Magneforce Inc.

HS5000R2TS Touchscreen Control Operation

1. General:

The Magneforce HS5000R2TS Induction Heating System incorporates an imbedded PLC and 7" Color Touch Screen Control Panel. The Touch Screen Controls enable multiple operating modes along with data recording, temperature control, output power verification, easily programmed outputs and recipe storage capability.

The control functions include:

- Six selectable operating modes

    1. Single timer and power control.
    2. Dual timer and dual power control.
    3. Single timer and power control with temperature control.
    4. Dual timer and power control with temperature control.
    5. Pulse Heating operation
    6. User Controlled Operation

- K Thermocouple or Infrared Pyrometer Temperature Input

- 2 user programmed +24V or SPDT outputs for accessory operation. 1 user programmed input.

- Recipe storage for all operating parameters including time, power, temperature, output setup, input setup, remote or local control, temperature setpoint, duration, power and hysteresis.

- °C/°F Temperature Display, Cycle Counters and KW Power Output Verification.

- Customizable data recording for power output, temperature and output amperage.

- Integrated Help Menus for all functions. Pop up warnings screens for system problems.

2. Opening Screen

When the system is powered up, the opening screen will turn on. The current software version in the touchscreen is shown in the bottom left corner. After approximately 10 seconds, this screen will turn off and the last used operating mode screen will turn on. For first time use, the standard TP1 (single timer and power control) mode screen will turn on.

Figure 1.

3. Setup Screen

If the current operating mode displayed is not what is required, the SETUP screen displays and enables selection of the six available OPERATION MODES. It also enables access to the COUNTERS, KW OUTPUT VERIFICATION and TEMPERATURE setup menus. To access the SETUP screen, press on the SETUP button. This button is located on the bottom of the screen for all modes as indicated below for the TP1 operating screen.

Figure 2.

3.1 Operation Modes

On the left side of the SETUP screen, the 6 available operating modes are displayed. To select one of the other available operating modes, press on the appropriate button. The selected operating mode screen will now be displayed. Other setup information is also entered using the SETUP screen as described later in this manual. Press HELP for more information. Press RETURN to go back to the previously entered operating mode screen.

CAUTION!

WHEN A NEW OPERATING MODE IS SELECTED ANY OPERATING INFORMATION, SUCH AS TIME, POWER ETC. THAT WAS ENTERED FOR THE PREVIOUSLY SELECTED OPERATING MODE WILL BE DELETED. DO NOT SELECT A NEW OPERATING MODE UNLESS YOU MEAN IT. PRESS RETURN TO GO BACK TO THE PREVIOUSLY USED SCREEN.

IF THE INFORMATION THAT WAS ENTERED FOR THE PREVIOUS OPERATING MODE WAS STORED AS A RECIPE, THE INFORMATION WILL STILL BE SAVED AS PART OF THAT RECIPE

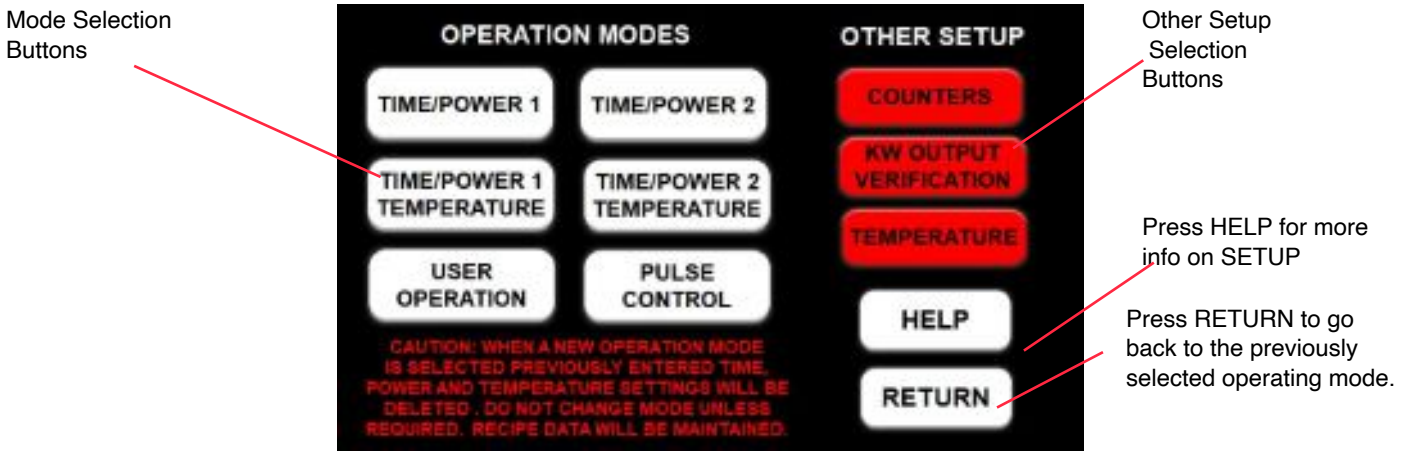


Figure 3.

3.2 Other SETUP functions

3.2.1 Cycle Counters

Two cycle counters are available to record the number of heating cycles that have been initiated. Each time that heating has been started using the local or remote START function the cycle timers will increment by 1.

The Session counter displays the number of cycles since the last time the system was powered up. The Total counter displays the total number of cycles that have been initiated. Both the Session and the Total counters can be reset to zero by pressing the RESET button for that counter.

The Session counter can also be displayed on the selected START screen by pressing the SHOW SESSION COUNTER button. The seession count will be displayed at the bottom of the START button in the center.

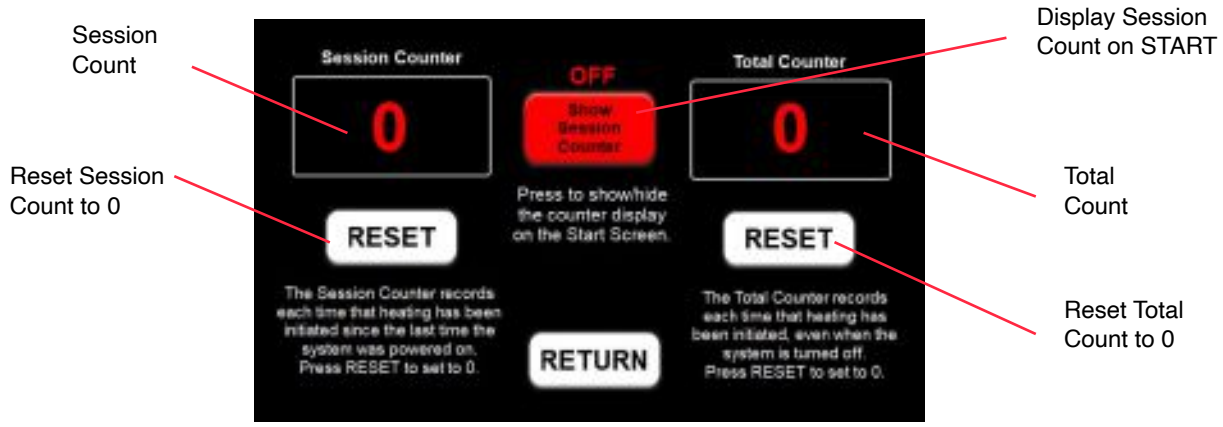


Figure 4. Counter Setup

3.2.2 KW Output Power fault

The heating power (output power) can be monitored using the KW Output Power Fault setup screen. Enter the allowed percent deviation in power output by pressing on the % deviation button. A keypad will come up. If the actual power output deviates from the set value by more than the % set, it will trigger a FAULT. For example, if the power is set at 60% (.60 x 5000W = 3000W) and the actual power level is less than 2700W with a 10% allowable deviation, FAULT will be triggered. This could occur if the unit is operating in amperage limit or if it has malfunctioned.

The DELAY time sets the time required until FAULT is active. DELAY time is required to prevent nuisance faults when heating is turned on and is ramping to power or when the heat level changes as part of an operating cycle.

The KW fault can be set to either display the FAULT screen for information purposes or it can be set to display the FAULT screen and shut down heating. The FAULT can also be setup as an output to send a signal to a signal.

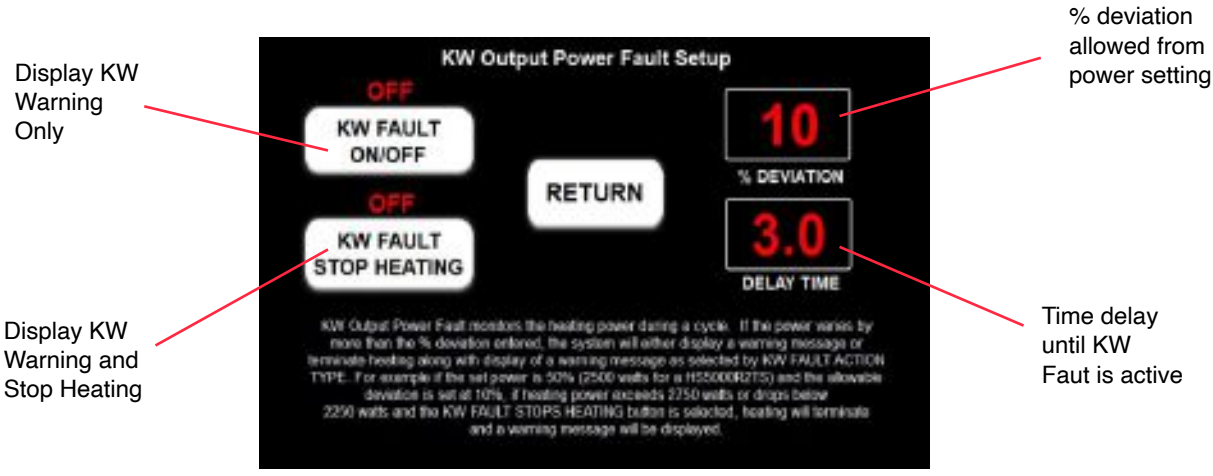


Figure 5. KW Output Fault Setup

3.2 Other SETUP functions

3.2.3 Temperature Setup

When temperature control modes are being used, the temperature displays and settings can be set for either degrees Fahrenheit or degrees Centrigrade as required by the process. Press the TEMP UNITS button to toggle back and forth between °C and °F.

Minor adjustments to the temperature display can also be made using the temperature setup function. If it is necessary to adjust the temperature to match that displayed by another temperature source, the displayed temperature can be offset up or down by pressing on the + or - Temp Offset button and entering the offset using the keypad that comes up. The maximum offset is 100°, either C or F.

Press RETURN to go back to the main SETUP screen.

Figure 6. Temp Units Setup

4. TP1 Operating Mode - Single Timer/Power Setting

The TP1 Operating Mode is the standard mode and is selected by default if no other mode has been selected. It is the operating mode that is used for most applications.

To set the desired cycle time, press on the SET TIME display. A keypad will come up as shown in Fig. 8. Enter the desired time (in tenths of a second) and then press ENTER. The cycle time will now be displayed on the TP1 START screen.

To enter the desired operating power, press on the SET POWER display. The keypad will come up. Enter the operating power level (heating level) from 0 to 100. For the HS5000R2TS unit, an entry of 50 indicates 50% power or approximately 2500 watts heating power. An entry of 100 is full power, approximately 5000 watts.

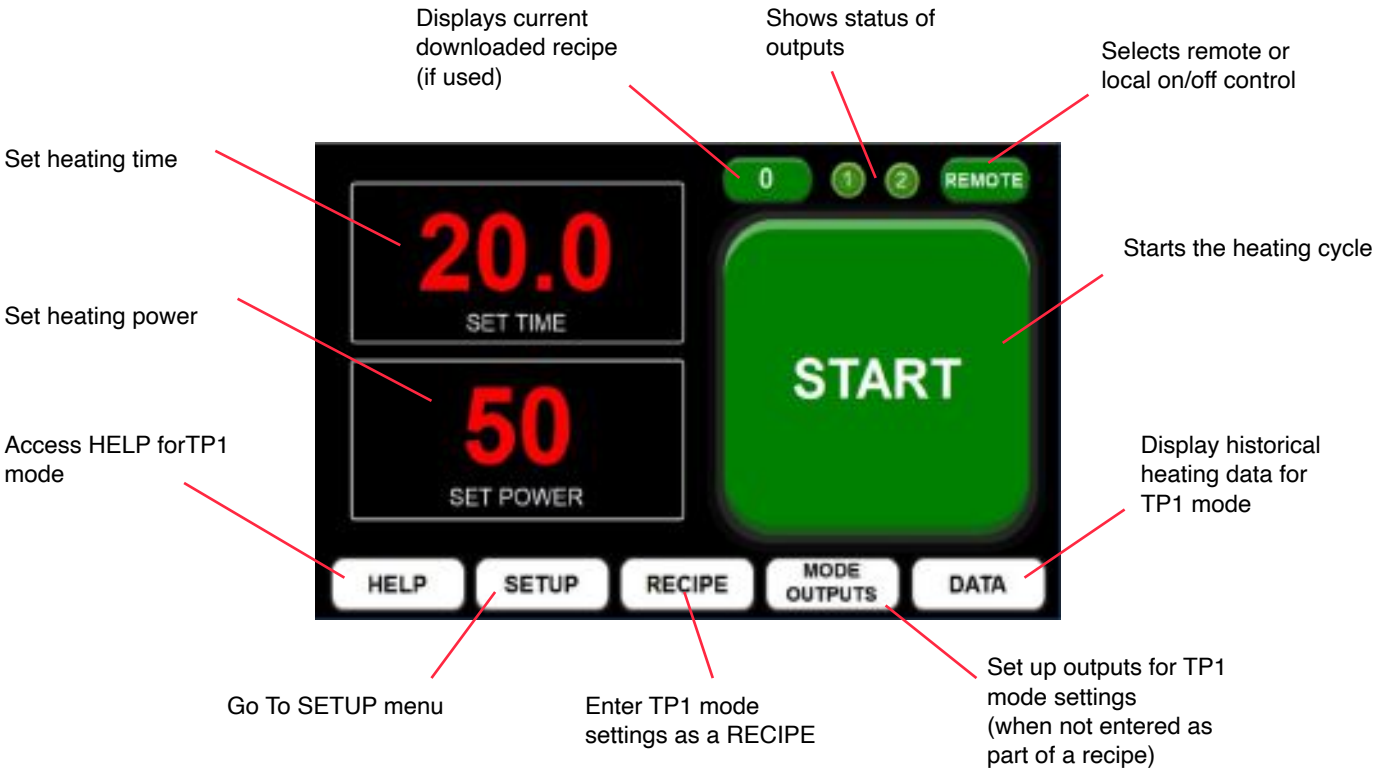


Figure 7. TP1 START Screen

Number Keypad

The number keypad will come up whenever a area is pressed that requires a numerical entry. Enter the value desired and then press ENTER to set that value and return to the mode screen. If an incorrect value is entered press ESC to return without enter, BACK to correct the entry or CLR to erase the entry and start over.

