COMPUTER APPLICATION MANUAL

By

GRAND CONTROLS Inc.
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PLEASE NOTE: This manual is currently undergoing updates following the addition of a large update to the features and functions of the HEAT VIEW Computer Application. Any section still currently being reviewed will be tagged with this symbol in the first paragraph the affected section. We are aware of a few visual bugs with some of the settings windows following the update that don't impact the functionality and are currently resolving them. Please https://heatviewcontrols.com/downloads/ check regularly for the updated computer application as well as this manual. We apologize for any inconvenience this may cause.

Revision 1.30.2

Creation Date: 15 August 2019

Revision Log

Revision	Description	Initial	Date
1.0	Initial Release	JB	15 Aug 2019
1.20	Update to match Version 1.20 of the software	JB	18 Feb 2021
1.30	Updated to match the release of version 1.30	JB	06 Dec 2022
1.30.1	Expanded on existing data and updated screenshots to more accurately reflect features and visual profile of 1.30 update.	JK	25-Feb-2023
1.30.2	Updated the faults section to include all the faults	JB	3 Mar 2023

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1 Introduction

This document was created to help an operator or service technician setup and use the computer application created for the HEAT VIEW temperature controller. In this manual you will learn how to download and install the desktop application, configure your PC's network settings to be able to properly communicate with your HEAT VIEW temperature controller(s), establish a static connection to your controller(s), program and monitor multiple types of heat cycles, as well as generate reports in PDF format that can be kept for your own records or provided to clients and customers.

There are several important features about the HEAT VIEW Temperature Control System that should be always kept in mind while reading this manual.

First, this software in conjunction with the controller allows an operator to control, record, and generate reports for heat cycles without ever having to leave the application, in an all-in-one solution to previously separate heat treatment practices.

Second, every channel of a HEAT VIEW controller is capable of being both master or slave; control or monitor, to fit any potential application. This means that depending on the number of channels your controller is configured for – 6,12,18, or 24, with 24 being the maximum a controller can be configured with – your controller can simultaneously run that many independent heat treatment processes. The only limitation being the operators understanding of how to program & interface with the controller and this software. This manual aims to overcome any such limitations.

Third, each HEAT VIEW controller as a unit is independent from all other HEAT VIEW controllers. Controllers are identified and interfaced with based on their individual assigned static IP address. While you can open multiple instances of this software on one computer to interface with multiple controllers simultaneously, controllers cannot interface with each other. Meaning you cannot configure channels from controller A to be slaved to a master from controller B. This means you can also not combine recorded cycle data from two separate controllers into a single combined chart.

Lastly, this system is being actively developed and upgraded to meet new and ever evolving industry needs. Should you encounter any bugs or have thoughts on ways to improve the system, or if you have a specific need the system does not fulfill, please do not hesitate to reach out to the HEAT VIEW authorized vendor you purchased your system from to request support, provide feedback, or even explore a custom solution to your problem.

We at HEAT VIEW are very proud of the system we have created and are pleased that you've purchased a controller and are coming with us as we aim to digitalize an industry that has been traditionally analogue.

Please visit the HEAT VIEW website at: http://www.heatviewcontrols.com for the latest software, products, manuals, and tutorial videos.

2 Getting Started

If this is the first time you are configuring your computer to communicate with a HEAT VIEW controller, you should start reading this manual from Section **Error! Reference source not found.** '**Error! Reference source not found.**', on page **Error! Bookmark not defined.**, and follow it through until Section 7 ' Connecting to The Controller', on page 37, as these are written in sequential order to help you, step-by-step, to install the program and then establish communications with a HEAT VIEW controller. You can then freely jump around between sections after that depending on what you would like to accomplish with the system.

The initial configuration of your computer and networking it to the controller is best performed by an IT professional. If possible, please have your IT department assist with the setup or contact your authorized HEAT VIEW distributor for installation or training assistance.

PLEASE NOTE: HEAT VIEW controllers come preconfigured with an IP address in the format of 10.0.0.XXX (where XXX is the unique system number between 2-255) Should you require your HEAT VIEW controller(s) reconfigured with an IP address unique to your company's network infrastructure, please contact your authorized HEAT VIEW distributor for assistance with the install/setup of your controller(s) and a HEAT VIEW technician will assist your IT department with this change.

PLEASE NOTE: When setting up your connections, it is best practice to connect your HEAT VIEW temperature controller with an UNDAMAGED ethernet cable directly to a computer that has a built in ethernet/RJ45 port. USB-to-Ethernet adapters can be used; however, they can prove to be less reliable and can cause communication faults to occur resulting in lost data or undesirable down time. A large majority of support calls stem from using these adapters and/or damaged ethernet cables.

If the initial software installation and network configuration has been completed and you are simply new to operating the computer application for the HEAT VIEW controller or are looking for a specific function of the system, please skip ahead to Section 0 '8 Welcome to the HEAT VIEW Application', on page 40, or use the Table of Contents to find which function you are looking for and start learning how to operate and control the system.

3 Downloading & Installing the Computer Application

An installer should have been provided to you with the purchase of your HEAT VIEW controller. Currently this software is only supported on Windows® 10 and 11 computers and will **not** work on any Mac® or Linux® machines.

PLEASE NOTE: The download, installation of software, and configuration of network settings for the HEAT VIEW controller may require administrator privileges depending on how your system has been configured. Please have your I.T department perform the actions laid out in the sections 2 & 3 if you are in doubt.

3.1 Downloading the Application

If you were not supplied with the installer or are installing the software on a new machine and don't have access to the original installation media, you can download it from http://www.heatviewcontrols.com.

1. Once on the Downloads page of the website, click on the "click here" download link next to "Temperature Controller – Computer application" as highlighted in Figure 1 below.

