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HELI FLOW
INSTALLATION & MAINTENANCE INSTRUCTIONS

WARNING: It is important to follow good start-up practices to avoid operational complications and potential system damage. Starting a steam system too quickly or using an improper sequence may lead to a potentially hazardous working environment. Lack of system maintenance over time can also contribute to this situation. It is imperative to develop proper start-up and maintenance procedures and train personnel on the importance of following them at all times. Consult a Watson McDaniel representative if questions arise.

CAUTION – All parts must be cool before assembly/disassembly. Piping depressurized.

Figure 1

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PRINCIPLES OF OPERATION

The Heli Flow is designed to efficiently harness the energy from steam to heat water for domestic or industrial use. The unit is designed to provide hot water on demand and eliminate the need for larger hot water storage tanks.

Steam Loop

Steam is supplied to the unit from the installation facility and sent through a strainer to remove any potential debris from entering the system. Either an electro-pneumatic or fully electrical control valve regulates the incoming steam based on the temperature requirements of the system. As the steam transfers heat via the heat exchanging tubes to the water in the shell, the steam cools and condenses. Condensate is discharged from the bottom of the unit through a steam trap or condensate pump.

Water Loop

The hot water outlet has a temperature sensor, RTD, which allows the Controller to respond to the demand for hot water by throttling the steam control valve. A recirculation pump loop feeds hot water down to the inlet of the cold water. This acts as a primer and allows the system to recover quickly after reduced demand for hot water. The PID controller monitors the temperature value and if it reaches above the set point, a valve will open allowing cold water from the inlet to mix with the hot water to achieve the user defined temperature

Common Operating Conditions

The Watson McDaniel Heli Flow is useful in many applications including building heating, industrial applications, medical facilities, and the food and beverage industry. The system can be manufactured to meet the needs that each industry specifically requires.

Parameter values for operation range significantly based on customer requirements, thus average values from previous Heat Miser & Heli Flow conditions are listed below for reference. For more specific capability information, contact a Watson McDaniel representative.

Table 1: Average Operating Condition Values

Water Flow Rate	100 GPM
Cold Water Inlet Temp	67 F
Hot Water Outlet Temp	147 F
Hot & Cold Temp Delta	80 F
Steam Load	3400 lb/hr
Steam Pressure to CV	30 psig
Steam Pressure to HX	12 psig

Note: CV is Control Valve and HX is Heat Exchanger

Table 2: Heli Flow Available Sizes

Code	Size	**Code**	Option
HF06	6"	**S**	Single Wall Tube Bundle
HF08	8"		
HF10	10"	**D**	Double Wall Tube Bundle
HF12	12"		

TYPICAL STEAM LAYOUT

Table 3: Heli Flow Assembly Components

ITEM	DESCRIPTION	MATERIAL
1	Base Frame	Carbon Steel
2	Heat Exchanger	Stainless Steel
3	Electric Steam Control Valve	Stainless Steel
4	Temperature Sensor	Stainless Steel
5	Air Vent	Stainless Steel
6	Control Enclosure, Integrated High Limit	
7	High Limit Butterfly Valve	Carbon Steel
8	Recirculation Pump	Stainless Steel
9	Hot Water Solenoid Valve	Bronze / SS
10	Temperature & Pressure Relief Valve	Bronze
11	Condensate Receiver	Carbon Steel
12	Pressure Motive Pump	Ductile Iron
13	Pressure Gauge	Stainless Steel