Figure 8. Standard Numerical Keypad

4. TP1 Operating Mode - continued

After the time and power levels have been entered and the part to be heated is located in the heating coil, the system is ready to start heating. To initiate heating, press the green START button. If a remote on/off actuator is connected to the remote jack on the side of the unit and is to be used, press the REMOTE button. A selection keypad will come up (Fig.9). Press 1 and ENTER. The START legend on the button will change to REMOTE ON and heating can only be initiated from the remote actuator.

When START or REMOTE start is pressed, the coolant source must first be turned on and coolant must be flowing. If it is not, a warning screen as shown in Fig.10 will come up and heating will not be allowed. Press CLEAR on the warning screen and turn on the coolant before proceeding.

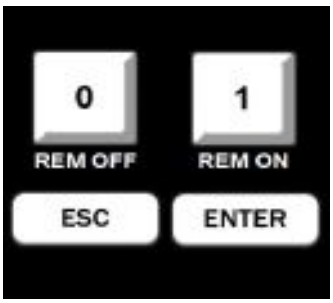


Figure 9. Remote On/Off Keypad

Figure 10. NO COOLANT Warning

When heating has been started, the START screen will change to the RUN sreen as shown in Figure 11 below. The time elapsed will be displayed, the actual heating power in KW will be displayed and the HEATING legend will flash on and off. The preset total time for the heating cycle will also be shown for reference.

If outputs have been set up the status of output 1 and 2 is shown below the KW display. When the output is turned on and is active, the display will flash on and off. Pressing and holding the DATA button will bring up additional information on the heating cycle, including operating DC voltage and DC amperage, tank amps, load resistance, measured temperature (if a temperature sensor is connected) and KW output. This display will turn off when the button is released.

Press the red STOP button at any time to terminate the heating cycle and return to the START screen. Otherwise heating will stop when the set time has elapsed and the screen will change back to the START screen.

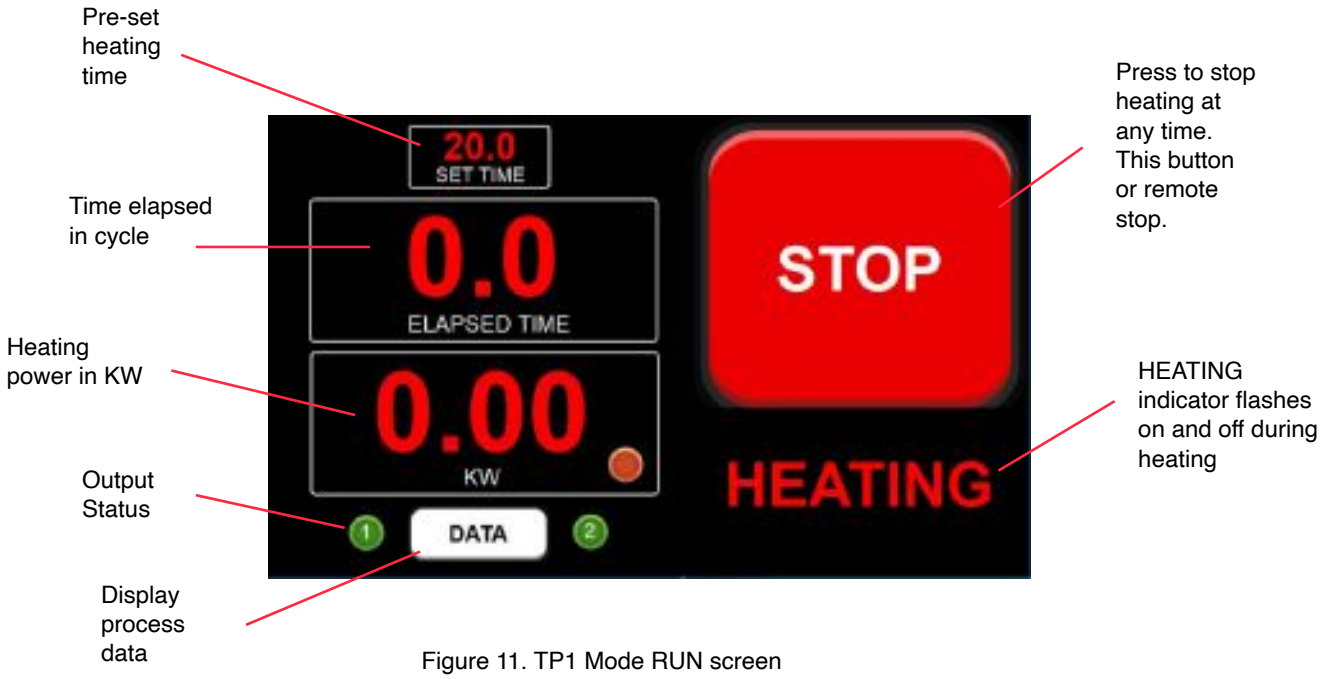


Figure 11. TP1 Mode RUN screen

NAVIGATION BUTTONS

At the bottom of the TP1 START screen , navigation buttons are displayed to access additional functions. The buttons access TP1 mode Help information, the mode SETUP screen, TP1 Recipe Input, TP1 mode output setup and TP1 mode DATA display.

Figure 12. Navigation Buttons

HELP

The Help button will bring up a screen that provides information on the use of the TP1 operating mode. When the screen is open, press MORE for additional information. Press RETURN to go back to the TP1 START screen.

SETUP

This will take you to the SETUP screen, described briefly on page 2. This navigation button appears on all mode START screens and allows selection of different operating modes. It also enables set up of the cycle COUNTERS, °C or °F Temperature and Temperature offset setup and Output Power Verification Setup. For more information on these SETUP functions go to Section 3.2, page 3.

RECIPE

This will take you to the TP1 Recipe screen. This screen allows you to enter TP1 operating information, including cycle time, power level and REMOTE on or off as part of a recipe that can be identified by name and easily downloaded for use. Up to 100 recipes can be entered for the TP1 mode. The RECIPE screen also allows you to look at a complete list of all recipes and to setup outputs as part of a recipe. Complete information on RECIPES and RECIPE OUTPUTS is provided in Section 9, page 17.

MODE OUTPUTS

The TP1 Mode Outputs screen allows the user to configure the outputs for use with standard TP1 settings that are entered but that are not set up as a recipe. This is common when only one setup is used or when settings for a specific application are first setup and changes are apt to be made. Output setups entered this way will be held in memory as long as the TP1 mode is active or until a recipe is downloaded. They will remain in memory even when the power supply is turned off and restarted. Additional information on MODE OUTPUTS is provided in Section 10, page 20.

DATA

The DATA button displays the historical data screen for the TP1 operating mode. Each time that a heating cycle is intiated, operating information is recorded and can be viewed or downloaded at a later time. The DATA screen allows the user to select to view only the heating power level or all recorded parameters. How often a data sample is taken is set up on the DATA screen. Up to 10000 data records can be stored. The records can be deleted to allow room for new records using the CLEAR button. Additional information on DATA is provided in Section 11, page 24.

5. TP2 Operating Mode - Dual Timer/Power Setting

The TP2 Operating Mode is similar to the standard TP1 mode. The only difference is that the TP2 mode allows for entry of two heating times with two corresponding power levels. This mode is often used when it is required to bring a part up to the desired temperature quickly and then reduce power to hold it at temperature for a set time.

To set the initial heating time, press on the SET TIME 1 display and enter the time in tenths of a second as described for TP1 mode. Then press on SET TIME 2 and enter the secondary heating time.

To enter the initial heating power, press on the SET POWER 1 display. Enter the operating power level (heating level) from 0 to 100. Then press on SET POWER 2 and enter the secondary power level for time 2. For the HS5000R2TS unit, an entry of 50 indicates 50% power or approximately 2500 watts heating power. An entry of 100 is full power, approximately 5000 watts.

After the time and power levels have been entered and the part to be heated is located in the heating coil, the system is ready to start heating. To initiate heating, press the green START button. If a remote on/off actuator is connected to the remote jack on the side of the unit and is to be used, press the REMOTE button and select REMOTE as described for the TP1 mode. The START legend on the button will change to REMOTE ON and heating can only be initiated from the remote actuator.

When START or REMOTE start is pressed, the coolant source must first be turned on and coolant must be flowing. If it is not, a warning screen as shown in Fig.10 will come up and heating will not be allowed. Press CLEAR on the warning screen and turn on the coolant before proceeding.

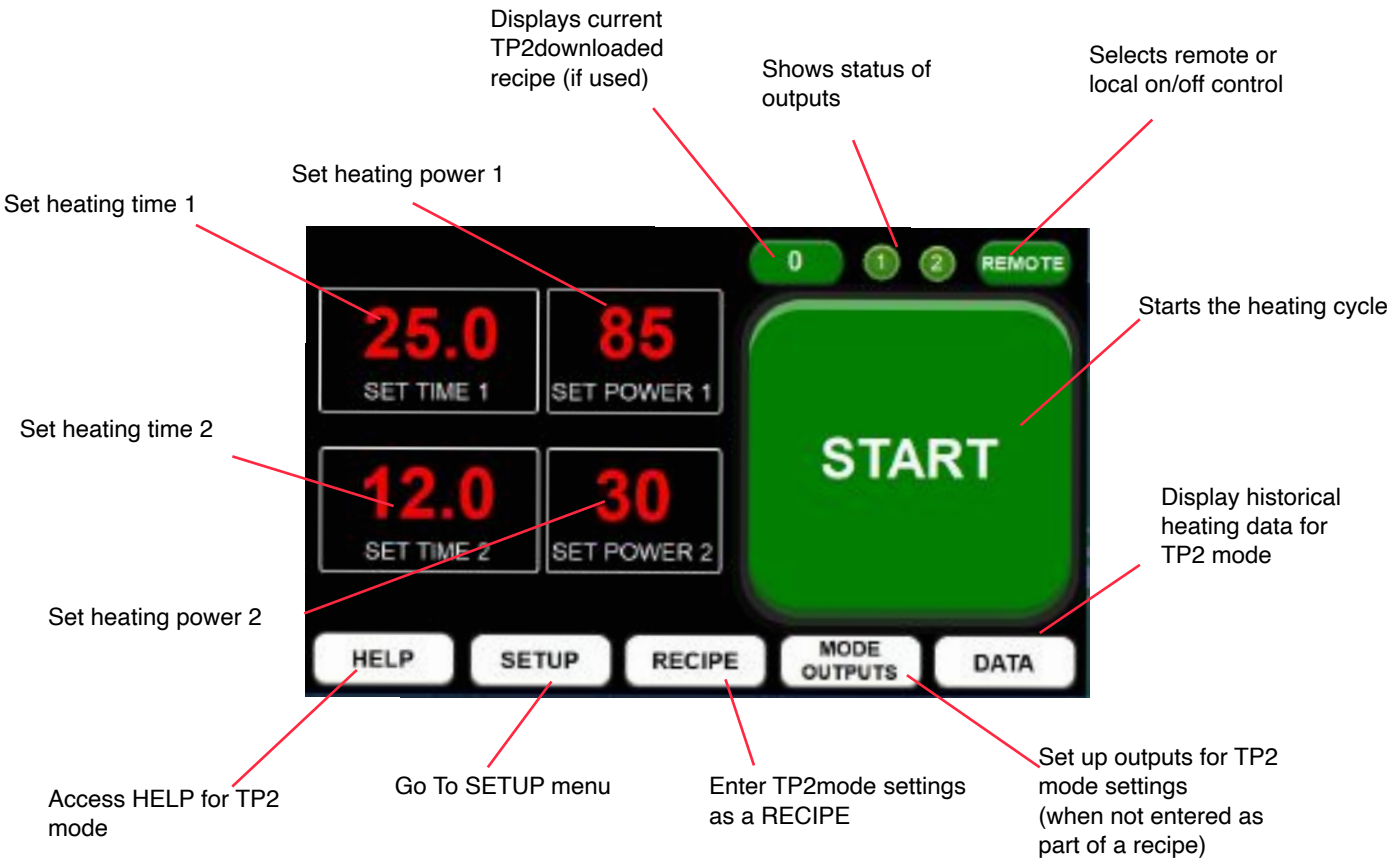


Figure 13. TP2 START Screen

5. TP2 Operating Mode - Dual Timer/Power Setting (cont'd)

When heating has been started, the TP2 START screen will change to the TP2 RUN sreen as shown in Figure 14 below. The system will begin to heat at Set Power 1 for Set Time 1. The actual power output will be displayed on the KW screen and the ELAPSED TIME 1 display will show the heated time so far. The pre-set times for time 1 and time 2 are displayed above the elapsed time displays. When Time 1 is complete, heating will automatically shift to Time 2 and Power 2. The change in power will be displayed on the KW screen. When time 2 is complete, heating will stop and the TP2 RUN screen will change back to the TP2 START screen. When the system is heating, the HEATING sign will flash on and off.