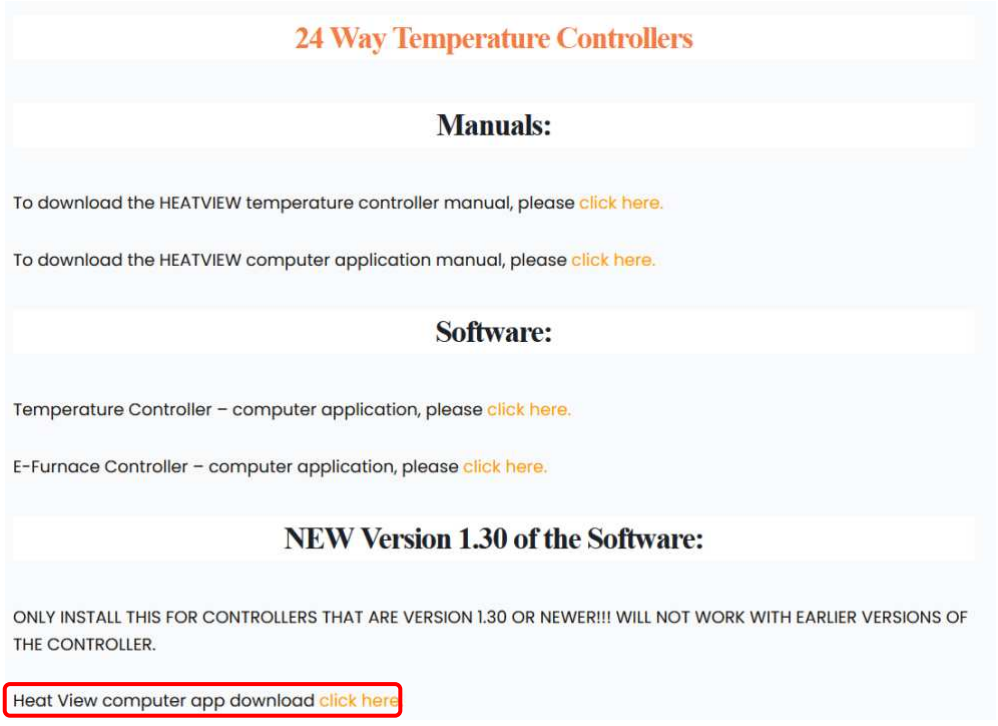


Figure 1: Application download link

2. Clicking the link will open a new window prompting you to save the installer to a location of your choice. By default, Windows® 10/11 saves new downloads in your Downloads

folder within 'File Explorer' as seen in Figure 2 below. Click 'Save' to save the file in the location you have chosen.

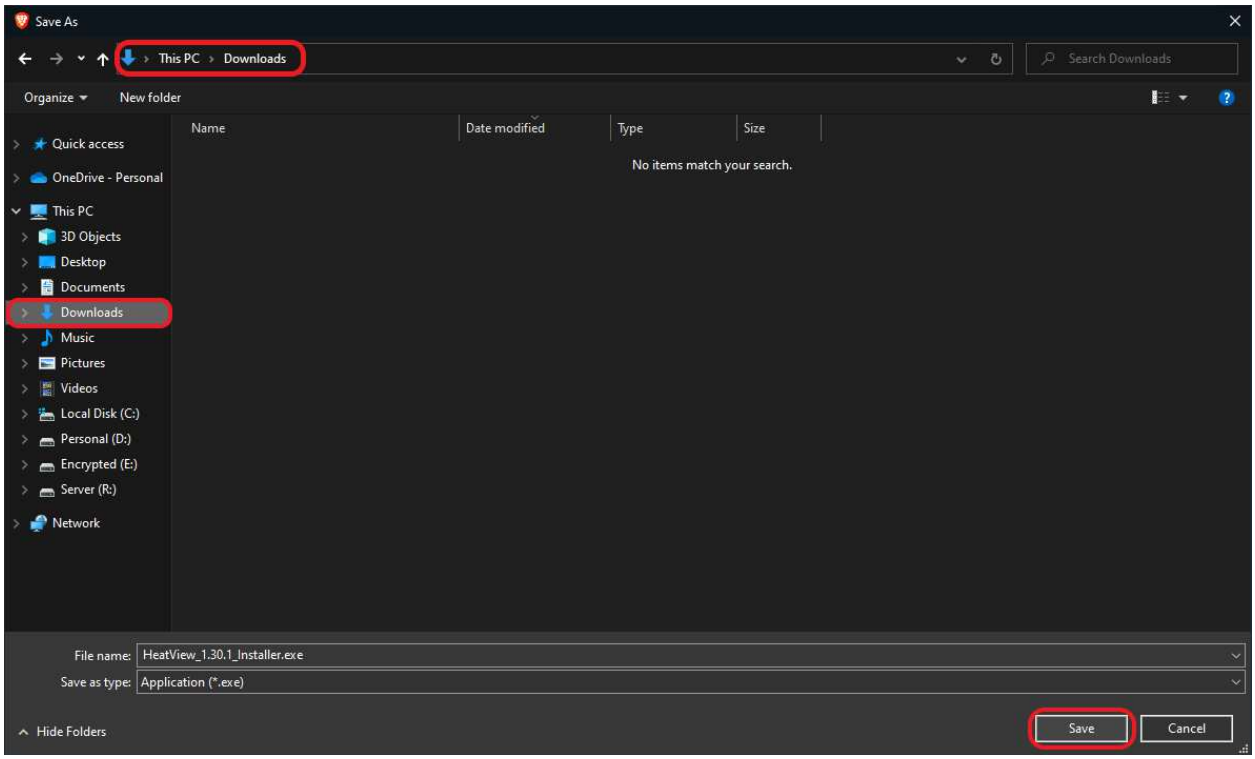


Figure 2: Installer save location

PLEASE NOTE: The controller and the computer application each have their own code. You need to match the version number of the computer application with the controller version. You cannot connect to a controller running version 1.20.xx of its code with version 1.30.xx of the computer application and vice versa.

3.2 Installation Steps

Installing the software is as simple as running the HEAT VIEW_X.X.X_Installer.exe file (where "X.X.X" is the version number of the software.) provided with your HEAT VIEW controller or that you downloaded from the HEAT VIEW website in the previous step.

PLEASE NOTE: Your computer should have all its critical system updates installed and all other running programs should be closed prior to starting this process as you will need to restart your computer once the installation finishes.

1. In ‘File Explorer’, open the location that contains your “HEAT VIEW_X.X.X_installer.exe” file – either on the installation media provided to you with your purchase, or the folder you selected in the previous step – and double-click the installer to start the process. Refer to Figure 3 below for an example. Version 1.30.1 is shown in this manual as an example, however yours will appear as whichever version you are installing. This file will be in the location you selected when downloading the file.

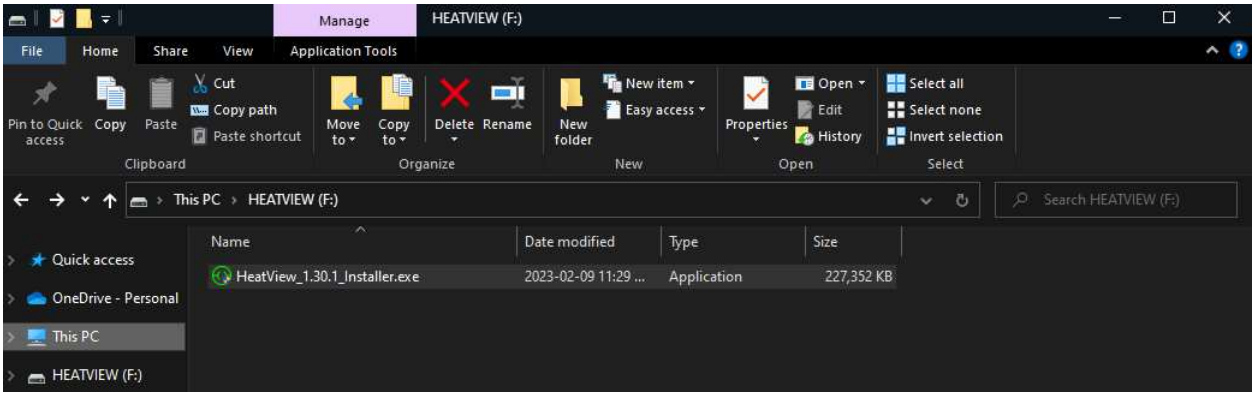


Figure 3: Installation – Locating your installer

2. Depending on how your system is configured this may or may not open ‘the User Account Control’ window shown in
3. Figure 4 below, requesting administrator level permissions to proceed. If you have ‘User Account Controls’ turned off, you might not see this pop-up. You must either click ‘YES’ or provide the installation with administrator authorization in order to proceed.

