer will have to be returned to the factory for service.

Replacement of E-PROM Chip:

The E-PROM Chip can be replaced if (i) it fails or (ii) to update the program and keep it tailored to the heating system.

THE E-PROM CHIP HAS A NOTCH ON ONE END. WHEN THE CHIP IS INSERTED INTO THE SOCKET IT IS CRITICAL THAT THIS NOTCH LINES UP WITH A MATCHING NOTCH ON THE RIGHT SIDE OF THE SOCKET. INSERTING THE CHIP WITH THE NOTCH TO THE LEFT WILL PERMANENTLY DISABLE THE E-PROM.

To insert the chip in the socket, gently rest the upper pins in the upper sockets without applying any downward pressure, and then insert the lower pins into the lower sockets. DO NOT FULLY INSERT THE PINS! With all pins properly alligned, place your fingers behind the circuit board to prevent it from bending, and your thumbs on the top of the EPROM. Apply slow and even downward pressure with your thumbs until the pins are snugly seated.

SECTION 7: ENTRY CODE DETAILS

This section provides more detail to better understand the control panel Entry Codes.

ENTRY CODE 21: OUTSIDE TEMPERATURE SETTING

PRESS + = ENTRY CODE

ENTER YOUR CHOICE

PRESS = SAVE KEY

FOR AN OUTSIDE TEMPERATURE SETTING OF 55°F.
THE AVAILABLE RANGE IS + 0°F to + 120°F

The outside temperature is not used to cycle boilers in a domestic hot water application. The panel is manufactured to only use the return water temperature. So when this code is set at 55°F the panel is fooled to behave as if there is a constant call for heat based on the outdoor temperature.

ENTRY CODE 24: RATE OF CHANGE FACTOR

PRESS + = ENTRY CODE

ENTER YOUR CHOICE

PRESS = SAVE KEY, FOR A RATE OF CHANGE FACTOR OF .10.

THE AVAILABLE RANGE IS FROM .01 TO 2.00

This code allows you to set the speed of the counter that was explained in code 17. The Rate of Change Factor directly influences how fast or slow boilers are brought on line when heat is called for. If boilers are brought on line too quickly, a waste of fuel can result due to too many boilers running and short-cycling. Too long a count between boilers may result in unsatisfactory heat to the building. Triad recommends an initial setting of .10. The lower the factor, the longer (slower) the response time of the boilers, and the higher the factor, the shorter (faster) the response time.

ENTRY CODE 26: NUMBER OF BOILERS TO BE CONTROLLEDPRESS + = ENTRY CODEENTER YOUR CHOICE PRESS = SAVE KEY, TO CONTROL 24 BOILERS.

THE AVAILABLE RANGE IS FROM 1 TO 24

ENTRY CODE 27: DESIGN RETURN WATER TEMPERATURE SETTINGPRESS + = ENTRY CODEENTER YOUR CHOICE PRESS = SAVE KEY, TO SET DESIGN RETURN WATER TEMPERATURE.

THE AVAILABLE TEMPERATURE RANGE IS +100°F TO +225°F

This sets the Design Return Water Temperature. It is Important to set this code correctly because many of the panel's calculations are based on this figure. Usually the system design engineer will have already calculated this. However, if you do not know the proper temperature simply use 180°F.

ENTRY CODE 30 – 37: WATER TEMPERATURE SETBACK SCHEDULESPRESS + = ENTRY CODE FOR ALL 7 DAYS OF THE WEEK ALL 7 DAYS THURSDAY MONDAY FRIDAY TUESDAY SATURDAY WEDNESDAY SUNDAY

SETBACK TIME ON AND TEMPERATURE SETBACK = 9:00 PM, 5°F SETBACK

FIRST SETBACK OFF-TIME = 6:00 AM, 0°F SETBACK

PRESS = SAVE KEY

This code programs water temperature setback schedules for either the entire week or for each day of the week. This feature is primarily used at night, or whenever the building is empty.

The control panel uses 24 hour military time. Choose the hour (on the hour) for setback to begin, say 9 p.m., or 1800 hours in the example above. Then enter how much you wish to set back the temperature, which can be anywhere from 1 to 99 degrees. The example above assumes 5°F. After setting the setback "on time" and the degrees to be setback press the enter key (#). When the # is pressed at the end of each entry, it not only enters the values into program memory, but also advances the display to the next slot.

Next, input the time to turn the setback off and return to normal running conditions. In this example we are assuming 6:00 a.m. The panel now knows to lower the water temperature by 5 degrees at 9 p.m. and return to the original temperature at 6 a.m. An important feature of the panel is that it begins the warming process two hours prior to the programmed time. Thus, the panel will begin monitoring both the outside and return line temperatures at 4:00 a.m. to determine the most fuel efficient way to reach the desired water temperature by 6:00 a.m..