If outputs have been set up the status of output 1 and 2 is shown below the KW display. When the output is turned on and is active, the display will flash on and off. Pressing and holding the DATA button will bring up additional information on the heating cycle, including operating DC voltage and DC amperage, tank amps, load resistance, measured temperature (if a temperature sensor is connected) and KW output. This display will turn off when the button is released.

Press the red STOP button at any time to terminate the heating cycle and return to the START screen. Otherwise heating will stop when the set time has elapsed and the screen will change back to the START screen.

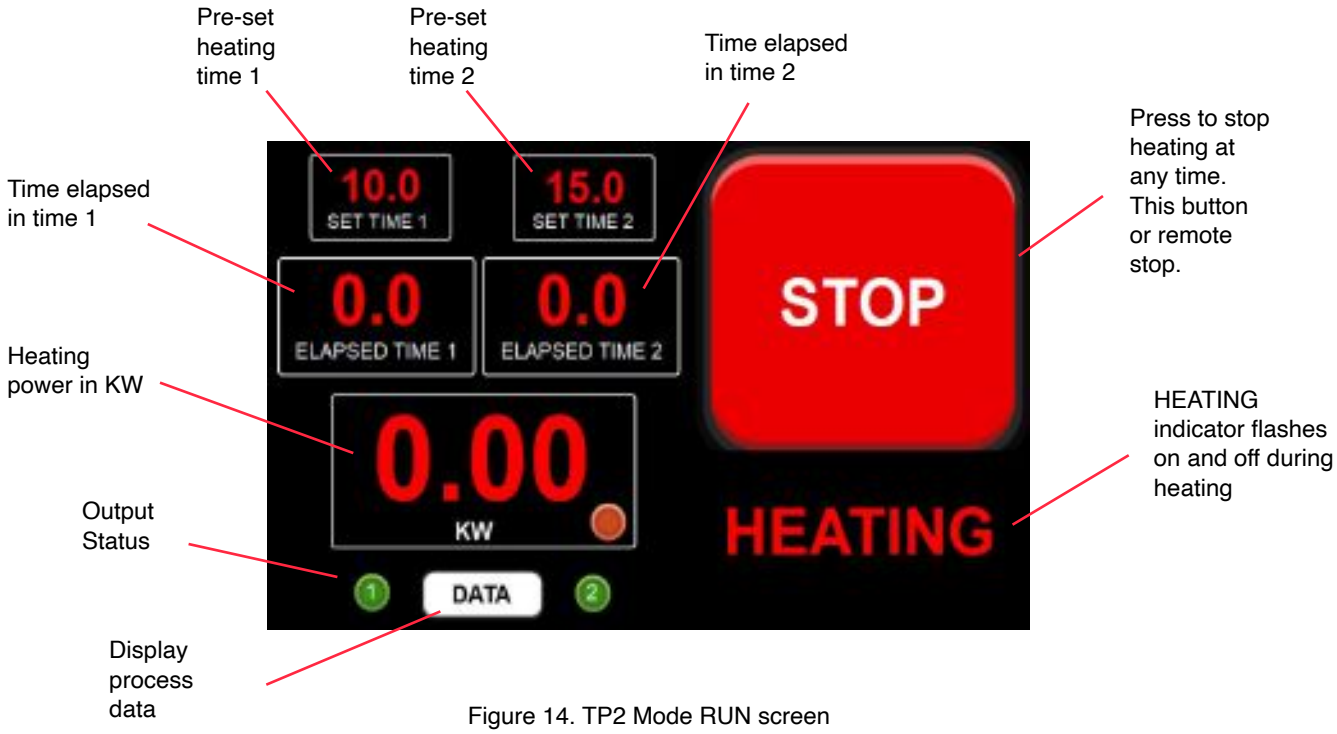


Figure 14. TP2 Mode RUN screen

NAVIGATION BUTTONS

At the bottom of the TP2 START screen , navigation buttons are displayed to access additional functions. The buttons access TP2 mode Help information, the mode SETUP screen, TP2 Recipe Input, TP2mode output setup and TP2 mode DATA display. The function of the navigation buttons is the same as described for TP1 operating mode on page 7. Figure 12. However, all screens accessed by the Navigation buttons will be specific to the TP2 mode.

6. TP1T Operating Mode - Single Timer/Power Setting with Temperature Control

The TP1T Operating Mode enables temperature control of the heating cycle. Temperature is sensed by a K type thermocouple or infrared sensor attached to the TEMP jack on the side of the power supply.

To set the initial heating time, press SET TIME and the keypad (Fig.4) will come up. Enter the desired time. To set the initial heating power, press SET POWER and enter the desired power level. These are the settings to heat the part until the entered temperature setpoint has been achieved.

To enter the temperature cutoff required, press the TEMP SETPOINT button and enter the temperature. It can be entered in either degrees C or F as previously set in the SETUP menu. (See page 4.). Then enter the time that heating is to continue after the SETPOINT is achieved by pressing on the TEMPTIME button. Next, enter the heating power level required after the SETPOINT is achieved. This power level is usually less than the initial power level to hold the part at the set temperature. Finally, enter the hysteresis by pressing on the HYS button. The hysteresis sets the range of on/off of heating around the setpoint when temperature has been achieved.

Figure 15. TP1T START Screen

After the settings have been entered and the part to be heated is located in the heating coil, the system is ready to start heating. To initiate heating, press the green START button. If a remote on/off actuator is connected to the remote jack on the side of the unit and is to be used, press the REMOTE button and select REMOTE as described for the TP1 mode on page 6. The START legend on the button will change to REMOTE ON and heating can only be initiated from the remote actuator.

When START or REMOTE start is pressed, the coolant source must first be turned on and coolant must be flowing. If it is not, a warning screen as shown in Fig.10 will come up and heating will not be allowed. Press CLEAR on the warning screen and turn on the coolant before proceeding.

6. TP1T Operating Mode - Single Timer/Power Setting with Temperature

When heating has been started, the TP1T START screen will change to the TP1T RUN sreen as shown in Figure 16 below. The system will begin to heat at SET TIME for SET POWER. The actual power output will be displayed on the KW screen and the ELAPSED TIME display will show the heated time so far. When using temperature control, the SET TIME and POWER should be high enough to make sure that the temperature setpoint is achieved. If it is not, heating will turn off at the end of SET TIME and return to the START screen. It is OK to set the time at an excessively long period if not sure of the heating.

When the measured temperature reaches the TEMP SETPOINT the timing will switch over to the SET TEMPTIME and the power will shift to the TEMP PWR. Heating will continue to cycle on and off around the setpoint. The on/off band is determined by the hysteresis. For example, if the hysteresis is set at 10°F and the TEMP SETPOINT is 600°, heating will turn off at 600°. When the temperature drops to 590°, heating will turn back on until temperature again reaches 600° where it will turn off again. Heating will continue to cycle on and off until the SET TEMPTIME expires. The HEATING display will only flash on and off when the system is actively heating.

If outputs have been set up the status of output 1 and 2 is shown below the KW display. When the output is turned on and is active, the display will flash on and off. Pressing and holding the DATA button will bring up additional information on the heating cycle, including operating DC voltage and DC amperage, tank amps, load resistance, measured temperature (if a temperature sensor is connected) and KW output. This display will turn off when the button is released.

Press the red STOP button at any time to terminate the heating cycle and return to the START screen. Otherwise heating will stop when the TEMPTIME has elapsed and the screen will change back to the START screen.

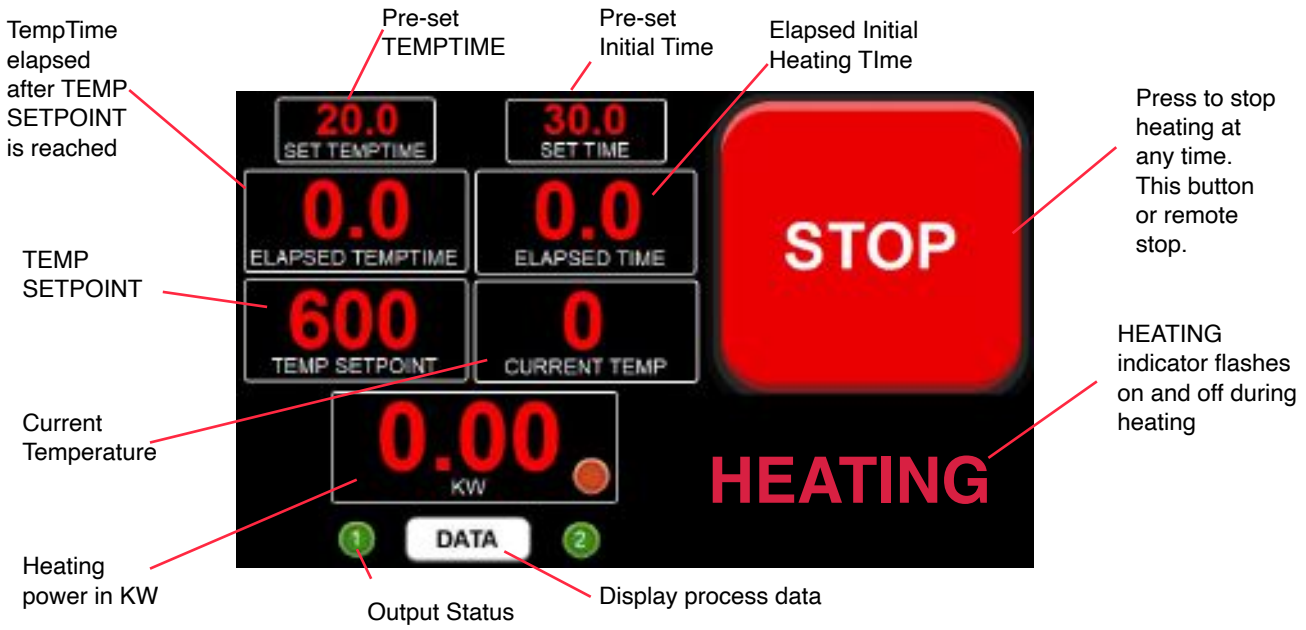


Figure 16. TP1T Mode RUN screen

NAVIGATION BUTTONS

At the bottom of the TP2 START screen , navigation buttons are displayed to access additional functions. The buttons access TP2 mode Help information, the mode SETUP screen, TP2 Recipe Input, TP2mode output setup and TP2 mode DATA display. The function of the navigation buttons is the same as described for TP1 operating mode on page 7 Figure 12. However, all screens accessed by the Navigation buttons will be specific to the TP2 mode.

6. TP2T Operating Mode - Dual Timer/Power Setting with Temperature Control

The TP2T Operating Mode enables temperature control of the heating cycle. Temperature is sensed by a K type thermocouple or infrared sensor attached to the TEMP jack on the side of the power supply. It is similar to the TP1T Operating Mode except that the TP2T mode allows for entry of two heating times with two corresponding power levels. This mode is used when more precise temperature control and minimal overshoot of the temperature set point is required.

To set the initial heating time, press SET TIME 1 and enter the time in tenths of a second. Then press SET TIME 2 and enter the secondary heating time. To set the initial heating power for TIME 1 press SET POWER 1 and enter the desired power level. To set the heating power for TIME 2 press SET POWER 2 and enter the desired power setting.These are the settings to heat the part until the entered temperature setpoint has been achieved. Some testing may be required to determine the proper settings. SET TIME 1/SET POWER 1 should be set to bring the part close to the desired temperature. SET TIME 2/SET POWER 2 should then be set at a significantly reduced power so that the temperature set point is achieved gradually to minimize overshoot. Again, It is OK to set the TIME 2 at an excessively long period if not sure of the heating.