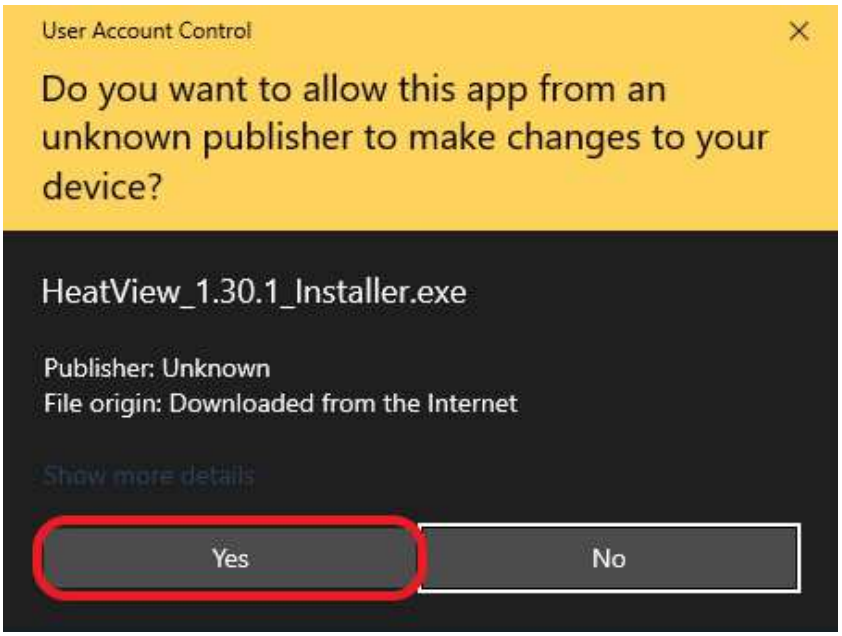


Figure 4: Installation – ‘User Access Controls’ window

4. To continue the installation, you must click ‘Next >’ – as highlighted in Figure 5 below.

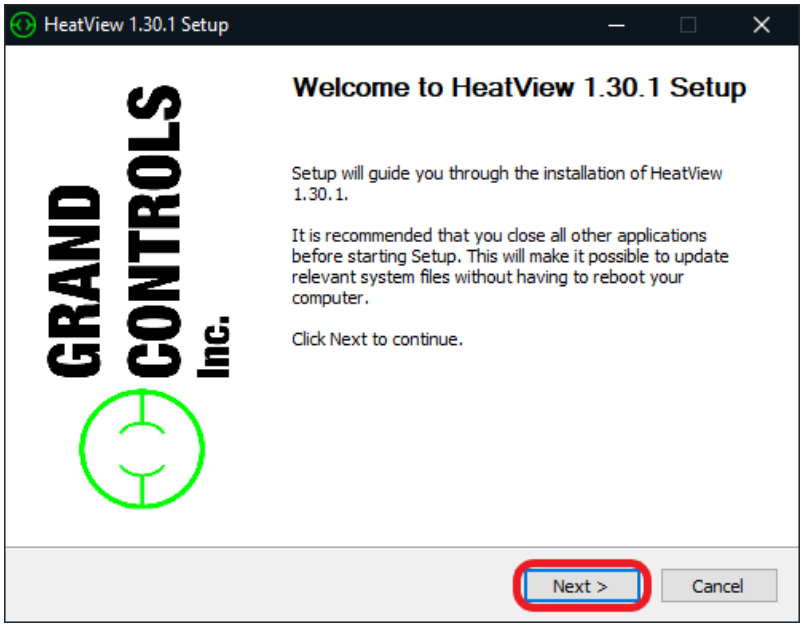


Figure 5: Installation - Welcome Screen

5. Next, you can choose to rename the folder the program will be accessible under in the ‘Start Menu’. The default is “HeatView X.X.X” (where X.X.X is the version number). Once you’ve chosen your desired name, click ‘Install’ – as highlighted in Figure 6 below – to proceed.

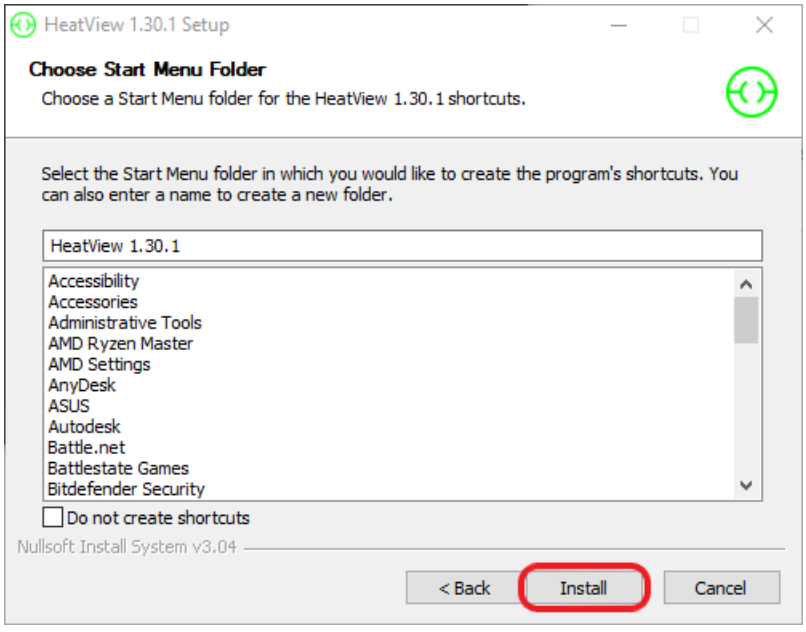


Figure 6: Installation – ‘Start Menu’ folder name

6. The installer should automatically install the software and all necessary Beckhoff communication drivers for the HEAT VIEW controller, and you should see the installation status progress on a window like that shown in Figure 7 below.