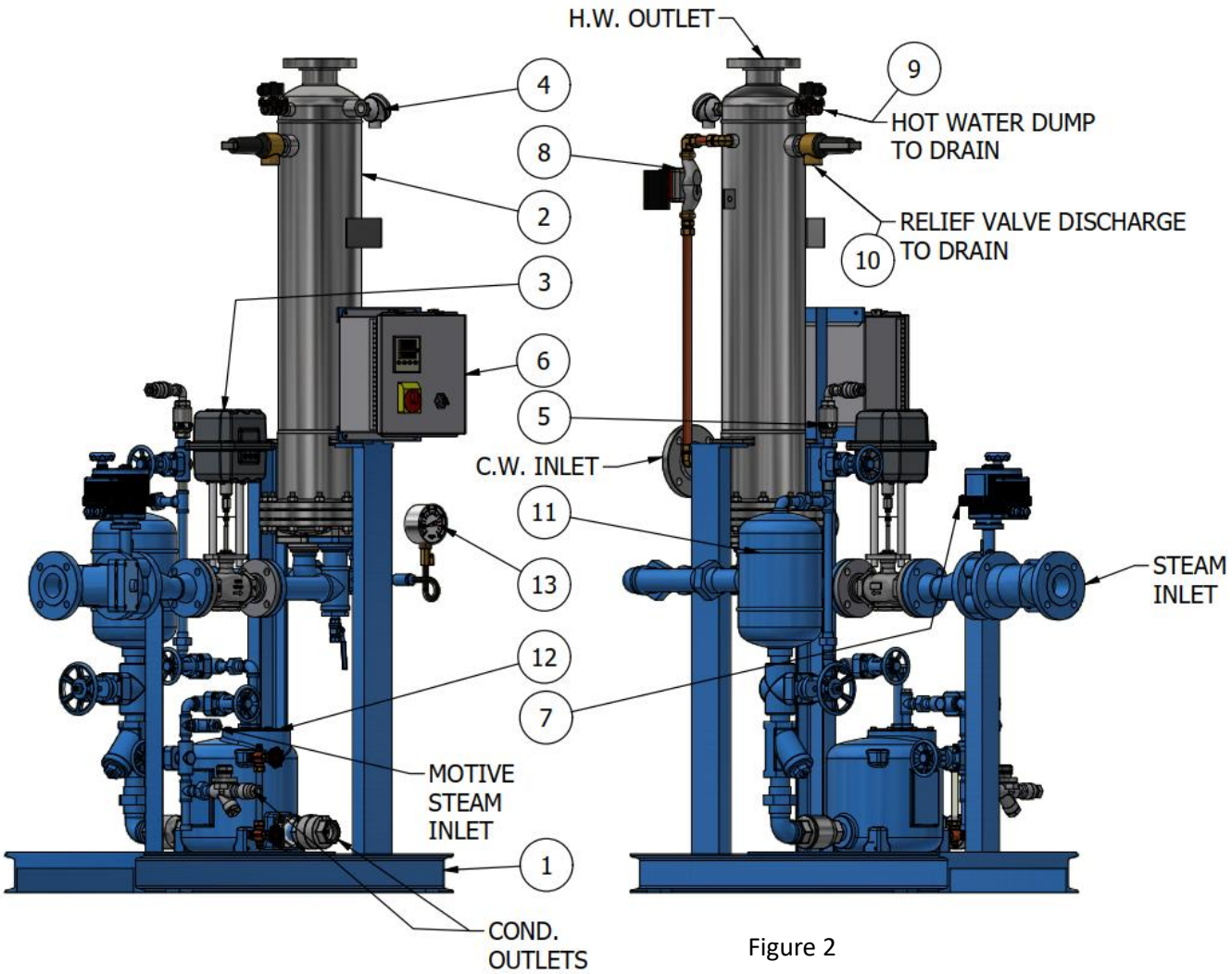

Figure 2

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INSTALLATION

Connections:

The Watson McDaniel Heli Flow utilizes primarily 150# class flanged and threaded NPT connections to attach steam lines, water lines, and condensate return lines.

Steam

The steam inlet to the heat exchanger is generally a 150# flange ranging in size from 2-1/2" to 4". If a pressure motive pump is included in the system, there will be a 1/2" NPT steam motive inlet connection.

Water

The cold water inlet and hot water outlet connections will be either 2", 3", or 4", 150# flange connections depending on the model of shell and tube heat exchanger selected.

Condensate

The condensate drainage will generally consist of 1-1/2" to 2" NPT connections from the heat exchanger, depending on heat exchanger size. If a condensate pump is selected for the system, a 1/2" NPT condensate outlet will be piped from the motive drip leg. Depending on condensate flow rates, some systems can use a steam trap without a pump on the condensate piping line. Contact a Watson McDaniel representative for more information.

Cautions:

1. Read all instructions carefully and follow to avoid injury or damage to the system and personnel.

2. The installer should be trained and experienced with all necessary mechanical, plumbing and electrical responsibilities required for the tasks.

3. The system is recommended to be handled with a forklift in the pockets at the base of the frame. Avoid adding stress to piping during transport.

4. Piping will need to be adequately sized to handle the flow, velocity, and pressure requirements for the heat exchanger's application.

5. The unit should be installed indoors in a location that will allow complete access for maintenance.

6. Shutoff valves are strongly recommended near all connection points to the unit to allow isolation for maintenance.

7. To prevent condensate from possibly damaging the unit or pipe, an adequately sized drip leg with steam trap should be installed prior to the system.

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Instructions:

1. Main electrical power must be disconnected prior to installation to prevent electrical shock or equipment damage. Unit is recommended to be installed on a dedicated circuit.

2. Verify the steam supply is safely shut off.

3. After the unit is positioned properly and leveled, it must be secured to the floor using the four anchor bolt holes located on the frame skid.

4. Clean out existing pipes with steam or compressed air to remove mill scale and debris buildup. Buildup in the lines could cause damage to the heat exchanger system.

5. Additional components such as a High Limit shut-off valve and/or steam inlet strainer may ship loose. HL Valve shall be installed just upstream of the control valve. The strainer should be installed upstream but before the incoming steam isolation valve.

6. Verify the direction of flow is correct for each of the 4 connections. See Figure 2 for proper installation points for steam supply, condensate return, cold water inlet, and hot water outlet.

7. If a pressure motive pump is included in the system, a secondary steam connection, ½" to 1" NPT typically, will need to be installed at the inlet piping to the pump motive line. A strainer should also be installed before this motive steam inlet.

8. A pressure and temperature safety relief valve will be mounted on the outlet hot water line. Install a properly sized relief valve discharge line in case of release.

9. When installing the flange bolts, tighten evenly and in a star pattern. This will reduce stress and prevent the flanges from fracturing. Also ensure flange gaskets are correctly placed between faces.

10. 120VAC (typical) power should be connected to the main enclosure. Additional connections may need to be made if the control valve or HL valve ship loose. See Electrical Schematics (Figures 7 & 8) in the Heli Flow Configurations section or consult the factory for assistance.

11. If the system has a pneumatic actuator for the controls, connect air pressure to the positioner, I/P, or regulator mounted on the control valve assembly. The supply should be clean, dry air and regulated down to approximately 30 psig.

12. Inspect all connections to confirm everything has been installed correctly and all bolts are tight.

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START-UP

1. All valves in the installation need to be closed.

2. Slowly open the cold and hot water isolation valves.

3. Allow time for the unit to fill with water and check the water loop system for leaks. Shut down and repair as required.