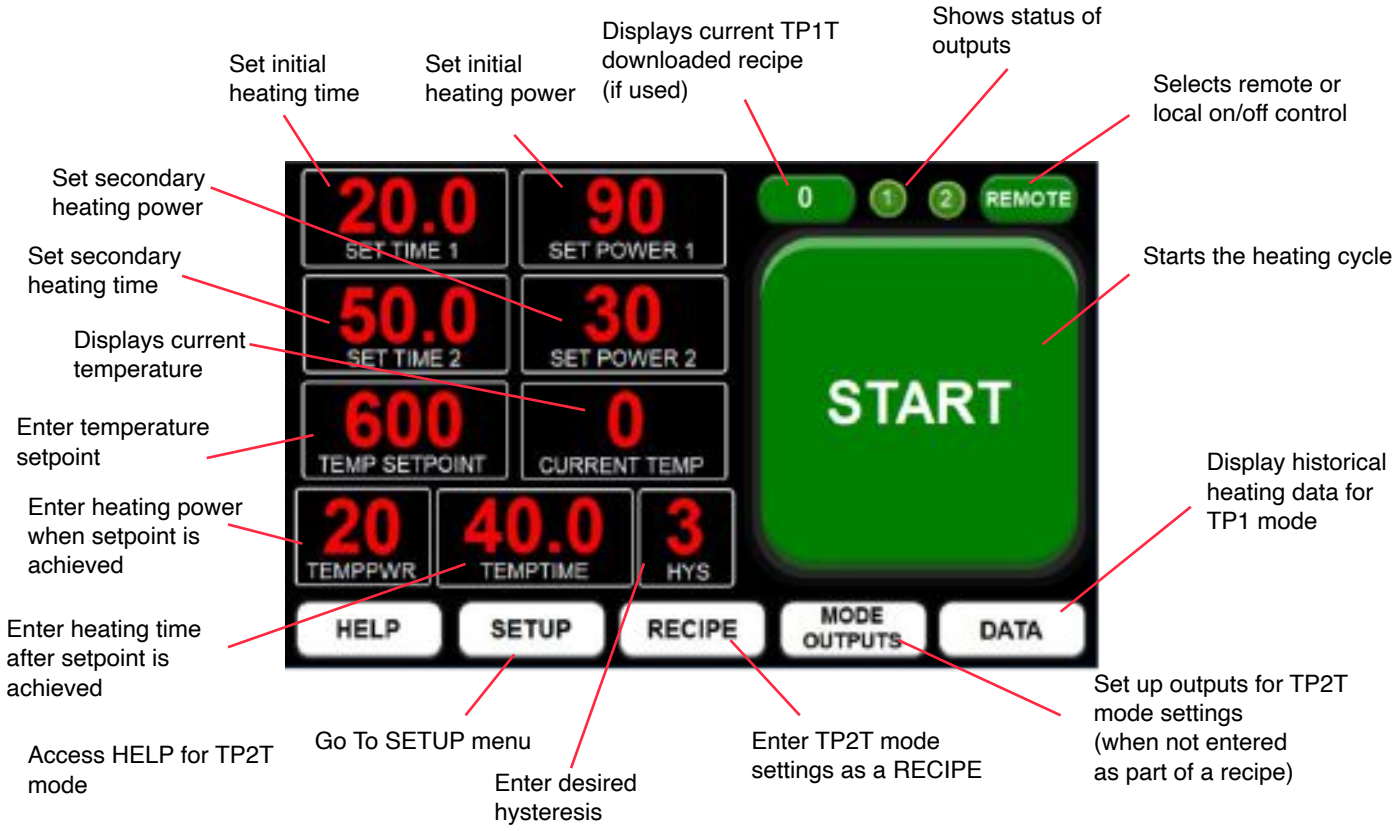


Figure 17. TP2T START Screen

To enter the temperature cutoff required, press the TEMP SETPOINT button and enter the temperature. It can be entered in either degrees C or F as previously set in the SETUP menu. (See page 4.). Then enter the time that heating is to continue after the SETPOINT is achieved by pressing on the TEMPTIME button. Next, enter the heating power level required after the SETPOINT is achieved. This power level is usually less than the initial and secondarypower level to hold the part at the set temperature. Finally, enter the hysteresis by pressing on the HYS button. The hysteresis sets the range of on/off of heating around the setpoint when temperature has been achieved.

Navigation buttons are the same as described on Page 7, Figure 12.

6. TP2T Operating Mode - Dual Timer/Power Setting with Temperature Control - cont'd

After the settings have been entered and the part to be heated is located in the heating coil, the system is ready to start heating. To initiate heating, press the green START button. If a remote on/off actuator is connected to the remote jack on the side of the unit and is to be used, press the REMOTE button and select REMOTE as described for the TP1 mode on page 6. The START legend on the button will change to REMOTE ON and heating can only be initiated from the remote actuator.

When START or REMOTE start is pressed, the coolant source must first be turned on and coolant must be flowing. If it is not, a warning screen as shown in Fig.10 will come up and heating will not be allowed. Press CLEAR on the warning screen and turn on the coolant before proceeding.

When heating has been started, the TP2T START screen will change to the TP2T RUN screen as shown in Figure 18 below. The system will begin to heat at SET TIME 1 for SET POWER 1. The actual power output will be displayed on the KW screen and the ELAPSED TIME 1 display will show the heated time so far. At the end of Set Time 1, heating will shift to Set Time 2 and heating power will change to Set Power 2. Again, SET TIME 2 and SET POWER 2 should be high enough to make sure that the temperature setpoint is achieved.

When the measured temperature reaches the TEMP SETPOINT the timing will switch over to the SET TEMPTIME and the power will shift to the TEMP PWR. Heating will continue to cycle on and off around the setpoint. The on/off band is determined by the hysteresis. For example, if the hysteresis is set at 10°F and the TEMP SETPOINT is 600°, heating will turn off at 600°. When the temperature drops to 590°, heating will turn back on until temperature again reaches 600° where it will turn off again. Heating will continue to cycle on and off until the SET TEMPTIME expires. The HEATING display will only flash on and off when the system is actively heating.

If outputs have been set up the status of output 1 and 2 is shown below the KW display. When the output is turned on and is active, the display will flash on and off. Pressing and holding the DATA button will bring up additional information on the heating cycle, including operating DC voltage and DC amperage, tank amps, load resistance, measured temperature (if a temperature sensor is connected) and KW output. This display will turn off when the button is released.

Press the red STOP button at any time to terminate the heating cycle and return to the START screen. Otherwise heating will stop when the TEMPTIME has elapsed and the screen will change back to the START screen.

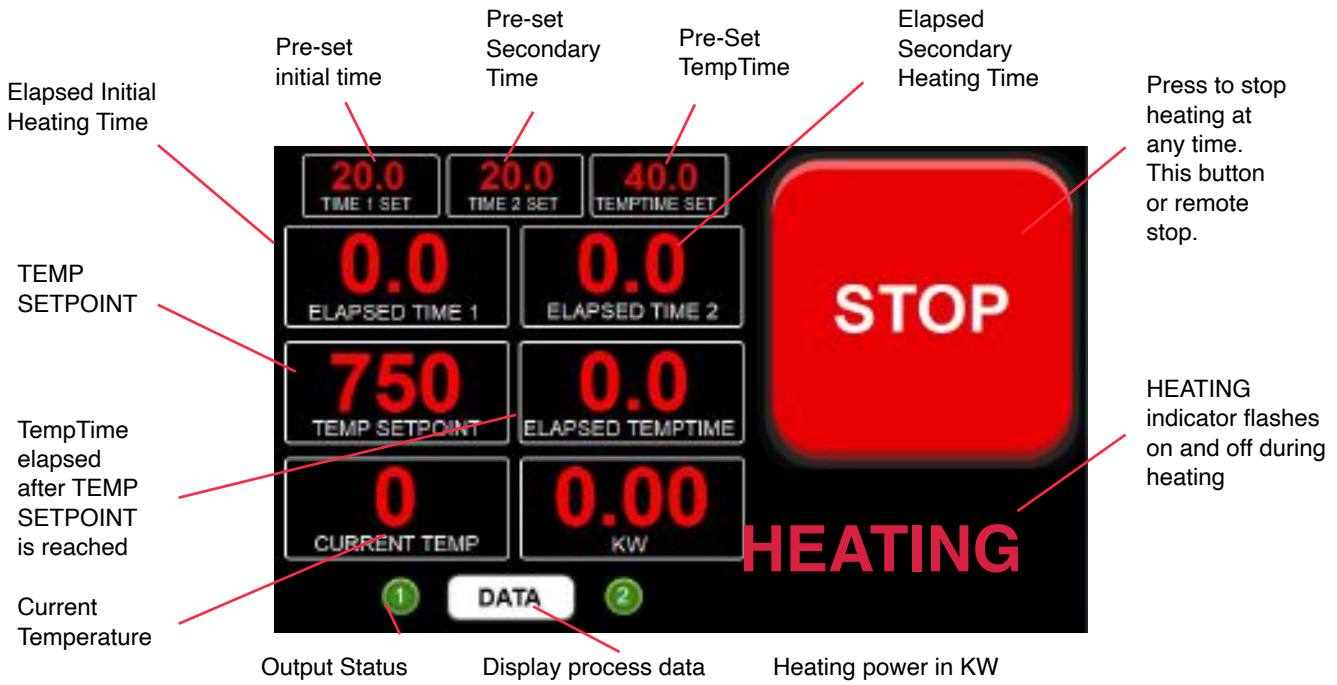


Figure 18. TP1T Mode RUN screen

5. Pulse Operating Mode

The Pulse Operating Mode enables repetitive cycling between 2 heating power levels for an extended period of time. This operating mode is used primarily for testing purposes and for the heating of large parts where it is advantageous to heat in pulses to allow the heat to conduct into the interior of the part without excessive heating or burning on the exterior of the part.

To set the desired pulse times and pulse power levels, first select PULSE TIME 1. A keypad will come up as shown in Fig. 8 on page 5. Enter the desired time (in tenths of a second) and then press ENTER. The cycle time will now be displayed on the Pulse START screen. Then set the heating power level by pressing on PULSE POWER 1. The keypad will come up. Enter the operating power level (heating level) from 0 to 100. For the HS5000R2TS unit, an entry of 50 indicates 50% power or approximately 2500 watts heating power. An entry of 100 is full power, approximately 5000 watts.

Repeat for PULSE TIME 2 and POWER LEVEL 2. Then set the total cycle time by pressing on TOTAL TIME and entering the value in seconds.

After the time and power levels have been entered and the part to be heated is located in the heating coil, the system is ready to start heating. To initiate heating, press the green START button. If a remote on/off actuator is connected to the remote jack on the side of the unit and is to be used, press the REMOTE button. A selection keypad will come up. Press 1 and ENTER. The START legend on the button will change to REMOTE ON and heating can only be initiated from the remote actuator.

When START or REMOTE start is pressed, the coolant source must first be turned on and coolant must be flowing. If it is not, a warning screen as shown in Fig.10 will come up and heating will not be allowed. Press CLEAR on the warning screen and turn on the coolant before proceeding.

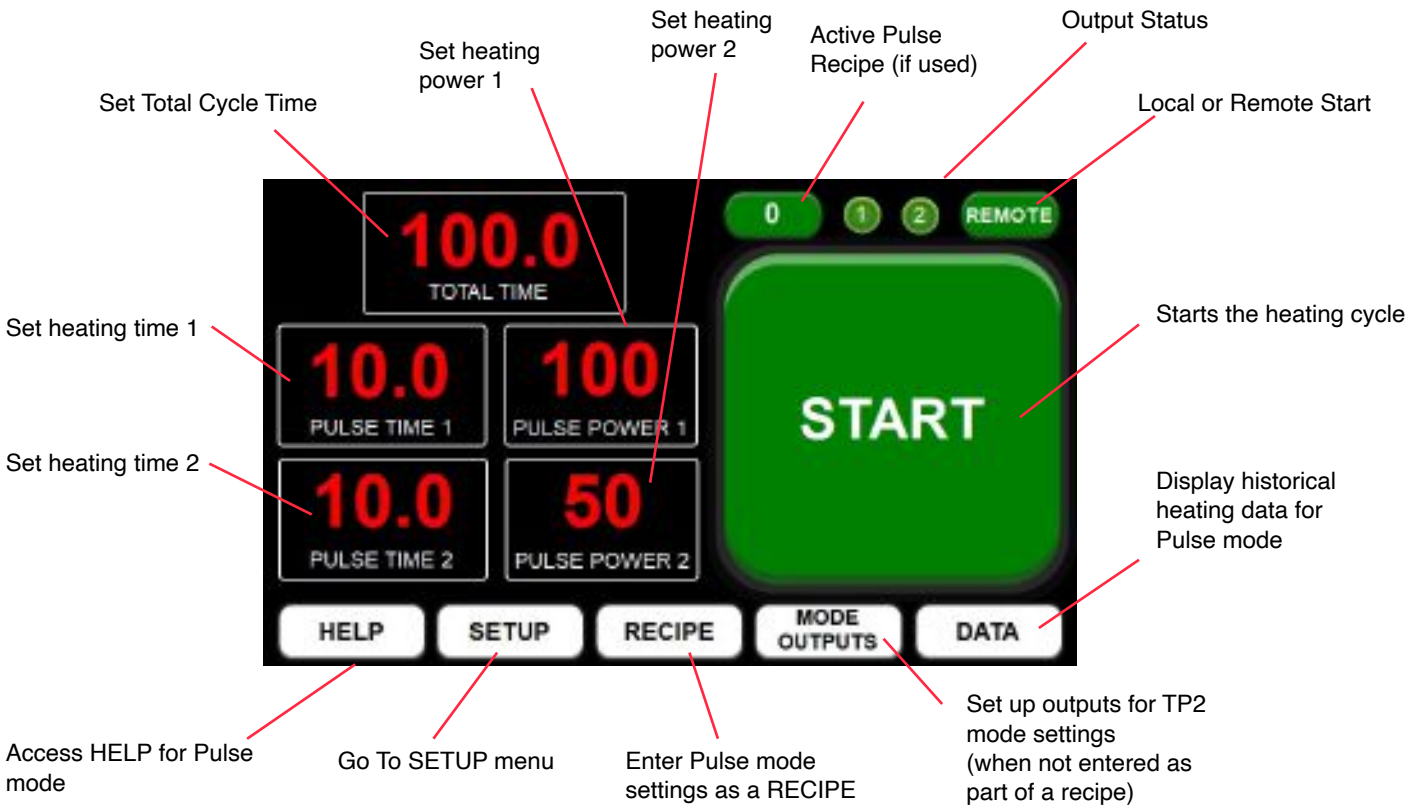


Figure 19. Pulse Mode START Screen

7. Pulse Operating Mode (cont'd)

When START or REMOTE start is pressed, the coolant source must first be turned on and coolant must be flowing. If it is not, a warning screen as shown in Fig.7 will come up and heating will not be allowed. Press CLEAR on the warning screen and turn on the coolant before proceeding.