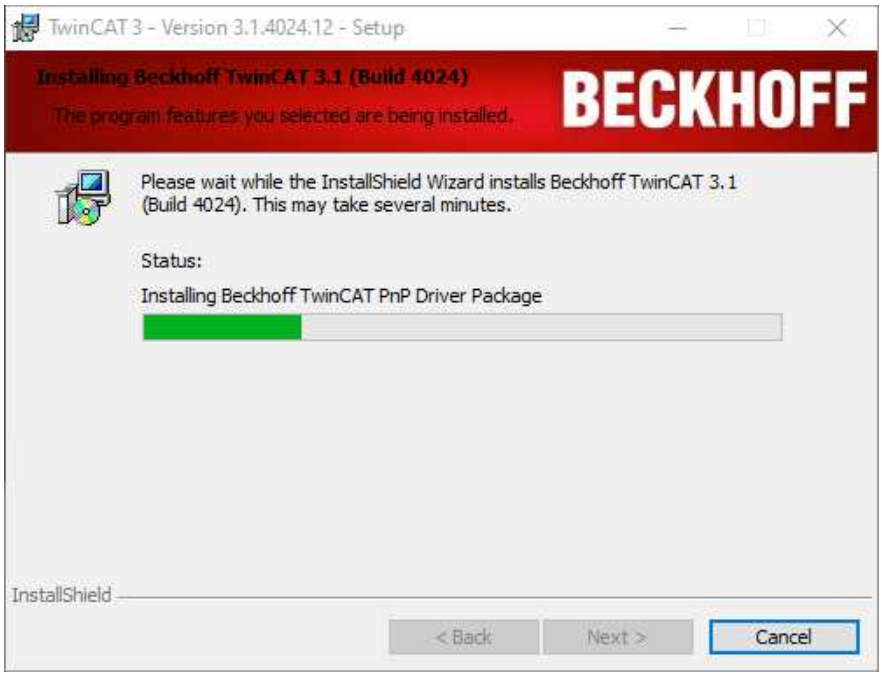


Figure 7: Installation - Communication driver package

PLEASE NOTE: Depending on your system configuration the installer may not automatically proceed with installing all the necessary drivers and may pop-up several windows like that shown in Figure 8 below. Please click 'Install' on all windows that pop-up to complete the installation process.

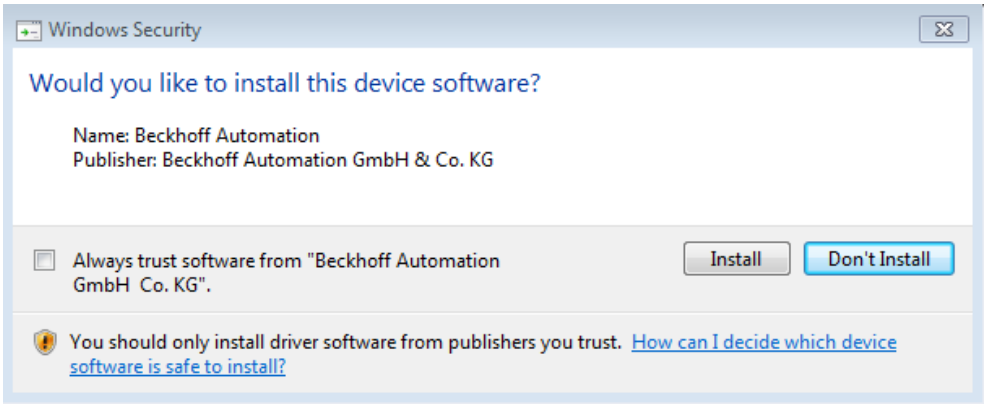


Figure 8: Installation - Individual driver install request

PLEASE NOTE: On rare occasion the installation process will fail to install the necessary Beckhoff communication drivers. If this happens, please return to http://www.heatviewcontrols.com and then navigate to the downloads page. Scroll to the bottom of the page and locate the “Installer Support” section. Click the link highlighted in Figure 9 below to download the TC31-ADS-Setup.X.X.XXXX.XX.exe (where X’s represent the version number) then save and run this installer and reattempt the HEAT VIEW software install.

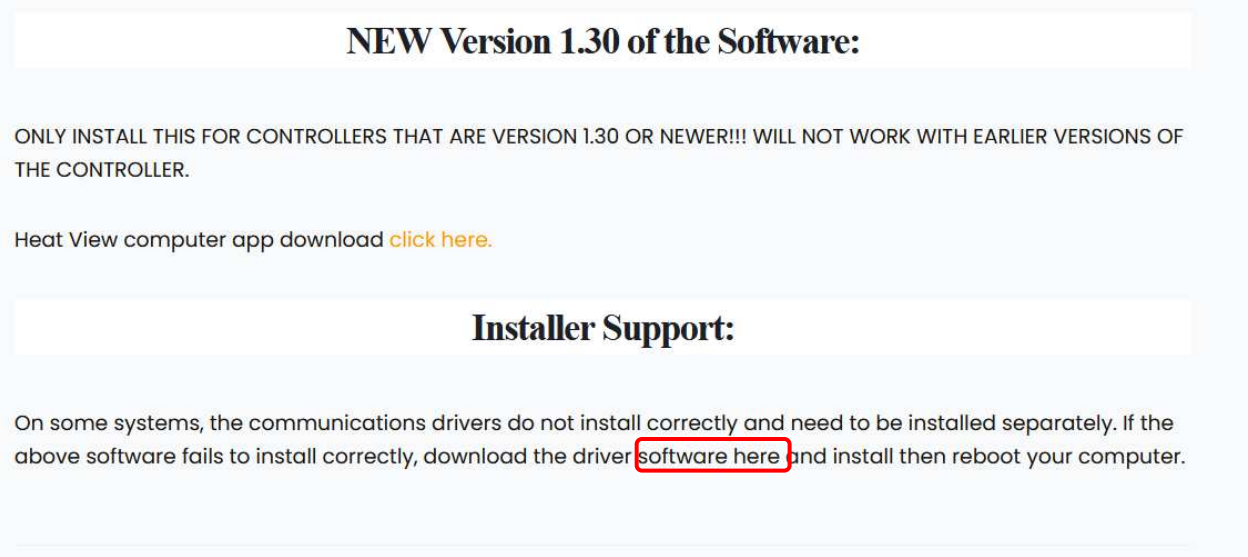


Figure 9: Installation - Driver package download link

7. Once the system has successfully installed both the communication drivers and the HEAT VIEW controller software, it will ask you to reboot your system. If you are ready to do so, click ‘Yes’ – as highlighted in Figure 10 below. Otherwise, click ‘No’ and make sure you reboot your system before trying to run the software to avoid issues connecting to your HEAT VIEW controller