4. Set the temperature for the Aqua stat high limit switch (if not equipped with a PID controller) by adjusting the dial with a small screwdriver. If equipped with a PID controller, set the temperature set point, see Controller Interfacing section TR893 & Nanodac (w/ BACNet) PID Controllers and Figures 3 & 4 for details.

   Note: This temperature should be set at or just above/below the actual desired water temperature to help prevent outlet water from overheating.

5. Open the gate valve before the steam trap or pump to allow condensate to drain from the inlet piping.

6. Open the isolation valve to the condensate return line downstream of the unit.

7. Slowly open the steam inlet valve, this includes the motive line if applicable and verify there aren't any water hammer conditions.

   Note: Do not allow condensate to collect while system is operational. Serious damage to the system can occur from water hammer.

8. Inspect for leaks throughout the system. Shut down and repair as required.

9. Open valve for the compressed air if equipped with a pneumatic control valve. Check the air pressure regulator for the control valve and confirm it is approximately 30psig.

10. Activate the electrical power to the main control enclosure and switch the circulator pump on.

11. If the High Limit Option is equipped, then adjust the alarm set point on the high limit controller see the High Limit Setup section and Figure 6 for details.

12. Verify that the High Limit Isolation Valve opens. The reset button may need to be pressed if the alarm is on.

13. Apply a demand for hot water. This can be accomplished by adjusting the set point temperature at the controller. Further reference to the High Limit Setup section may be necessary.

14. Confirm the displayed temperature has increased and that steam is flowing through the valve. The pressure gauge on the steam side should be reading a positive value.

15. Inspect the piping system for any leaks. Shut down and repair as required.

16. Auto Tune the controller by first applying a typical or full heat load demand to the system. See system equipped Controller Manual for instructions on complete setup. For abbreviated set up, reference the PID Controller Tuning Guide section.

17. Apply various heat loads to the hot water system to confirm that the system is functioning properly.

18. Test the high limit switch (is so equipped) and adjust the high limit switch down to a lower setting to confirm that the cold-water solenoid activates. Return the limit switch setting back to the correct value and confirm that the solenoid valve closes.

19. If equipped with a PID controller, still confirm cold water solenoid activation by adjusting temperature set point in the same manner as above.

20. If applicable, test the High Limit Option; adjust the alarm set point below the current water temperature. Verify the High Limit valve closes and verify that the reset button won't open the valve. Return the alarm set point to the correct value and verify that the High Limit Valve remains closed until the Reset Button is pressed. Once more, reference the section titled High Limit Setup for help.

21. Perform a final check of all piping and components to verify the system is tight and there are no leaks or other potential issues.

22. Upon completion of all checks the system may be released for operation.

MAINTENANCE

Proper maintenance is significant for proper operation of the heat exchanger system. Frequency of cleaning and maintenance performed are dependent on the conditions of the steam system.

1. Inspect all connections for leaks and tighten as required.

2. Blow down or clean all line strainers in the system.

3. Remove the tube bundle from the heat exchanger to properly remove any debris or build up, this is critical to ensuring proper performance. The tube bundle is easily removable and should be cleaned on a regular basis.

4. Verify the temperature is properly set and that the measured temperature is correct.

5. Inspect the circulation pump and ensure correct operation.

6. Adjust the high limit switch (if so equipped) down to a lower setting to confirm that the cold-water solenoid activates. Return the high limit value after inspection.

7. If High Limit Option is included, then check to verify the High Limit Valve closes when the water temp is too high, see High Limit Setup for details. Also verify that the Reset Button latches, the system cannot be reset until the hot water temperature is below the alarm set point.

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8. If equipped, check the air pressure regulator for the control valve and confirm it is around 30 psig.

Note: These maintenance operations should be performed a few days after the system has been initially installed and at least on an annual cycle, timing will depend on use and water quality. The customer is responsible for setting a timeframe based on their conditions.

CONTROLLER INTERFACING

Three primary PID controllers are available for the Heli Flow based on customer requirements and pricing. The following sections will display the features of the available controllers for the Watson McDaniel Heli Flow system. See following section for details. **Note that the touchscreen manual is a separate document, see 2768251 for details.**

TR893 Interface	Nanodac Interface	10" Touchscreen

TR893 Interface

Measured Value (PV)

Present measured valued (PV) is displayed on the screen group 0, basic screen and output display screens (OUT1 and OUT2) in red. Type of parameter is shown on each parameter screen. This will be the RTD measured temperature value in the case of the Heli Flow.

NOTE: Pressing parameter key simultaneously with the enter key in screen group 1 calls preceding screen onto display.

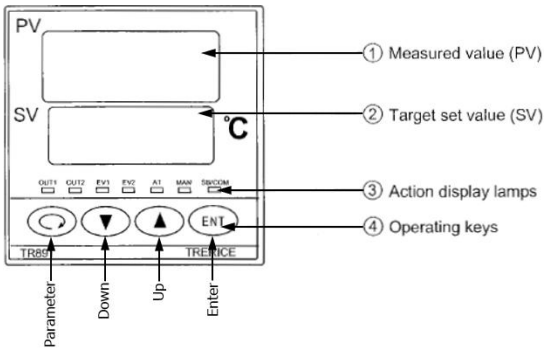

Figure 3: TR893 Controller Display

Target Set Value (SV)

Target set value (SV) is displayed on the basic screen of the screen group 0 in green. Present output value is displayed in % on control output monitor screens (OUT1 and OUT2) of the screen group 0. Selected item and set value are displayed on each parameter screen. This is how the user sets a temperature value for the Heli Flow system, SV should be just below or above desired temperature to ensure overheat does not occur.