When heating has been started, the PULSE START screen will change to the PULSE RUN screen as shown in Figure 20 below. The system will begin to heat at Pulse TIME 1 for Pulse POWER 1. The actual power output will be displayed on the KW screen and the ELAPSED TIME 1 display for Pulse TIme 1 will show the heated time so far at Pulse Power 1. At the end of Pulse Time 1, heating will shift to Pulse Time 2 and heating power will change to Pulse Power 2. Heating will continue to cycle between Pulse 1 and Pulse 2 for the total cycle time that was previosuly set. The HEATING display will flash on and off when the system is heating. The amount of total time that has elapsed will be shown in the Elapsed Total display. When the total time is completed, heating will stop.

If outputs have been set up the status of output 1 and 2 is shown below the KW display. When the output is turned on and is active, the display will flash on and off. Pressing and holding the DATA button will bring up additional information on the heating cycle, including operating DC voltage and DC amperage, tank amps, load resistance, measured temperature (if a temperature sensor is connected) and KW output. This display will turn off when the button is released.

Press the red STOP button at any time to terminate the heating cycle and return to the START screen. Otherwise heating will stop when the Total Time has elapsed and the screen will change back to the START screen.

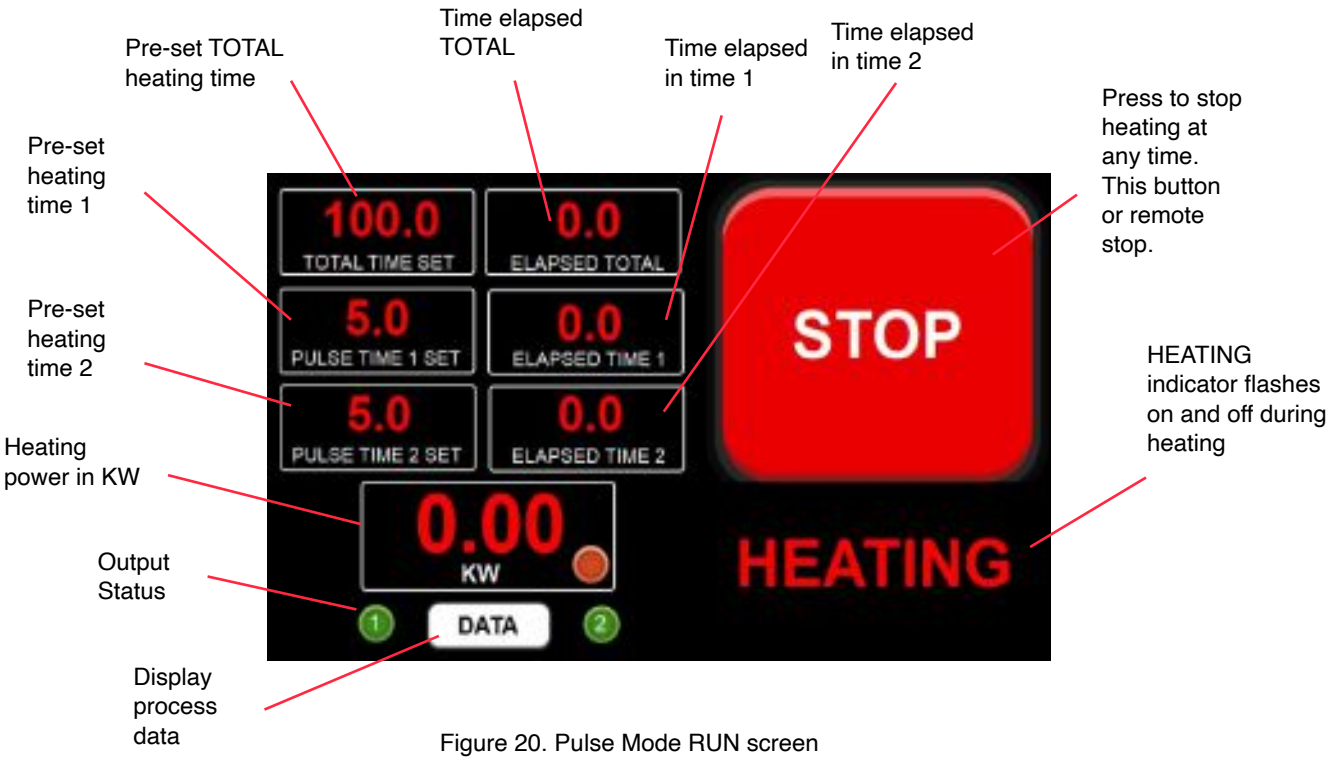


Figure 20. Pulse Mode RUN screen

Navigation buttons for Pulse Mode are the same as described on Page 7, Figure 12.

8. User Operation Mode

If the Magneforce HS5000R2TS System is to be used as part of a machine utilizing a PLC or other user supplied controls, it may be required to bypass the internal timers and power control settings provided by the other operating modes. The User Operation mode allows the heat on/off function and power control function to be supplied by the end user using the included remote control cable.

When the User operation mode is selected, all previous timer, power, output and recipe settings will be disabled. If desired, the temperature display can still be used for display purposes only. The temperature display can be toggled on and off using the navigation button at the bottom of the screen.

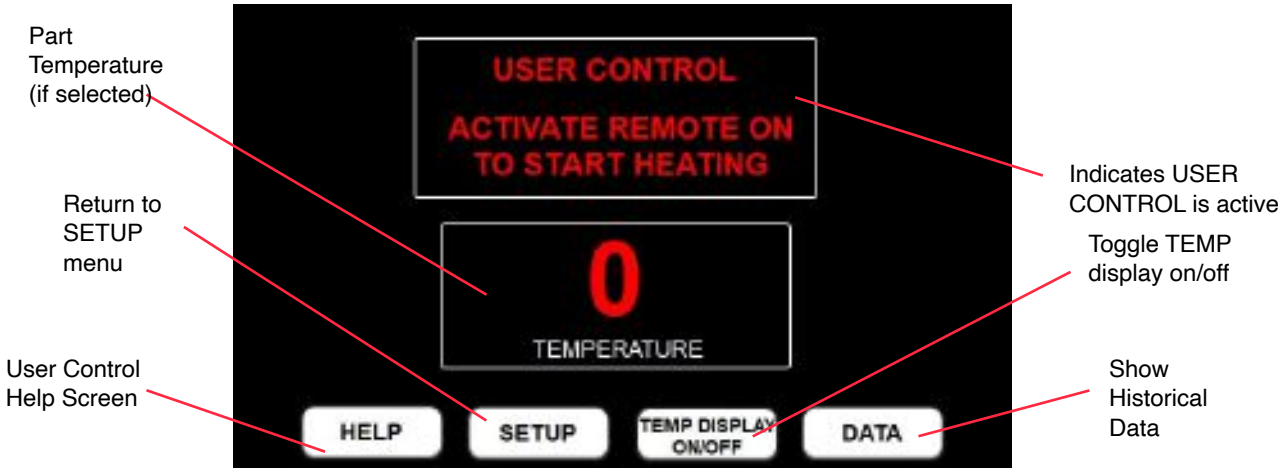


Figure 21. User Control Mode START screen

When heating is started using the remote operator, the User Operation Run screen will turn on. This screen will show the operating power in KW and the HEATING lamp will flash on and off. Temperature will be displayed if selected.

When the STOP button is pressed, it will cut off heating, even if a Start signal is being supplied by the USER controls. The screen will change back to the USER mode Start screen. In order to continue heating, the STOP RESET button must be pressed. Before pressng the STOP RESET make sure that the START signal provided by ther USER control has been turned off.

Figure 22. User Control mode RUN screen

9. Recipes

All settings for each operating mode can be entered into the system as recipes. The recipes can be called up and downloaded quickly for use.

Recipes are entered and stored per the OPERATING MODE that is selected and are available for all modes except for the USER OPERATION mode. Depending on the mode selected settings that can be stored include recipe name and number, heating times, power levels, temperature set point, time, power, hysteresis and remoter or local on/off control. Up to 100 recipes per mode can be stored. In addition, the configuration of the two available outputs can be stored as part of a recipe. For more information on this, see SECTION 10, OUTPUTS.

The basic recipe entry and display screen is shown below in Figure 23. The screen shown is for the TP1 Operating mode. The setup and information display is basically the same for all operating modes, the difference being the additional settings available for the other modes.

An initial Base recipe will be previously entered for each mode. This recipe will be identified as ID #1, Mode type, Base.

TO ENTER A NEW RECIPE

- Press on the NEW RECIPE button. A new listing will appear in the RECIPE LIST on the left. At this point, it will be shown as a duplicate of the existing recipe that is highlighted in red.
- Press on the ID button. A keypad will come up. Enter the new ID number, typically the next number on the list.
- Press on the NAME button. A letter keypad will come up. Enter the name or P/N up to 10 characters.
- Enter the remaining settings by pressing on the appropriate button and using the number keypad.
- Enter local or remote activation method. Press the button and a selection keypad will come up.
- Review and verify all of the entries.

After all entries have been made and verified, press UPDATE RECIPE. The previous number and name of the duplicate record created with NEW RECIPE will now change to the new number and name.

NOTE: MAKE SURE TO PRESS UPDATE RECIPE AFTER ENTERING NEW INFORMATION.

9.1 TP1 Main Recipe Screen

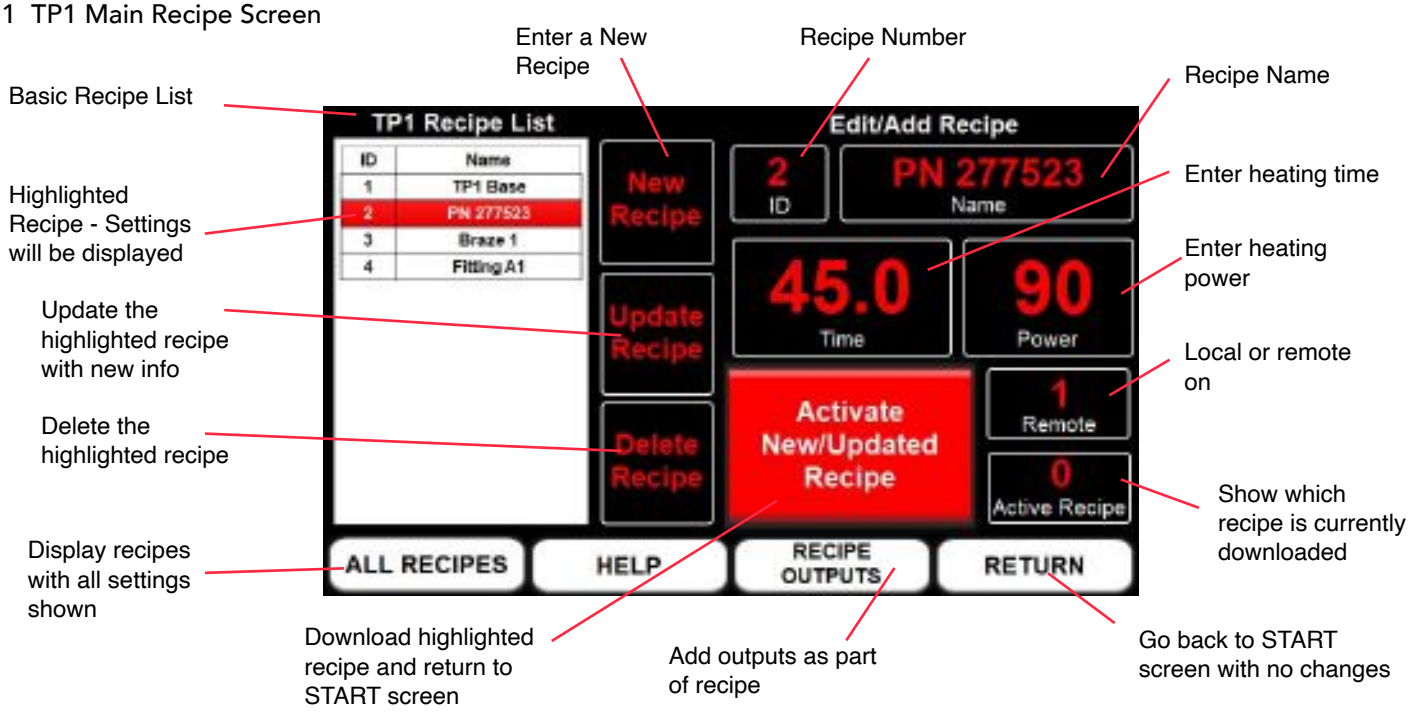


Figure 23. Main Recipe Screen - TP1 mode.