Each of the codes 30 through 37 has availability for four (4) complete on and off setback schedules per 24 hours. Remember that code 30 sets the time for all 7 days of the week and 31 through 37 sets each individual day for its own setback. A simple way to customize certain days is to input the times and temperatures that will be the same for the most of the days into the 30 code, and then enter the times and temperatures that will be different into the appropriate entry code(s) 31 through 37. The values entered into the 30 code are saved in program memory, but a specific entry into a specific day will override the 30 code entries for that day.

To eliminate the entries in codes 30 through 37 simply enter 9999, then press #.

Please note that codes 30 through 37 are used for scheduling purposes only. In order to activate the automatic operation of the setback times and temperatures, another entry must be made into entry code 66.

ENTRY CODE 40 – 42: STAGE /RELAY /BOILER ACTIVATION (ON)

These codes determine the boiler firing sequence.

The Series 8900 DHW control panel can have up to 24 stages, and thus could control up to 24 boilers because each code 40-42 can handle 8 stages. Inside the control panel enclosure is a terminal strip that is connected to the boiler wiring and sensor wiring. For each boiler there is

an on/off relay (mounted under the panel cover or on the inside of the enclosure) which closes to fire a boiler and opens to shut off a boiler.

Your mechanical contractor should have numbered the boilers to correspond with the numbers on the terminal strip. If not, use Code 63 to manually activate boiler No. 1. If it won't fire then rewire the terminal strip so relay 1 fires boiler 1, relay 2 fires boiler 2, etc. The sequence in which the boilers fire is important from both an efficiency and maintenance standpoint.

Now, assume a system has 12 boilers. To sequence them, go into Code 40 and enter a 1 to represent the first stage to fire when there is a call for heat. (See example No. 1).

Then enter a "blank" or zero (0) to simply separate the stage number from the boiler number.

Then enter a 1 so the first stage called on will fire boiler number one. The display LED's should resemble example one. If not, enter 9999 and # to start over.

When # is pressed, the display will clear and show you 40 0000. This means that the information related to stage 1 was saved and you have been bumped to the second slot. There are eight slots in each code 40 through 42. If you forget where you were or get confused, simply press *, which will take you out of the 40 codes and back to the last code monitored. Enter Code 40 again, and then repeatedly press # until you find your place. Each pressing of # moves you to the next slot.

Example 1:

ENTER CODE "40"					
DISPLAY WILL SHOW	4	0	0	0	0
ENTER STAGE "1"	4	0	.	1	
ENTER A BLANK "0"	4	0	.	0	1
ENTER BOILER NO. 1	4	0	1	0	1

PRESS # = SAVE KEY, TO HAVE BOILER #1 OPERATE AS THE FIRST STAGE.

To set stage 2 to fire the second boiler, you will enter 2 for the stage, then a 0, then a 2 for the second boiler. The display should read 40 2.02. Now press # to save that slot to memory. Again, the display will automatically bump you to the next slot with the display showing 40 0000 indicating you are in slot 3. The control panel will automatically go into the next slot. Continue to make your entries. Once the eighth boiler has been entered, all of the slots available in Code 40 have been used. Because there are still 4 more boilers remaining, simply press Code 41 and continue entering the last 4 stages.

Example 2:

4	1		9	0	9
4	1	1	0	1	0
4	1	1	1	1	1
4	1	1	2	1	2

PRESS = SAVE KEY, TO HAVE BOILERS 9 THROUGH 12 ENTERED.

Changing The Lead Boiler Firing Sequence:

After a boiler has been in the number 1 position for a year, it will have accumulated more firing time because it is always first to fire and last to go off, so it is recommended that the lead boiler be changed once a year. Generally, the position of the lead boiler is moved to the next boiler down the line. So, in Code 40, simply change boiler 2 to be in stage 1, boiler 3 to be stage 2, boiler 4, stage 3, etc., until finally, in Code 41, boiler 1 will be stage 12.

ENTRY CODE 61: KEYBOARD LOCK - UNLOCK

PRESS + = ENTRY CODE

PRESS + + + = TO LOCK / UNLOCK

DISPLAY SHOWS

OR

PRESS = SAVE KEY

Code 61 prevents tampering with the entries by locking the panel. When code 61 is entered, the display will show either "loc" or "unl". If loc is displayed, the keypad can only be used to view the settings. If the display shows unl, the settings can be changed. It is recommended that the keypad be locked after each entry session.

ENTRY CODE 62: SYSTEM MODEPRESS + = ENTRY CODEDISPLAY SHOWS = OFFOR = ONPRESS = SAVE KEY

The system mode turns the boiler system off and on, and is commonly used to shut down at the end of the heating season and turn it on again in the Fall. When turning the system on, the panel takes over control of the boilers and in some cases the primary system pump. To use this code, enter 62, and the display will show either 0 or 1, meaning off or on, respectively. Then enter your choice and press # to save.

ENTRY CODE 63: MANUAL OVERRIDE OF BOILERSPRESS + = ENTRY CODEDISPLAY SHOWS ENTER YOUR CHOICE PRESS = SAVE KEY, TO SET OUTSIDE DESIGN TEMPERATURE.