Action Display Lamps

Control Output Indicators: (option) OUT1 and OUT2 (green) OUT1 lights when output turns on and foes out when off during contact or SSR drive voltage. Brightness changes in proportion to output increase/decrease during current or voltage output. OUT2 functions only if this option is added.

Event Output Indicators: EV1/EV2 (option) (orange) light when assigned events including heater break or loop alarm turn on if equipped.

Auto Tuning Action Indicators: AT (green) flashes when on is selected by up key on the AT action selection screen and AT is executed by enter key and goes out when AT terminates automatically or is released.

Manual Control Output Action Indicator: MAN (green) flashes when manual control output is selected on control output display screens (OUT1/OUT2); remains unlit during automatic control output.

Set Value Bias/Communication Indicator: SB/COM (green) Lights when optional set value bias function is added and at the time of shorting across SB terminal. Also, lights when optional communication function is added and COM mode is selected, goes out when Local is selected for communication mode.

Operating Keys

Parameter Key: When this key is pressed on any screen of the screen group 0 or 1 calls the next screen onto display. When pressed continuously for 3 seconds, this key functions to move between the basic screen of group 0 and the initial screen of group 1.

Down Key: When pressed on a parameter screen, the decimal of the rightmost digit flashes and the set data decreases or moves backward.

Up Key: When pressed on a parameter screen, the decimal of the rightmost digit flashes and the set data increases or moves forward.

Entry/registration Key: This is used to register a set data changed by means of the up/down key on a parameter screen. When pressed continuously for 3 seconds, this key functions to switch between automatic and manual output.

Nanodac Interface

Page Button

From any non-configuration page, pressing this push button causes the top level menu to appear. Note that access levels (User, Engineer, Operator, Supervisor, logged out) will change the number of menu items. Within configuration pages, the Scroll button can be used as an enter key to select lower menu levels. In such cases the page button is used to reverse this action, moving the user up one menu level per operation.

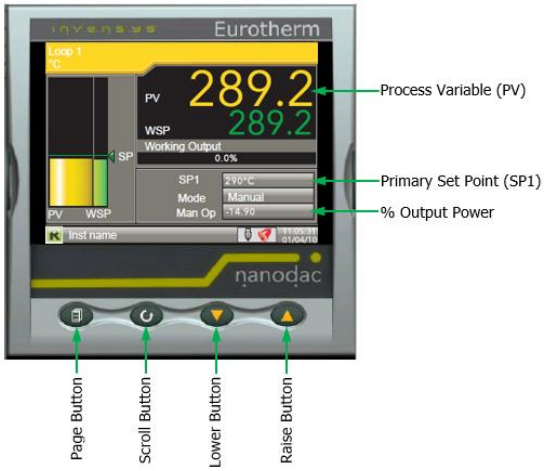

Figure 4: Nanodac Controller Display

Scroll Button

From trending pages, operation of the scroll push-button scrolls through the channels enabled in the group. The Faceplate cycling 'Off' selection can be used to keep a particular channel permanently displayed, and the scroll pushbuttons can then be used to select channels manually. In configuration pages, the scroll key operates as an 'enter' key to enter the next menu level associated with the highlighted item. Once the lowest menu level is reached, operation of the scroll key allows the value of the selected item to be edited by the relevant means (for example, the raise/lower keys, or a keyboard entry). The 'Page' key is used to move the user back up the menu structure, until the top-level menu is reached, when the scroll key can be used again to return to the home page. The scroll button is also used to initiate user wiring, see Nanodac Recorder Controller User Guide for information on user wiring.

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Raise/Lower Buttons

Within trending displays, the Raise and Lower keys can be used to scroll through the enabled display modes in the sequence: vertical trend, horizontal trend, vertical bar graph, horizontal bar graph, numeric, vertical trend... etc.

Process Variable

The Process Variable input value can be entered by the user but is most often 'wired' from an analogue input. This will be the RTD measured temperature value in the case of the Heli Flow.

Primary Setpoint One

Setpoint 1 is the primary setpoint of the controller. If the controller is in automatic control mode, then the difference between the setpoint and the process variable (PV) is continuously monitored by the control algorithm. The difference between the two is used to produce an output calculated to bring the PV to the setpoint as quickly as possible without causing overshoot.

Percent Output (Output Power)

The percentage output power to be applied when in Manual mode (100% = full on; 0% = off).

BACNet/Modbus Parameters

To ensure correct BACNet/Modbus connectivity ensure the following parameters are applied to the controller and applicable connected devices.

1	Cold Water Injection Valve Active	Channel.1.Alarm1.Active	1 = Alarm source active, or safe but not ack'd	bool	184b	6219	
2	Low Output Temp 15 minute Active	Channel.1.Alarm2.Active	1 = Alarm source active, or safe but not ack'd	bool	186b	6251	
3	RTD Hot Water Temperature Display	Channel.1.Main.PV	The process variable (output) of the channel	float32	0100	256	Set by Channel.1.Main.Resolution
4	RTD Cold Water Temperature Display	Channel.2.Main.PV	The process variable (output) of the channel	float32	0104	260	Set by Channel.2.Main.Resolution
5	Set Point Temperature	Loop.1.Main.WorkingSP	Working Setpoint	float32	0203515	512	1dp
6	Enables/Disables Loop Control Output	Loop.1.Main.Inhibit	Control Inhibit (0 = No; 1 = Yes)	bool	0205	517	Not applicable
7	Digital input indication	DigitalIO.1A1B.PV	For contact inputs, 0 = Open, 1 = Closed.	float32	1501	5377	0dp

Table 4: BACNet/Modbus Parameters for Heli Flow system

PID CONTROLLER TUNING GUIDE

This section will assist with autotuning the PID controller equipped on your Watson McDaniel Heli Flow. Verify the controller model installed and reference the applicable section associated with the equipped model. Manual tuning should be performed only after it has been determined that the Auto Tune process has not provided adequate control for the process. When changing PID settings, allow some time for the changes to take effect by observing the process and tracking the oscillation time between dwells if applicable.