9. Recipes (continued)

TO DOWNLOAD A RECIPE

• To download/activate a recipe so that it can be used, first make sure that the recipe name is highlighted in RED in the recipe list. It can be selected by pressing on the name.

• Press the ACTIVATE NEW/UPDATED RECIPE button. The screen will change to the START screen and the settings for that recipe will be displayed. The number of the active recipe will be displayed above the START button.

TO UPDATE A RECIPE

- Select the recipe in the list and make sure it is highlighted in RED.
- Make the changes required to the settings.
- Press the UPDATE RECIPE button tented the changes.

Note: Updating a recipe will not activate/download it. You must then press the ACTIVATE button.

TO DELETE A RECIPE

- Press on the desired recipe so it is highlighted in RED. Then press DELETE RECIPE to remove it from the list.

DISPLAY ALL RECIPES: Press on the ALL RECIPES navigation button and the screen will change to a more comprehensive list of all recipes and recipe settings for the currently selected operating mode. To select a recipe, press on it so it is highlighted in RED. Then press return and it will show up as the highlighted recipe on the main recipe screen.

RECIPE OUTPUTS: Outputs can be set up as part of a recipe by pressing on the RECIPE OUTPUT button. More information on RECIPE OUTPUTS is provided in Section 7.

CAUTION!

When adding a new recipe, updating an existing recipe or deleting a recipe, make sure to double-check all entries before UPDATING or DELETING to verify it is correct. It is easy to inadvertently change an existing recipe if not careful.

9.2 TP1 All Recipes Screen

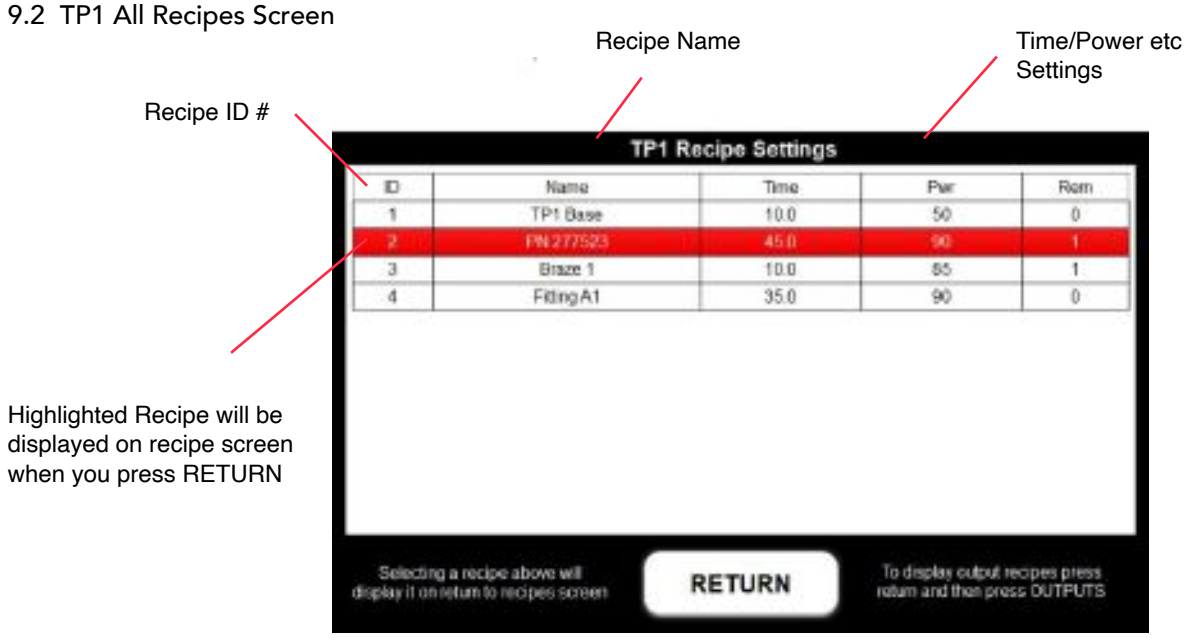


Figure 24. All Recipes Display - TP1 mode.

The RECIPE ENTRY SCREENS and ALL RECIPES screens for the TP2, TP1T, TP2T and Pulse Operating Modes are basically the same as the recipe screens for the TP1 mode. Each operating mode has its' own Recipe List and is accessed when that operating mode has been selected. The difference between the screens is the process information required. Screenshots of the other OPERATING MODES are shown below.

Figure 25. Main Recipe Screen - TP2 mode.

Figure 26. All Recipes Display - TP2 mode.

Figure 27. Main Recipe Screen - TP1T

Figure 27. All Recipes Display - TP1T mode.

Figure 28. Main Recipe Screen - TP2T

Figure 29. All Recipes Display - TP2T mode.

Figure 30. Main Recipe Screen - Pulse mode.

Figure 31. All Recipes Display - Pulse mode.

10. Outputs

The HS5000R2TS heating system incorporates 2 user configurable SPDT or 24V outputs and 1 input. The purpose of the outputs is to provide additional functionality. They are not intended to substitute for more robust PLC control.
Each of the available outputs can be user configured in up to 4 different predefined ways, depending on the operating mode selected. To chaange from a 24V output to a SPDT output requires a change to a jumper interior to the HS5000R2TS power supply. See the operation manual for more information.

The available output types include:

1. Output 1 or 2 turns on at the end of the heating cycle and remains on for a set time.
2. Output 1 turns on when the input is closed and turns off when the input is opened.
3. Output 1 turns on at a set time in the middle of a heating cycle and remains on for a set time.
4. Output 2 turns on and remains on if a fault occurs, such as low power output, blown fuse or lack of coolant flow.
5. Output 2 turns on for a set time at the end of output 1.
6. Output 1 or 2 turns on for a set time when a set temperature is reached. (For TP1T and TP2T modes only.)

Some typical uses of the outputs include:

1. Turning on a solenoid valve at the end of the cycle to provide air or water to cool the part.
2. Send out a signal to a LED or PLC when the set temperature has been reached.
3. Turn on a LED or send out a signal when a fault condition occurs.
4. Operate a solenoid to move the part in the middle of a heating cycle.
5. Trigger a cylinder or robot arm to remove a part from the coil at the end of the cycle.

TYPES OF OUTPUTS

There are two types of outputs, MODE OUTPUTS and RECIPE OUTPUTS.

MODE OUTPUTS are set up as part of a heating profile that is entered when a recipe is not used. This is likely when only one operating setup will typically be used or in experimenting with different settings and developing a heating profile. MODE OUTPUTS are setup by pressing on the MODE OUTPUT navigation button. The OUTPUT screen for TP1 mode outputs is shown below.

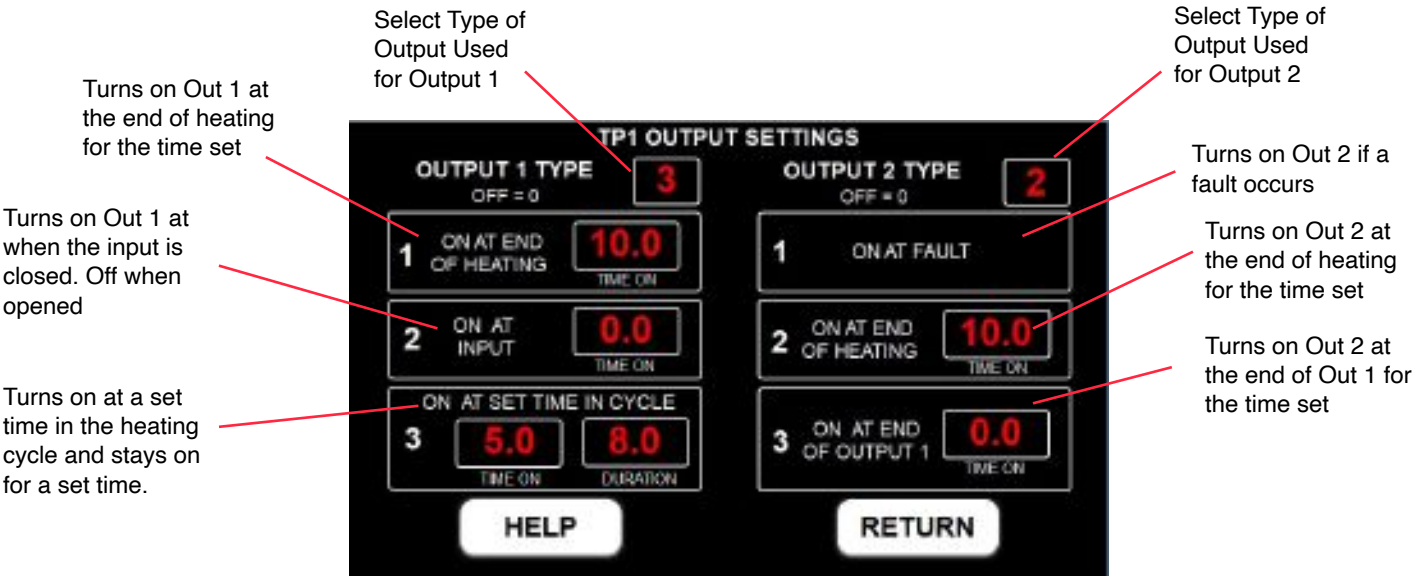


Figure 32. TP1T Mode RUN screen

To Set Output 1

• Select the Output Type that is to be used by pressing on the output type button. A selection keypad will come up. Enter the type required and press RETURN.
• Press on the TIME or DURATION button for the Output Type selected. A numeric keypad will come up. Enter the time from 0.1 to 99.9 seconds.
• If an output is not used, the output type should be set to 0.

To Set Output 2

• Select the Output Type that is to be used by pressing on the output type button. A selection keypad will come up. Enter the type required and press RETURN.
• Press on the TIME or DURATION button for the Output Type selected. A numeric keypad will come up. Enter the time from 0.1 to 99.9 seconds.
• If an output is not used, the output type should be set to 0.

The output setup screen is the same for the TP1, TP2 and PULSE operating modes. If the TP1T or TP2T mode is selected, the output screen will be different and allow for setting of either output 1 or 2 based on the part temperature. This screen is shown below.

NOTE:

When the system is turned off the information entered for the OUTPUTS will be saved in memory and active for the next time that the unit is turned on. If the time/power/temperature settings are changed on the mode START screen, the previously set Output Settings will still be active. Make sure to change the output settings if needed or turn off the outputs by entering 0 for the Output Type. If a different operating mode is selected in the SETUP screen, the entries made for the Outputs will be deleted. If they need to be reused the outputs must be set up as part of a recipe.