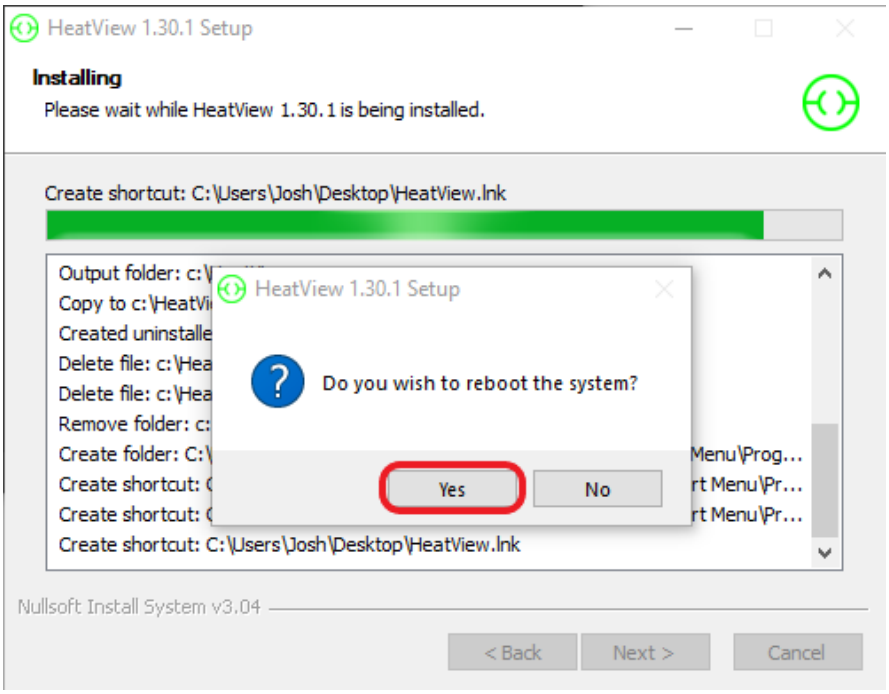


Figure 10: Installation – System reboot request

3.3 Opening The Software

Unless you chose otherwise during the installation process, the installer automatically installed a desktop icon and a shortcut link in your start menu for the HEAT VIEW controller software to make it simple to find, open, and start using. Should you wish to connect to more than one controller simultaneously, simply use the Desktop or Start Menu Icon to launch additional instances of this application, and follow the steps in Section 7 to connect to them.

The desktop icon can be easily located on both Windows® 10 and Windows® 11 and simply double-clicking the icon will open the HEAT VIEW computer application. However, the process for finding the 'Start Menu' folder differs slightly between the two operating systems. The steps for finding it on each operating system are outlined below.

3.3.1 Windows® 10 Start Menu Folder Location

Click the 'Start' button in the 'Task Bar' in bottom left corner of your screen – highlighted in Figure 11 below. Scroll through the alphabetical list of programs until you find a folder called "HeatView X.XX.X" (where X.XX.X is the version number) or whatever name you gave this folder during step 5 of the installation procedure on page 15. Click on this folder – in this example it is titled "HeatView 1.30.1" – to expand it and find the icon for the HEAT VIEW computer application; also highlighted in
Figure 11. Clicking this icon will launch the HEAT VIEW computer application.

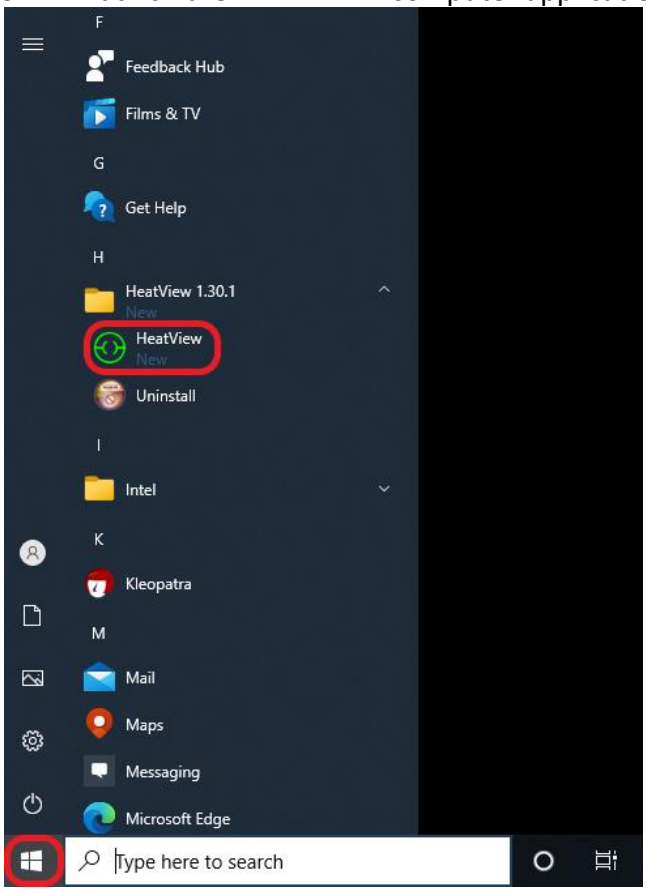


Figure 11: Windows® 10 – 'Start Menu' folder location

3.3.2 Windows® 11 Start Menu Folder Location

1. Click the 'Start' button in your 'Task Bar' – highlighted in Figure 12 below – to bring up the 'Start Menu.'

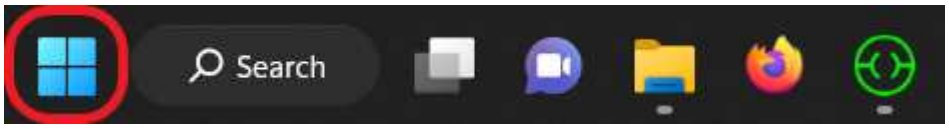


Figure 12: Windows® 11 'Start' button

2. Next, click on the 'All Apps' button at the top right of the 'Start Menu' – highlighted in Figure 13 below – to access the alphabetical list of installed applications.