Note: Menu pathways differ between TR893 and Nanodac controllers, refer to applicable section for steps. However, the PID manual tuning logical process remains the same. Refer to the Manual Tuning Guide section below for more information.

TR893 Autotune

1. Turn on the controller and/or verify it is at the main screen.
2. Apply a typical hot water demand on the system.
3. Press the Parameter button, the first button on the left side, to scroll through the menu screens.
4. The top display will read “At” for the Auto Tune screen.
5. Press the “Up” button to change the “off” value on the bottom display to “On”.
6. Press “Enter”, far right side button, to lock in the value.
7. The AT led will illuminate to confirm operation.
8. The Auto Tune sequence will begin by stroking the control valve open and closed twice which typically takes 1-5 minutes.
9. When complete the Auto Tune light will turn off.

TR893 Manual Tune Menu Path

1. Turn on the controller and/or verify it is at the main screen.
2. Press and hold the Parameter button, the first button on the left side for 3 seconds.
3. After 3 seconds the top display will show “PArA” to let you know that you are in the Parameters Menu.
4. Press the “Parameter” button to scroll through the Parameter menus.
5. The P, proportional, value will be the 3rd screen, the I, integral, will be next, and the D, derivative, will be the next screen.
6. To edit the PID values, press the “Up” or “Down” Buttons.
7. Press “Enter”, far right side button, to lock in the value.
8. Hold the Parameter button down to scroll through the Screens until it returns to the main “PArA” screen.
9. Hole the parameter button for 3 seconds to exit back to the main menu.
10. Proceed to the Manual Tuning Guide section for full manual tune logic.

Nanodac Autotune

1. Turn on the controller and/or verify main screen selected.
2. Press the page button, the first button on the left side.
3. Highlight ‘Login’ by using the arrow buttons and press the Scroll Button, second button in from the left. See Figure 4 in the manual.
4. Select ‘Engineer’ access and press Scroll button.
5. Press the down arrow 3 times to select ‘Numeric’ and press Scroll.
6. Enter 100 or eewwqq12 as the password using the Arrow & Scroll buttons. Note the password will depend upon the version of Nanodac equipped. Then Press Page when complete.
7. The confirmation box will appear. Highlight ‘Yes’ to confirm. Now the Auto tune can be initiated through the controller’s configuration.

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8. On the main screen, press the page button to access the top level menu.
9. Highlight ‘Loop’ in the Configuration Menu and press the Scroll Button.
10. Select Loop 1 and press the Scroll Button.
11. Highlight ‘Tune’ in the Loop Menu and press the Scroll Button.
12. Highlight ‘Tune Enable’. ‘On’ initiates the Auto Tune. You must log out of Engineer to start Auto Tune. Legend changes to ‘Off’ when Auto Tune is Complete. Set to ‘Off’ manually, to stop the tuning process.
13. ‘State’ will display the progress of the Auto Tune. Verify that it is ‘Running’. **Log out of the Engineer level after Setting Tuning Enable.**
14. On the main screen, press the page button to access the top level menu.
15. Highlight ‘Logout’ by using the arrow buttons and press the Scroll.

Nanodac Manual Tune Menu Path

1. On the main screen, press the page button to access the top level menu.
2. Highlight ‘Configuration’ by using the arrow buttons and press the Scroll Button.
3. Highlight ‘Loop’ in the Configuration Menu and press the Scroll Button.
4. Highlight ‘PID’ in the Loop Menu and press the Scroll Button.
5. The Proportional Band ‘PB’, Integral Time ‘Ti’, and the Derivative Time ‘Td’ will be in this menu.
6. Proceed to the Manual Tuning Guide for full manual tune logic.

Manual Tuning Guide

Proportional Band Setting (P)

1. Adjust the set point to the desired temperature.
2. Set the Proportional Band (P) to 75% of the set point temperature to start. a. Ex: 120°F Desired Temperature would be P = 90
3. Set the Integral and Derivative (I and D) to ‘off’.
4. Apply a normal heating load or demand on the system. a. Ex: Open several hot water faucets or wash down hoses.
5. Watch the Process Variable (PV – actual measured outlet temperature) and verify that there is a stable temperature. The Process Temperature will most likely be sluggish in response and offset, high or low, from the set temperature. See Figure 5.1 for a visual example. If the PV does not have these characteristics, then multiply P by 2 and observe until it does.