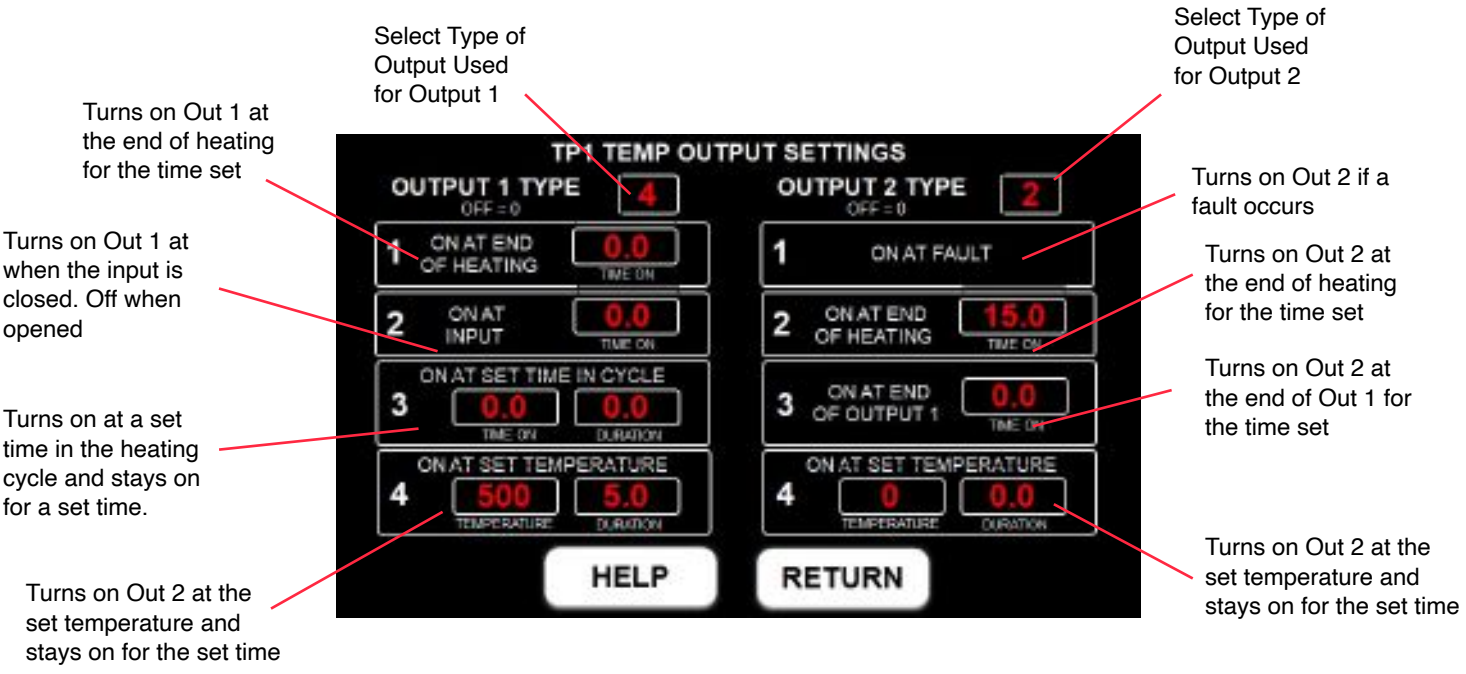


Figure 33. TP1T Mode OUTPUT screen

RECIPE OUTPUTS are set up to be entered as part of a recipe. When a recipe for an Operating MODE is selected and downloaded, the settings for the OUTPUTS will also be downloaded. Like the Mode Outputs, the downloaded settings will be retained in memory when the system is turned off and will still be active, along with the other recipe settings, when the system is turned back on.

To set up outputs as part of a recipe:

- Press the RECIPE navigation button at the bottom of the selected mode START screen. This will bring up the recipe screen. Then select the desired recipe from the RECIPE list so that it is highlighted in RED.
- Press on the RECIPE OUTPUTS navigation button at the bottom of the recipe screen. This will bring up the RECIPE OUTPUTS entry screen and the ID number and name for the recipe selected will be displayed.
- If the wrong recipe was selected, you can change the recipe to be used by pressing on its name in the RECIPE list so it is highlighted. The ID number and name will change to the new one.
- Press on the OUTPUT 1 TYPE button. A selection keypad will come up. Enter the number for the type.
- Press on the time/duration button for the type selected and enter the time required.
- Repeat for Output 2.
- After all entries have been made, press RETURN. This will take you back to the RECIPE screen.
- On the recipe screen, press the UPDATE RECIPE button. The setup of the outputs will now be included as part of the selected recipe.

NOTE

Make sure to press UPDATE RECIPE when you return to the main recipe screen from the recipe outputs screen or else it will not be entered.

- To activate the selected recipe with the configured outputs, press the red ACTIVATE NEW/UPDATED RECIPE button.

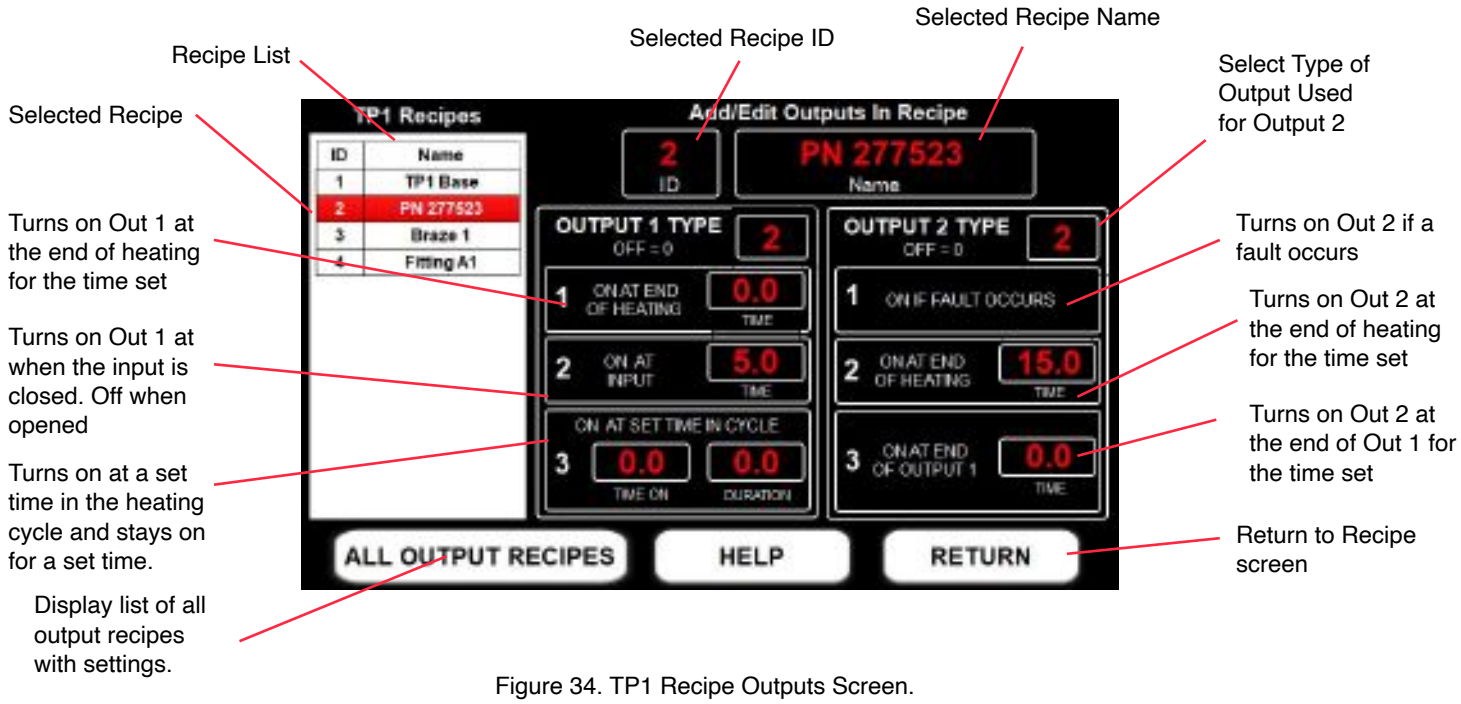
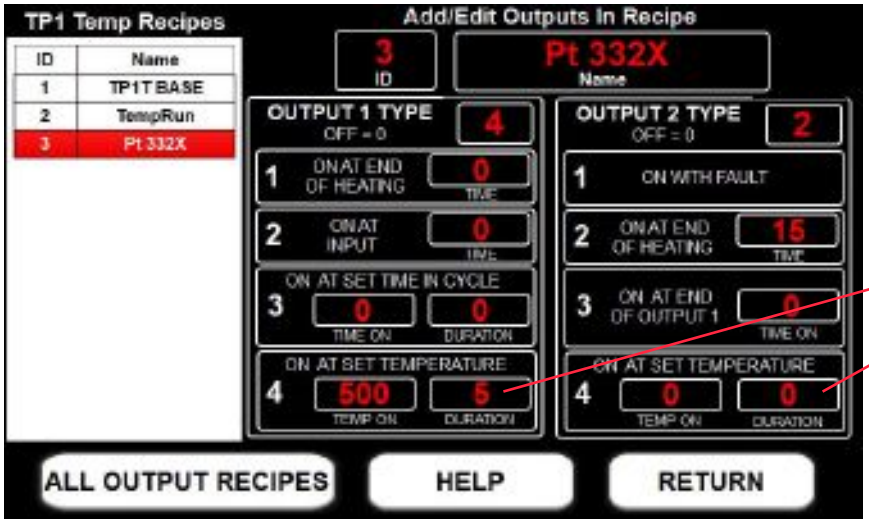


Figure 34. TP1 Recipe Outputs Screen.

10. Outputs (continued)

The Recipe Outputs screen for the TP1 operating mode is shown in Figure 34 on the previous page. The screen is similar to that used for the TP1 Mode Output screen described earlier but includes the Recipe List and the Recipe ID and Name. It also requires that you return to the main Recipe screen to Update the recipe to include the outputs setup.

The TP2 and Pulse Mode recipe outputs screens are the same as the TP1 recipe output screens. The TP1T and the TP2T recipe output screens include the ability to set outputs 1 or 2 based on temperature. The TP1T recipe output screen is shown below.

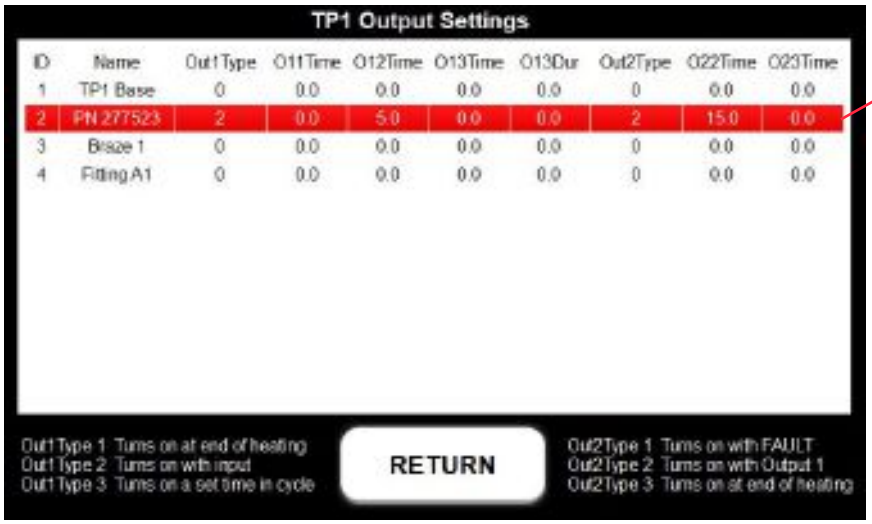


For TP1T and TP2T modes one or both of the outputs can be triggered by a set temperature.

Figure 35. TP1T Recipe Outputs Screen.

The output setups for all recipes entered for the active Operating Mode can be displayed by pressing on the ALL OUTPUT RECIPES navigation button. The ALL OUTPUT RECIPES screen for the TP1 mode is shown below in fig. 36. The ALL OUTPUT RECIPES screens for modes TP2 and Pulse are the same. The ALL OUTPUT RECIPES screen for modes TP1T and TP2T are basically the same with aditional settings for temperature.

The selected recipe is highlighted in red and can be changed by pressing on the desired recipe line. When RETURN is pressed the screen will change back to the Recipe Outputs screen and the entry for the highlighted item will be displayed.



Recipe selected and highlighted in red will be shown on main recipe screen on RETURN.

Figure 36. TP1 All Output Recipes

11. Historical Data Recording and Display

Historical process information on each heating cycle can be recorded and displayed to verify that the required heating has taken place. The information recorded includes Heating Power in KW, Part Temperature and output mperage to the heating coil.

To access the Data screen for each operating mode, press on the DATA navigation button from the navigation bar on the mode START screen. This will bring up the data screen for that mode. For TP1, TP2 and Pulse mode the information can be displayed as only Power KW or KW and Tank (Output) Amperage. For TP1T and TP2T operating modes the information can be displayed as Power KW, Temperature, Power and Temperature or Display All which includes power, temperature and tank amperage. Press on the selection button for the display type desired.

To set the frequency of the data sample, press on the Sample Rate button. A keypad will come up. Enter the desired sample rate in seconds. To enter a 2 second time, enter 20. To enter a 4 second time, enter 40, etc. A time stamp will also be shown for each sample. When the data is displayed, the samples will be shown in order ascending order where the last sample taken will be shown at the top of the screen. Use the scroll bar to scroll down the list to view previous samples. Up to 10000 samples can be stored for review. The sample data can also be stored to a USB stick tolater review. In order to store the data to USB it is necessary to open the front door of the power supply enclosure and insert the USB into the port on the touchscreen.

To clear all data recorded, press the CLEAR button and enter CLEAR on the keypad. Actual sample data screens are shown on page 25.