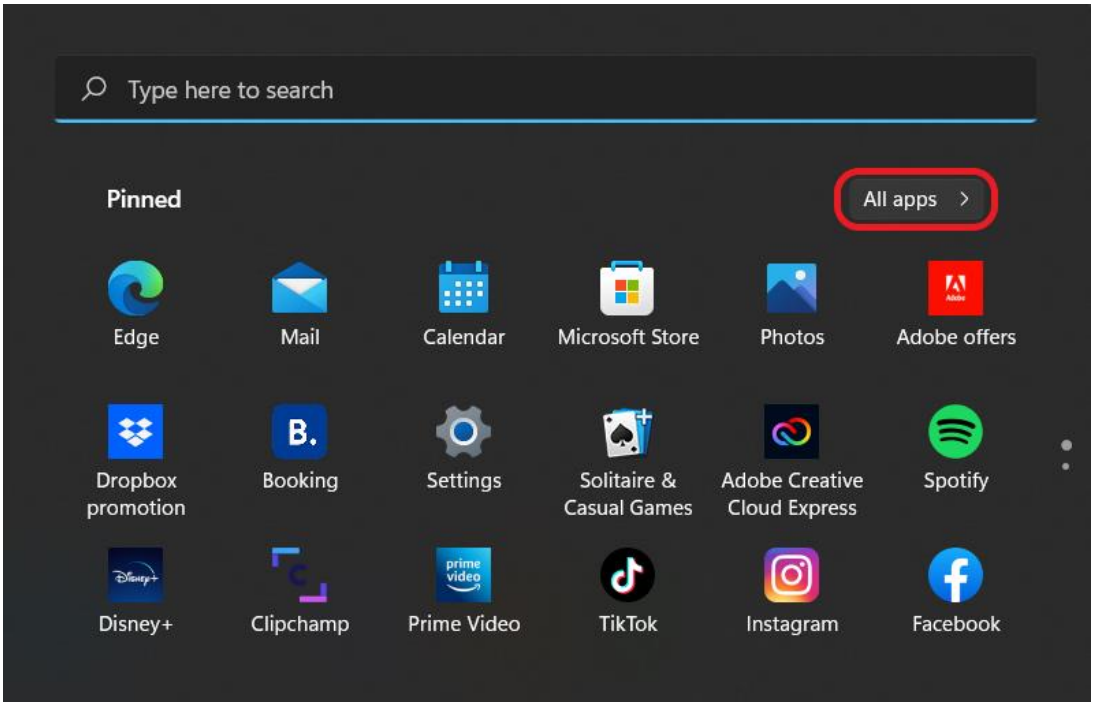


Figure 13: Windows® 11 – 'Start Menu' main window

3. Scroll through the alphabetical list of programs until you find a folder called "HeatView X.XX.X" (where X.XX.X is the version number) or whatever name you gave this folder during step 5 of the installation procedure on page 15. Click on this folder – in this example it is titled "HeatView 1.30.1" – to expand it and find the icon for the HEAT VIEW computer application, which is highlighted in Figure 14 on the next page. Clicking this icon will launch the HEAT VIEW computer application.

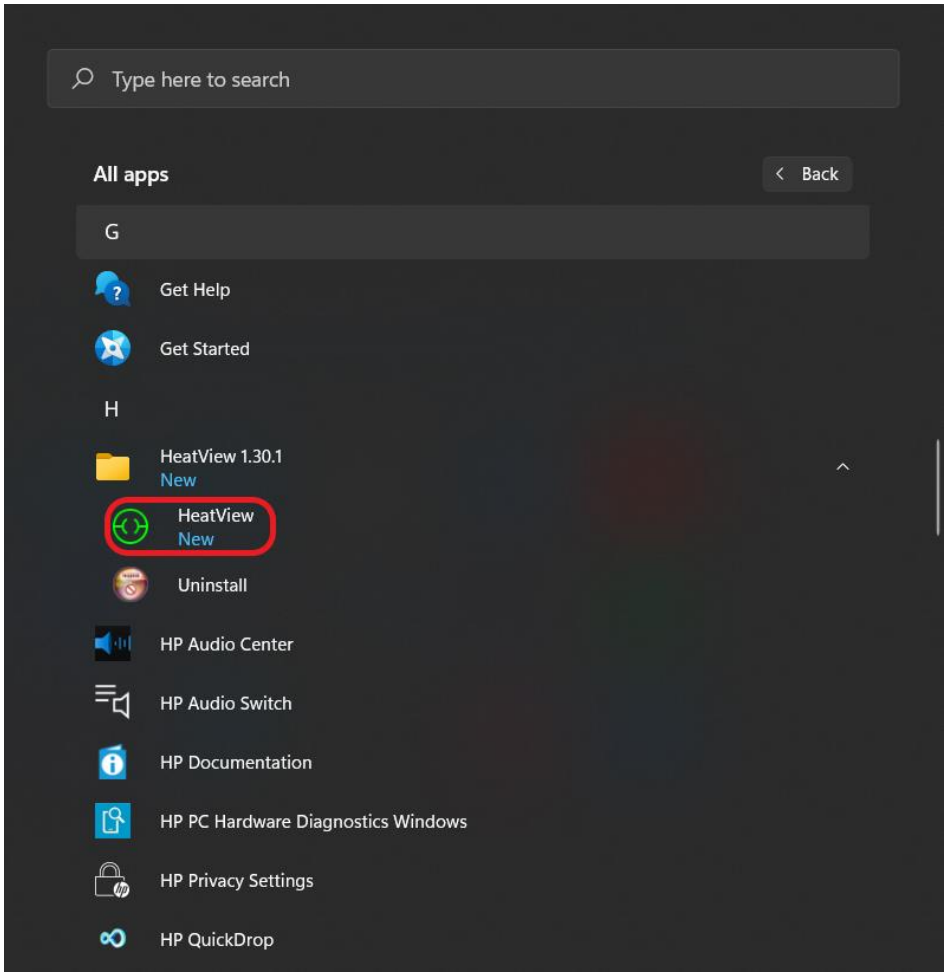


Figure 14: Windows® 11 – 'Start Menu' folder location

PLEASE NOTE: Once you have launched the application you can right-click on the icon for it in the 'Task Bar' and select 'Pin to taskbar' – highlighted in Figure 15 below – to pin the application to the 'Task Bar' for faster launching of the program in the future in both Windows® 10 & 11.

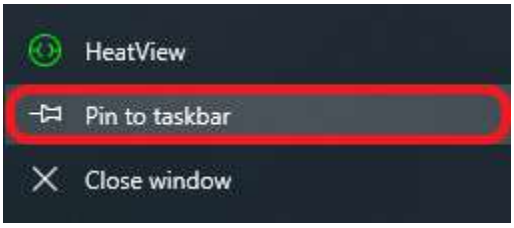


Figure 15: 'Task Bar' – Pinning the application

4 Configuring Network Settings

HEAT VIEW controllers require dedicated network routes to properly communicate back and forth with your computer. The controllers come equipped with an internal router – that can be turned on or off via the 'Stand Alone Enable' switch on the rear of the device – that should automatically assign your computer an IP address to allow for communication with the controller.

If you experience any issues with this internal router, the easiest way to guarantee uninterrupted network communication between your computer and the controller is to set your computer up with a static I.P address. HEAT VIEW controllers come pre-set with their own static I.P address in the 10.0.0.XXX format (where XXX is the unique system number between 2-255.)

The steps for accessing the necessary network configuration settings differs slightly visually between Windows® 10 and Windows® 11, however, the steps are identical in function.

1. Depending on your configuration, click on the search bar or magnifying glass in the lower left corner of your screen (just left of center along the bottom on Window® 11), and type in "Network Connections." Click 'View network connections – as highlighted in Figure 16 below – to open the 'Network Connections' window.