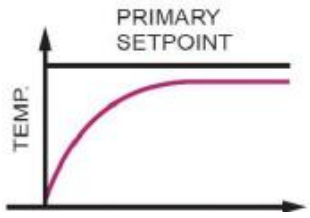

Figure 5.1: High P Value (Stable but Offset)

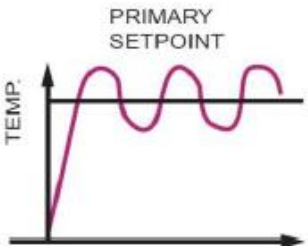

Figure 5.2: Low P Value (Large Oscillations)

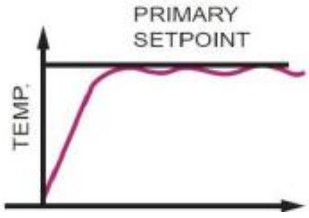

Figure 5.3 Ideal P Value (Minimal Oscillations)

6. Once a stable High P value has been observed, divide the P value by 2 and observe the PV, Process Temp.
   Ex: Stable @ P = 90 (Figure 5.1) Divide P by 2 so P = 45
7. Repeat step 6 until oscillations are noticeable and then multiply P by 1.5.
   Ex: Stable @ P = 45 (Figure 5.1) Divide P by 2 so P = 22. PV now resembles Figure 5.2
8. Observe the Process Temp, PV, to see if it matches Figure 5.3
   Ex: Multiply P by 1.5 to get PV value to resemble Figure 5.3
9. Adjust the P value between the two images Figure 5.1 and Figure 5.2 values until an ideal P value is achieved as shown in Figure 5.3. Note: There should be a minimal PV deviation and the dwell time between oscillations should be several minutes.
10. Observe the process at startup to ensure that the Temperature rises to the set point with minimal overshoot.

Integral Time Setting (I)

1. Track the length of time in between oscillations in seconds and multiply that by 5/8. This will be the starting Integral value.
   Ex: 1-minute oscillations = 60 seconds; I = 60 seconds x 5/8 = 38
2. Track the performance of the Integral by changing the heating load conditions.
3. To increase the response time of the offset, reduce I value by 0.5x, and to reduce the response time, increase by 0.5x.
   Ex: Sluggish recovery after heating load change, 38 x 0.5 = 19; I = 38 – 19 = 19
4. From a cold start, test and verify that the Integral Time allows maximum elimination of offset with minimum overshoot. If not completely satisfied, fine-tune the value, up or down, as needed and test until correct.

Derivative Time Setting (D)

1. Use the oscillation time from before and divide it by 10 to enter the Derivative value.
   Ex: 1-minute oscillations = 60 seconds; D = 60 seconds / 10 = 6
2. If the system is very dynamic the D value may remain at zero.
3. Make 25% changes with D to adjust. Increase if the response is still sluggish and decrease if oscillations are at a quick rate.

Recommendations

1. Make slow methodical changes and track the PID settings w/ any high/low cyclic temps as well as oscillation times.
2. Track temperature changes and recovery times during heat load changes as well to ensure minimal overshoot.
3. Decrease the Integral if overshooting occurs. Decrease the Derivative accordingly as well if on.
4. Systems with quick PV changes may benefit from a low P (0.2) & higher I (1.5-10) or high P (1.5 x set point) & low I (2-10).

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HIGH LIMIT SETUP

The high limit package is an optional adder that improves the safety of the Heli Flow in case of system failure. This includes an integrated high limit safety in the control valve which can shut off when temperature limitations are reached. The FDC-L91 high limit valve is usually paired with a butterfly valve that can shut off the steam supply to the heat exchanger to prevent overheating and damage of equipment.

High Limit Display

Enter/Scroll Key

When acting as an enter key, press the scroll key for 4 seconds and the display will enter the setup menu. Pressing the key for 8 seconds will enter calibration mode. When used as a scroll key, one can press to select a setpoint to be displayed. As well as selecting a parameter to be viewed or adjusted. It can also advance the display from a parameter code to the next parameter code.

Up/Down Key

When the lock indicator is off, these keys can increase or decrease the selecting parameter.

Reset/Unlock Key

When used as the reset key, it can reset the limit condition after the process is within the limit. It can also revert the display to normal display, reset the latching alarm, and reset the annunciator. When used as an unlock key, pressing the key for 4 seconds will enable the up/down functions and the lock indicator LED will turn off. This function is disabled if remote lock is selected for EIFN (event input function).

Note: If the enter/reset key is left pressed only one reset operation will occur. If the unit goes into a state where reset is required again, release the key and press in again.

Indicators

OP1/OP2: Output status one and two

C/F: Temperature reading in Celsius or Fahrenheit

PV: Process Value

HSP1: High limit set point 1

LSP1: Low limit set point 1

SP2: Set point 2 for output 2

LOCK: Lock status on/off

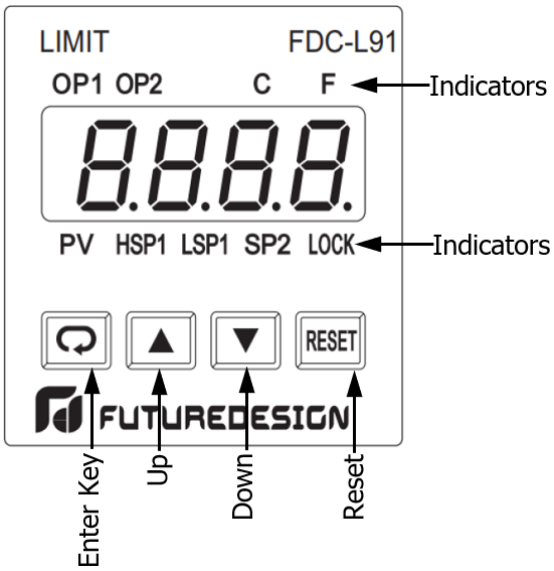

Figure 6: High Limit Controller Display

High Limit Setup

1. Press and hold the enter/scroll key for 4 seconds to open parameters.

2. Hold the reset/unlock key to unlock controller.

3. Use Table 5 to update controller settings, reference the display settings on how to maneuver through the menu items.

Setting	InPt	Unit	rESo	SHiF	FiLt	Out1	01.HY	HSP.L	HSP.H	Out2	EiFn	diSP
User Input	Pt.dn	°F	no.dP	0	0	H1.	2	32	200	EiFn	rEST	SP1