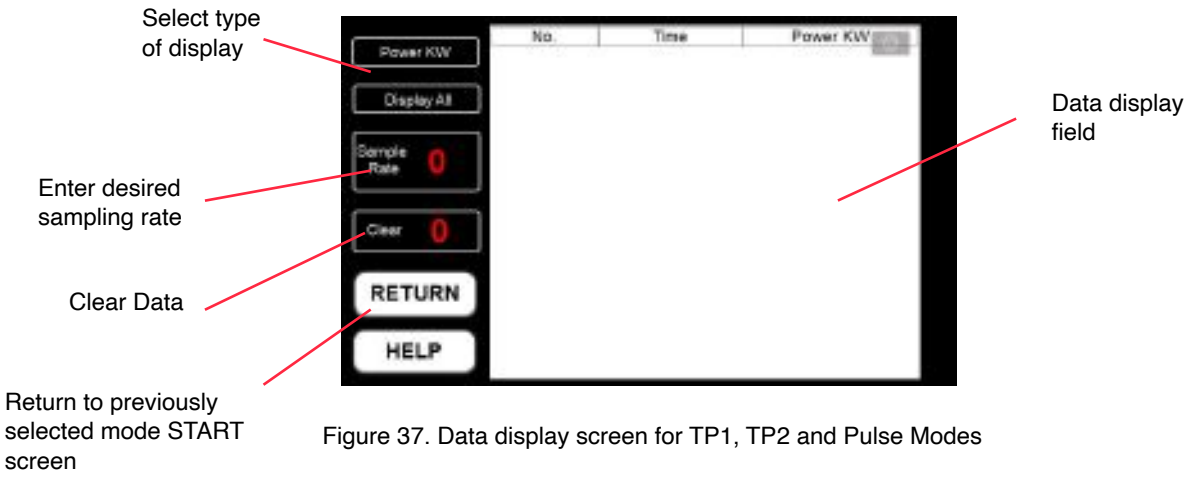


Figure 37. Data display screen for TP1, TP2 and Pulse Modes

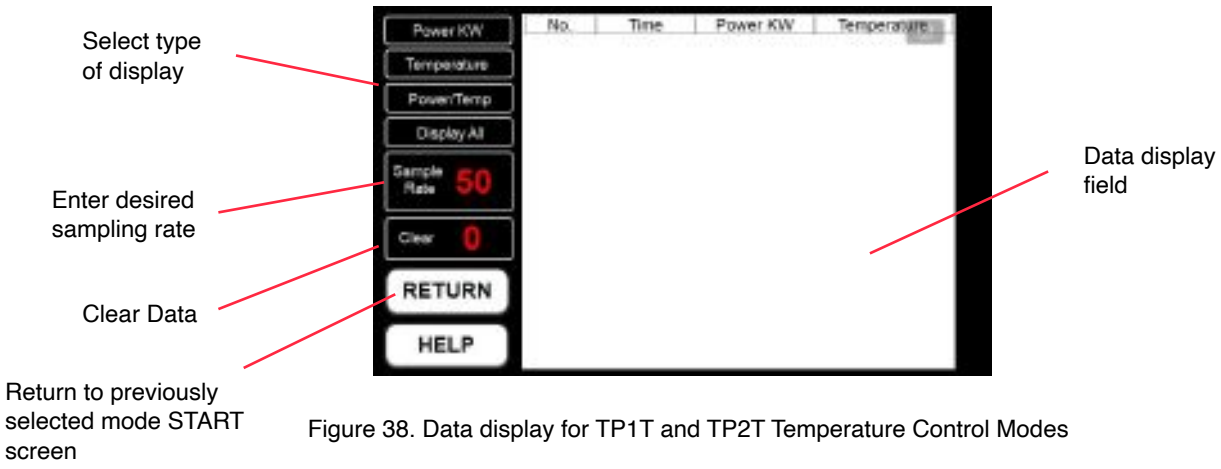


Figure 38. Data display for TP1T and TP2T Temperature Control Modes

Actual sample data displays are shown below. As indicated, data shown for ech screen includes the sample number and the time the sample was taken. The samples are shown in ascending order where the last sample taken is displayed at the top of the screen. To view previous samples that are not shown on the screen you can scroll down the screen.

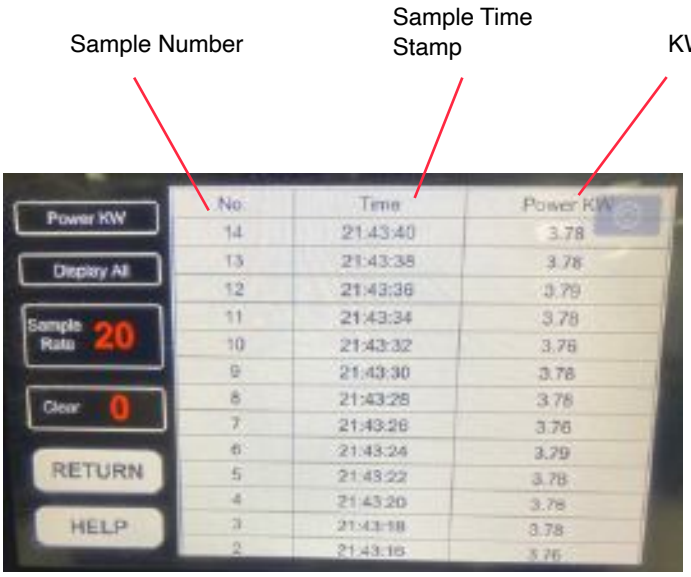


Figure 39. Data display screen for TP1, TP2 and Pulse Modes - Only Power KW is displayed. As shown by the time stamp, samples are taken every 2 seconds.

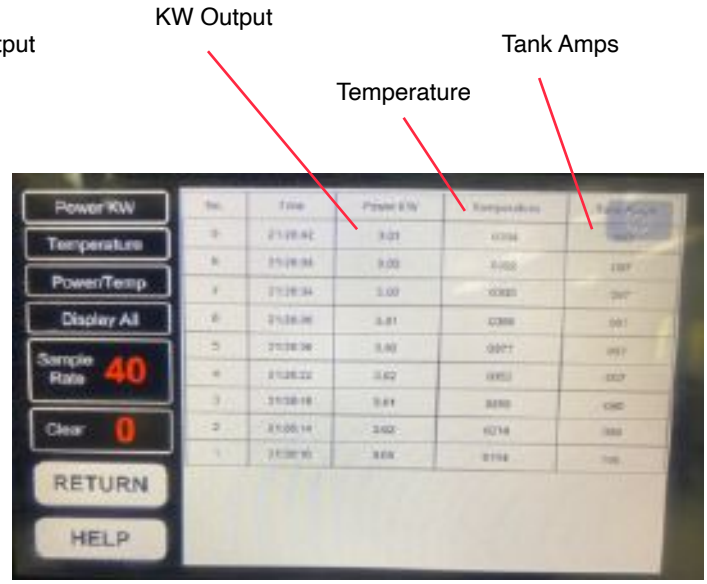


Figure 40. Data display screen for for all modes. Power KW, Temperature and Output AMps Displayed. Temperature can be displayed for TP1, TP2 and Pulse modes if sensor is attached. Samples taken every 4 seconds.

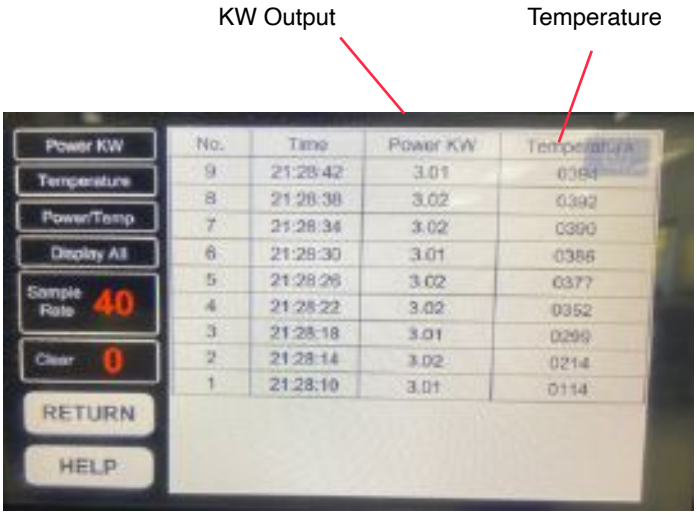


Figure 41. Data display screen for TP1T and TP2T Temperature Control Modes. Power KW and Temperature are shown. Sample taken every 4 seconds.

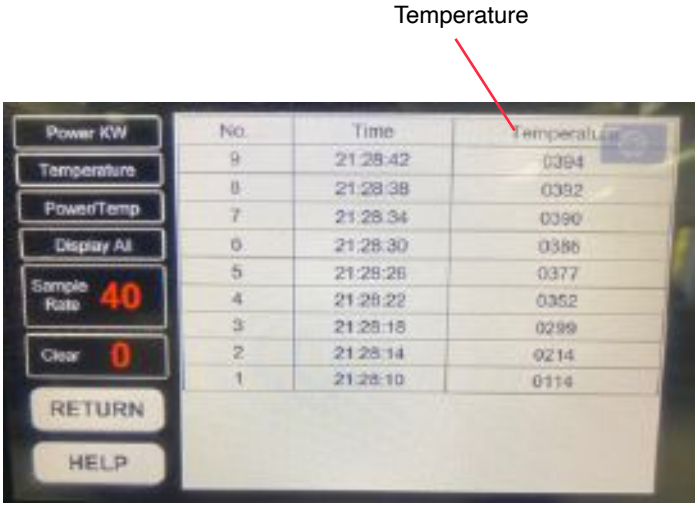


Figure 42. Data display screen for TP1T and TP2T Temperature Control Modes. Only temperature is shown. Sample taken every 4 seconds.

12. Help Screens

HELP screens are available for all control system functions. In the navigation bar at the bottom of each mode screen and many other screens will be a HELP button. Pressing on this button will bring up additional information that is pertinent to the screen that is currently active.

Examples of some HELP screens are shown below. Some HELP items include more than 1 page. To go to the next page, press the MORE button. Press RETURN to go back to the previous screen.

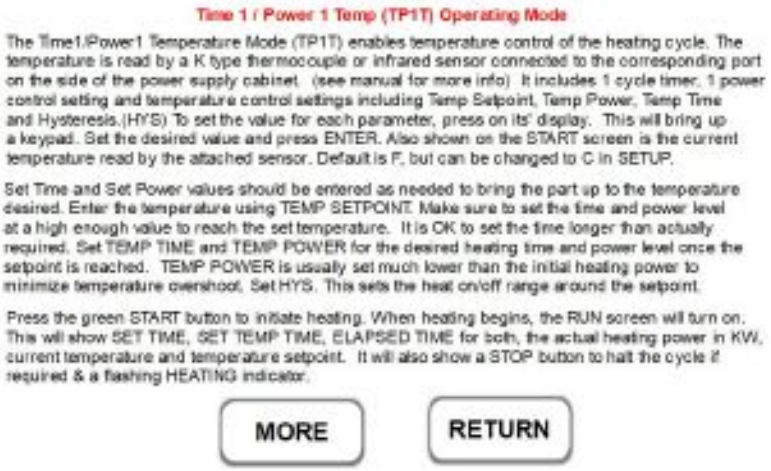


Figure 43. HELP screen for TP1 Mode (1 Time/Power)

Figure 44. HELP screen for TP1T Recipres (1 Time/Power Temperature)

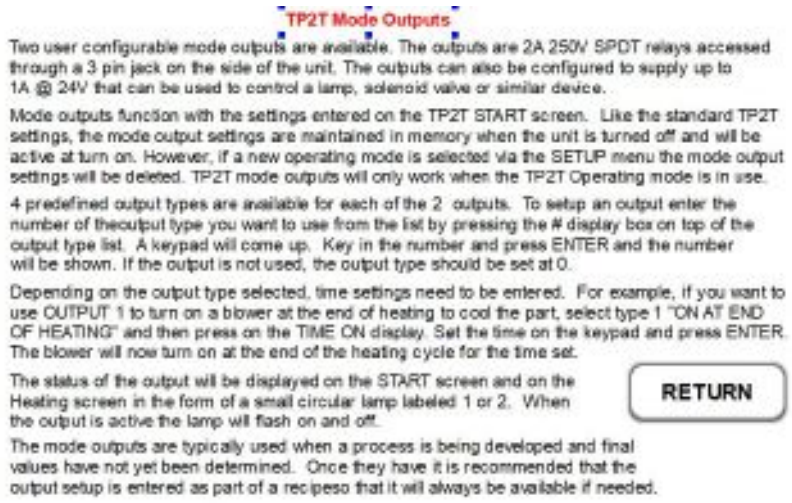


Figure 45. HELP screen for TP2T Mode Outputs (2 Time/Power Temperature)

13. Warning Screens

The HS5000R2Ts Control system includes popup warning displays when a system problem or malfunction occurs. The standard warning displays are shown below.

1. DC Volts Too Low - If there is a problem with the DC voltage inside the unit, particularly if it is too low, the DC volts warning screen will come up. This could be cause by a blown fuse, bad current limiters or low incoming AC voltage. The cause of the problem must be corrected before the screen can CLEAR and heating continue.

2. No Coolant Flow - Coolant must be turned on for the system too heat.

3. SCR Temp too high - If the temperature of the main heat sink is too high this warning will be displayed and heating will be prevented until the temperature drops below 125°F.

4. KW Output too low - If the heating power is below what is requested, this warning sigh will come up. Depending on the setup for the KW output verification, heating may also turn off or just the warning will be displayed.

Figure 46. DC Volts Low Warning Screen

Figure 47. No Coolant Warning Screen

Figure 48. SCR Temp TOO HIGH Warning Screen

Figure 49. KW Output Low Warning Screen