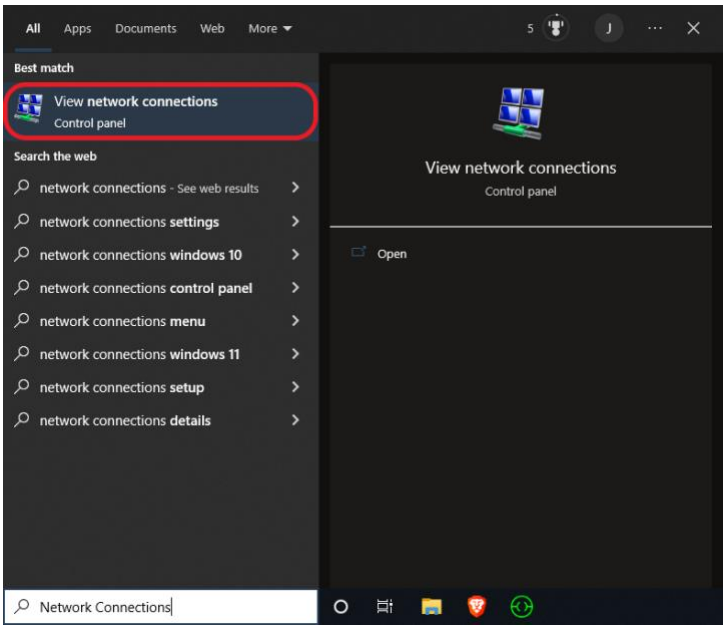


Figure 16: Network Configuration – View network connections

2. The 'Network Connections' window will show you all networking devices installed on your computer; it may differ visually from what you see below. Find the ethernet adapter that you will be using to connect to your HEAT VIEW controller(s) – in this example it is "Ethernet 2" as highlighted in Figure 17 on the next page – and double-click on it to start editing the network settings.

PLEASE NOTE: If you are using a USB-to-Ethernet adapter to connect to the HEAT VIEW controller(s) you will need to have the adapter plugged in, and all of the necessary drivers installed before it will show up in the 'Network Connections' window.

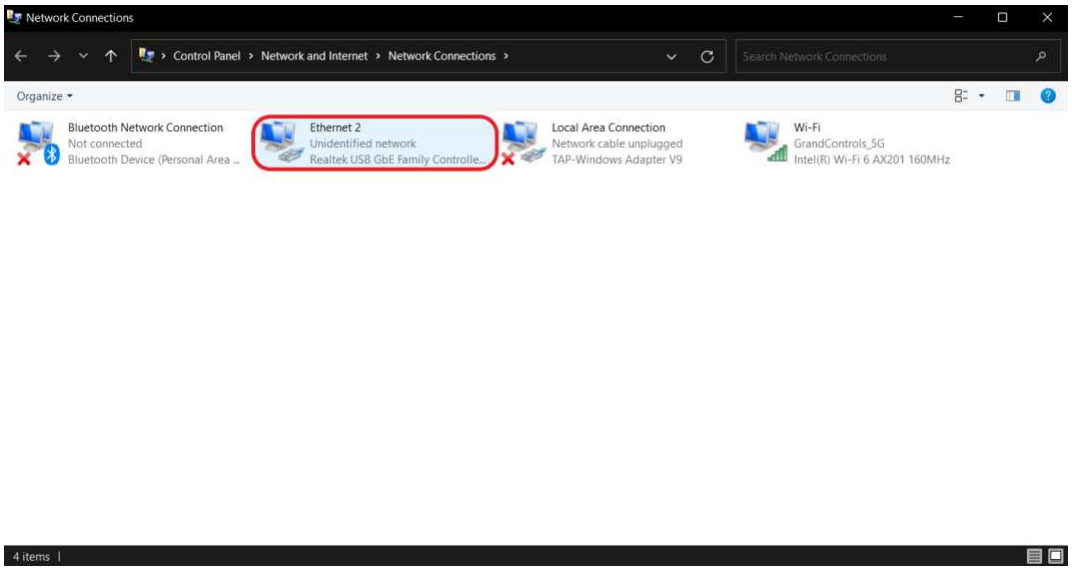


Figure 17: Network Configuration – 'Network Connections' window

3. If your computer is connected to a HEAT VIEW controller already via ethernet cable, the window that pops up will be the 'Ethernet Status' window and you will have to click on 'Properties' as is highlighted in Figure 18 below.

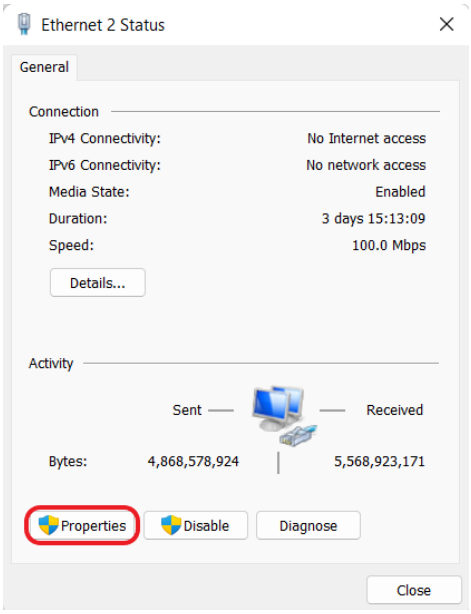


Figure 18: Network Configuration – 'Ethernet Adapter Status' window

4. If you are not yet connected via ethernet cable to the controller the system will automatically open the 'Ethernet Properties' window shown in Figure 19 below. In either case you need to navigate to the 'Ethernet Properties' window and double-click on 'Internet Protocol Version 4 (TCP/IPv4)' – highlighted in Figure 19 below – to proceed.

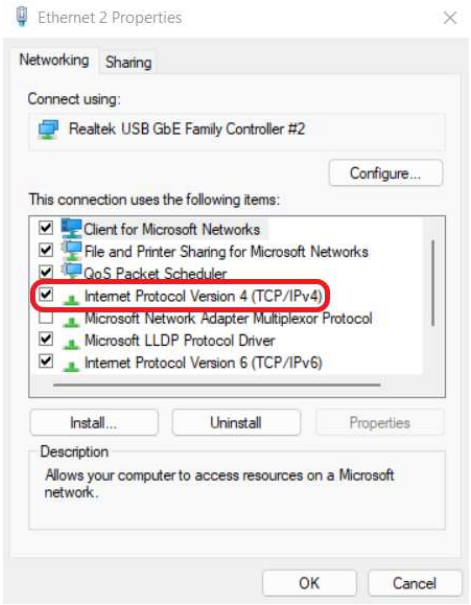


Figure 19: Network Configuration – 'Ethernet Adapter Properties' window

5. Once in the 'Internet Protocol Version 4 (TCP/IPv4) Properties' window you will see several fields that are all greyed out and non modifiable. This is since computers by default are set to 'Obtain an IP address automatically' from your router. To change this, please click on 'Use the following IP address' as is highlighted in Figure 20 below. This will enable you to edit all the fields previously greyed out. For HEAT VIEW controllers, the only fields you need to modify are the 'IP address' and the 'Subnet mask' fields.

Figure 20: Network Configuration - TCP/IPv4 Properties window

6. The IP address you assign to your computer needs to be in the same format as the HEAT VIEW controller(s). For example, if the HEAT VIEW controller has an IP address of 10.0.0.20, you need to set your computers IP address to something different but similar such as 10.0.0.3; as seen in Figure 21 below. **The preferred IP address for your computer is 10.0.0.3.**

   The 'Subnet Mask' will always be 255.255.255.0 unless using a custom network configuration. Once you've entered the settings, please click 'OK' – as is highlighted in Figure 21 below – on all windows that have an 'OK' button. Clicking 'Cancel' will cause any changes you made to not take effect.