Table 5: High Limit Controller User Defined Parameters

HELI FLOW CONFIGURATIONS

Electrical Schematics

The Watson McDaniel Heli Flow runs off standard United States power grid electric, 120 VAC 50-60Hz. Several variations of electrical schematic exist for the Watson McDaniel Heli Flow. Alternate configuration selections will change the schematics shown below. Alternate configurations may include additional RTDs, NO high limit package w/ high limit valve, split range control valves (electronic or pneumatic), or selecting no PID controller and instead using an Aquastat high limit switch and/or HD valve with temperature pilot.

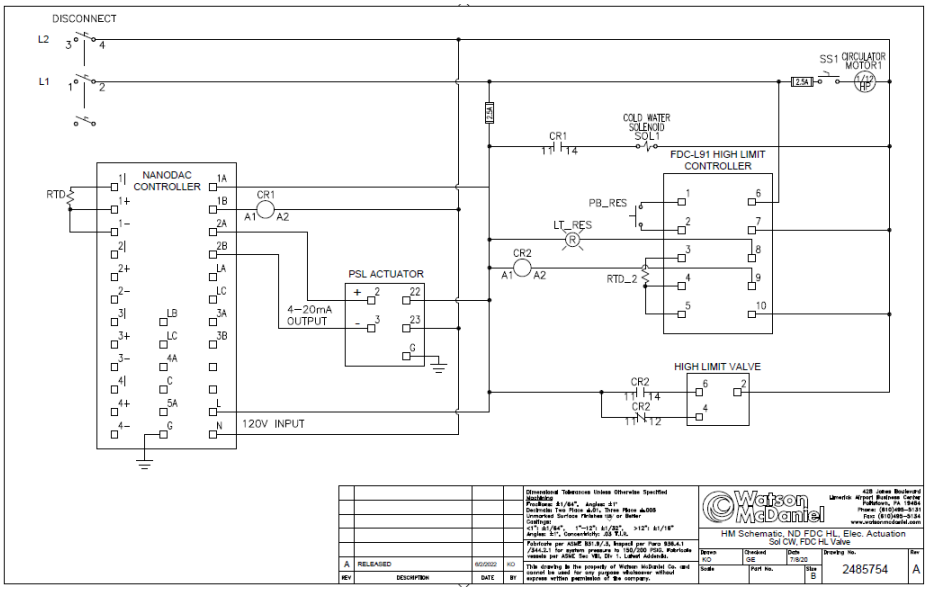

Figure 7: Displays the high limit package with a Nanodac controller and electric actuator

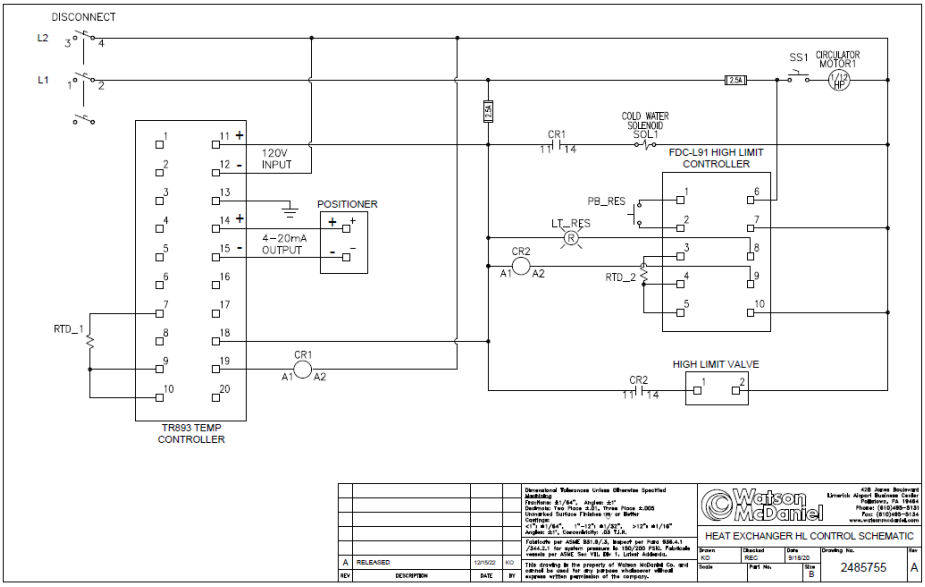

Figure 8: Displays the high limit package with a TR893 controller and pneumatic actuator