THE AVAILABLE RANGE OF BOILERS IS FROM 1 TO 24.

The code allows for manual control of staging. During normal operation, the panel controls all the boilers. Code 63 will override that to control any boiler you choose. To use this code, you must first enter 0 in code 62, then enter code 63, then enter the boiler/stage you want to run. Remember to always press # after each entry.

This code turns off when a zero is entered and turns on when the number of boilers you want is entered. Thus, to give control of the boilers back to the panel, enter 0 to turn code 63 off, and enter a 1 to turn code 62 on. Code 63 is commonly used during maintenance or testing.

ENTRY CODE 65: MANUAL OVERRIDE FOR SYSTEM PRIMARY PUMPPRESS + = ENTRY CODEDISPLAY SHOWS = OFFOR = MANUAL ONOR = AUTOMATICPRESS = SAVE KEY

This code allows the system primary pump to be turned on, off, or put on automatic. The system primary pump circulates water from the boilers through the building. To use this code, enter 65, and then enter 0 or 1 to turn it off or on, respectively, which takes control of the pump away from the panel. Enter 2 to have the panel control the system pump. Please note that the pump must have an auto-reset feature to work with setting number 2.

ENTRY CODE 66: SETBACK - ON / OFFPRESS + = ENTRY CODEDISPLAY SHOWS = OFFOR = ONPRESS = SAVE KEY

This code turns the system setback feature off and on. Once this is turned on, then refer to codes 30 through 37 to actually set when and how much you want the temperature to decrease.

ENTRY CODE 67: 24 HOUR CLOCK - HOUR AND MINUTEPRESS + = ENTRY CODEDISPLAY SHOWS = 6:30 PM

This code allows you to set or observe the 24 hour military time clock. To set the clock, enter 67, then the hour, then the minute, then press #.

ENTRY CODE 68: DAY OF THE WEEK AND DATE OF THE MONTHPRESS + = ENTRY CODEPRESS = SEVENTH DAY OF THE WEEKPRESS = TWENTY-NINTH DAY OF THE MONTHPRESS = SAVE KEY

This code allows you to set, or observe, the day of the week and month. To set the proper day of the week, enter a single digit of 1 through 7 to represent Monday through Sunday, then enter two digits to represent the calendar day of the month and then press # to save.

ENTRY CODE 69: MONTH AND YEARPRESS + = ENTRY CODEPRESS = JUNEPRESS = YEAR 2001PRESS = SAVE KEY

This code allows you to set, or observe, the month and year.

ENTRY CODE 81: SETBACK OVERRIDEPRESS + = ENTRY CODEENTER CHOICE = MINUTES OF SETBACK

RANGE IS FROM 1 TO 240 MINUTES

PRESS = SAVE KEY

This provides flexibility to the setback schedule.

SECTION 8: TROUBLESHOOTING

THE BUILDING EXPERIENCES A POWER OUTAGE

In the case of a power outage, the control panel has two built-in rechargeable batteries that will power the memory for 30 days, allowing the panel to continue where it left off when power is restored. However, the boilers will not run without electricity, and the building has lost the hosting system until power is restored. Please note that the batteries require 48 hours to trickle charge the first time the panel is turned on.

THE RED DISPLAY LED'S ARE OUT

First check the breaker that feeds the control panel.

Next, make sure the switch in the panel is "on", and there is a good fuse in the fusestat. If there is a spare fuse in the panel enclosure, replace the fuse.

Pull the cover off the panel circuit board, and with a volt meter, check that there is between 9.8 and 10.5 VAC to the two "WALL XFMR" terminals (transformer terminals) on the control relay output terminal strip. If there is insufficient voltage, the power from the transformer to the circuit board has been lost. If you do have proper voltage, the control panel may be bad. Turn the panel off so the boilers will automatically revert to self control via their high limit controls and continue to supply the building with heat. Contact your TRIAD Service contractor or your TRIAD representative.

THE BOILERS ARE NOT OPERATING

First decide if the problem is with the boilers or the control panel by flipping the power switch off. The boilers should fire and maintain temperature through their own high limit controls. If not, the problem is with the boiler equipment. First check the power supply to the boilers at the breaker box. Next check the boiler fuel supply. If the problem is still not resolved, contact your TRIAD representative.

THE CONTROL PANEL IS DAMAGED

Turn off the control panel and contact your TRIAD service contractor or TRIAD representative.

THE BURNER WILL NOT COME ON DURING TESTING OF THE SYSTEM (CODE 63)

Be sure that the control panel is calling for the boilers by:

1. Making sure that 0 has been entered in code 62
2. Making sure that 1 has been entered in code 63
3. Making sure the high limit set points on the boilers have not been exceeded

THE CONTROL PANEL WILL NOT ACCEPT ENTRIES

Make sure the Keypad is unlocked in code 61.