Common System Dimensions

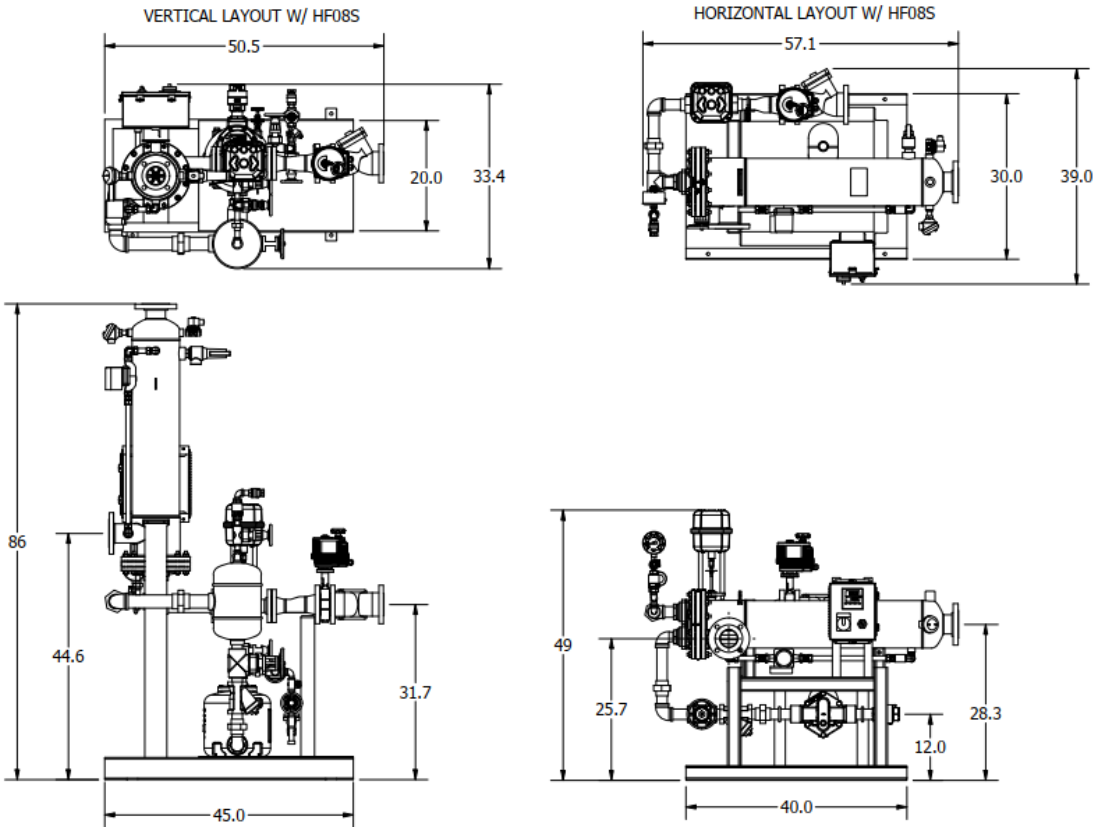

Figure 9: Displays two common Heli Flow configurations. The left image shows an HF08S option, high limit package, electric control valve, PMPT, strainers, receiver, and pressure & temperature safety relief valve. The right image shows an HF08S equipped with high limit package, electric control valve, steam trap, strainers, and pressure & temperature safety relief valve.

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HELI FLOW SYSTEM TROUBLESHOOTING

PROBLEM	ACTION
1) Unit will not power on	a) Check circuit breakers at facility panel and in Heli Flow enclosure.
	b) Verify Line and Neutral connections are connected properly to the main disconnect switch.
	c) Use a Multimeter to verify proper voltage is being read at inlet and outlet of disconnect switch.
2) No hot water or not getting up to desired set temperature	a) Ensure there is sufficient steam pressure.
	b) Ensure there is water supply and the valves are open.
	c) Make sure there is hot water demand.
	d) Make sure condensate is draining from the heat exchanger properly.
	e) Ensure heat exchanger is free of scale build up or debris on surface.
	f) Decrease the temperature differential or get an appropriately sized unit.
	g) Tune PID settings.
3) Outlet water temperature is overshooting or unstable	a) PID controller needs to be tuned. See tuning section.
	b) May need to manually tune around on/off processes such as washdown hoses.
	c) Add circulation in hot water loop.
4) Auto Tune is not working	a) Verify the PID controller is logged out when tuning starts.
	b) Make sure there is a demand on the hot water loop by opening faucets or turning on process equipment.
5.1) High Limit Valve will not open: General Actuator	a) Check terminal connection in the enclosure and confirm with the wiring schematic.
	b) Verify the controller is reading the correct temperature.
	c) Verify the high limit setpoint and configuration is correct.

PROBLEM	ACTION
6) Control valve is not working	a) Verify power and air are on.
	b) Verify there is an active control signal from the controller.
	c) See Control Valve Manual for more troubleshooting help.
7) Condensate is backing up into heat exchanger	a) Verify isolation valves are open.
	b) Verify there is proper gravity drain for steam traps.
	c) Verify there is enough motive steam pressure to overcome the condensate back pressure for pumping applications.
	d) See Pump-Trap or Steam Trap specific manual for more troubleshooting help.
8) Tube bundle leaking from 1/8" NPT weep port on tube sheet	a) Verify the tube sheet 1/8" NPT drain plug is not what is leaking, this connection is located closer to the shell. Tighten drain plug if loose.
	b) Shutdown unit, remove tube bundle, inspect O-rings and gaskets for wear or failure and replace if damaged.
	c) Inspect tube sheet for holes or damage to the tubes. Replace tube sheet if damage or heavy corrosion is present.
	d) If weep port is leaking still, contact factory for assistance or replacement.
9) Tube bundle leaking between shell and tube sheet or from tube sheet to bonnet.	a) Ensure bonnet to shell bolts are tight.
	b) Shutdown unit, remove tube bundle, inspect O-rings and gaskets for wear or failure and replace if damaged.