PLEASE NOTE: To avoid IP address conflicts please ensure that you never set your computers IP address as 10.0.0.1 or the same as any of the HEAT VIEW controllers you intend to connect to with that computer. To clarify – if the controllers IP address is 10.0.0.20, the computers IP address cannot also be 10.0.0.20.

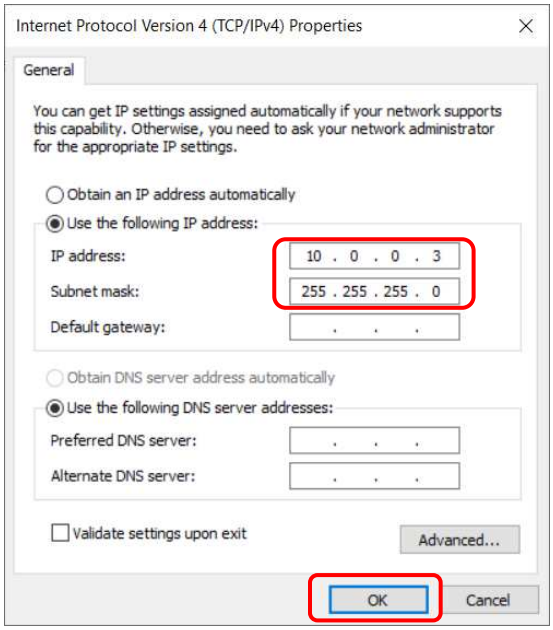


Figure 21: Network Configuration – IP address & Subnet mask

PLEASE NOTE: It is common practice to use HEAT VIEW controllers with 900Mhz radios for wireless communication on industrial sites in point-to-point and multi point-to-point setups. These radios must also each have their own unique IP address assigned to them in the same 10.0.0.XXX format and not conflict with either the HEAT VIEW controller(s) or the computer.

5 Connecting Your Computer to The Controller

There are several methods and configurations you can use to connect to HEAT VIEW controllers. They are broken down and explained in detail below. Please ensure that you've powered on your HEAT VIEW controller(s) and that it has initialized completely before starting this process.

PLEASE NOTE: In the following scenarios, if your computer is using a static IP address instead of being assigned one by the router built into the controller, please ensure you have the 'Stand Alone Enable' switch in the 'OFF' position at all times. Leaving this switch enabled can lead to communication issues.

5.1 Single Hardwired Connection

All HEAT VIEW controllers support hardwired connections via standard CAT5 or CAT6 Ethernet cables. Standard configuration HEAT VIEW controllers come with 2 external ethernet ports on the left-hand side to allow direct connection or 'Daisy-Chaining' of devices. More on how to 'Daisy-Chain' later in this section. Follow these steps to connect a single HEAT VIEW controller to your computer.

1. On the rear of the HEAT VIEW controller there is a 'Stand Alone Enable' switch. Ensure this switch is in the 'ON' position.
2. Power on the HEAT VIEW controller and wait for it to fully initialize – this can take up to 2 minutes.
3. Using an undamaged ethernet cable, connect one end to either of the 2 ethernet ports on the HEAT VIEW controller.
4. Connect the other end of the ethernet cable directly to your computers ethernet port. If using a USB-to-Ethernet adapter, ensure both the ethernet side and USB side of the adapter are fully inserted into their respective ports.
5. Open the HEAT VIEW computer application and proceed to Section 6 ' Adding Static Routes' on Page 30 of this manual to add a static route and complete the connection process.

5.2 Multiple Hardwired Connections

It is possible to connect multiple HEAT VIEW controllers to a single computer via a couple of different methods. These methods include connecting several controllers together via an ethernet switch or directly 'Daisy-Chaining' controllers together. The steps to accomplish this are detailed below.

5.2.1 Ethernet Switch Connection Method

1. On the rear of the HEAT VIEW controller there is a 'Stand Alone Enable' switch. Ensure this switch is in the 'ON' position **on only one** of the controllers and 'OFF' on all other controllers that will be connected to the ethernet switch.

2. Power on the HEAT VIEW controllers and wait for them to fully initialize – this can take up to 2 minutes.
3. Using undamaged ethernet cables, connect each HEAT VIEW controller to the ethernet switch.
4. Using an undamaged ethernet cable, connect the switch to the ethernet port of your computer or USB-to-Ethernet adapter connected to your computer.
5. Open the HEAT VIEW computer application and proceed to Section 6 ‘ Adding Static Routes’ on Page 30 of this manual to add a static route and complete the connection process.

5.2.2 Daisy-Chain Connection Method

‘Daisy-Chaining’ refers to connecting one controller to another via ethernet cables and then connecting the last ethernet cable in the chain to the computer. This is the reason that standard configuration HEAT VIEW controllers have 2 external Ethernet ports on them. This process can be started at either end of the chain, but for this manual the steps start from the end of the chain (last controller) and work their way back to the beginning of the chain (the computer).

1. On the rear of the HEAT VIEW controller there is a ‘Stand Alone Enable’ switch. Ensure this switch is in the ‘ON’ position on the controller that will be directly linked to the computer in the chain. Set the ‘Stand Alone Enable’ switch of all other controllers in the chain to the ‘OFF’ position.
2. Power on the HEAT VIEW controllers and wait for them to fully initialize – this can take up to 2 minutes.
3. Using undamaged ethernet cables, starting at the controller at the end of the chain, connect one end of the ethernet cable to either of the open ethernet ports.
4. Connect the other end of the Ethernet cable you just plugged into the last controller in the chain into either of the 2 open ethernet ports on the next controller in the chain.
5. Repeat this process, connecting one controller to the next in the chain, until you have an unbroken ‘chain’ of controllers.
6. Connect the first controller in the chain – the one with the ‘Stand Alone Enable’ switch set to the ‘ON’ position – directly to the computer or USB-to-Ethernet adapter using an undamaged ethernet cable.
7. Open the HEAT VIEW computer application and proceed to Section 6 ‘ Adding Static Routes’ on Page 30 of this manual to add a static route and complete the connection process.

5.3 Wi-Fi Connection

Standard configurations of the HEAT VIEW controller come equipped with an internal router. This router will allow you to connect to the HEAT VIEW controller(s) wirelessly over short range. This form of connection is best used if the computer that will be connecting to the controller(s) is going to be near the controller(s) but has limited or obstructed access for an Ethernet cable.

The biggest limitation of this form of connectivity is that you cannot access the internet via Wi-Fi while connected to the controller unless you have an additional Wi-Fi adapter for your computer.

To connect a controller via Wi-Fi please follow the steps as outlined below.

1. On the rear of the HEAT VIEW controller there is a ‘Stand Alone Enable’ switch. Ensure this switch is in the ‘ON’ position.
2. Power on the HEAT VIEW controller and wait for it to fully initialize – this can take up to 2 minutes.
3. On your computer, in the bottom right corner on the task bar, click on the Wi-Fi symbol and find the Wi-Fi network “Temperature_Controller1” and click “Connect” – both highlighted in Figure 22 below.

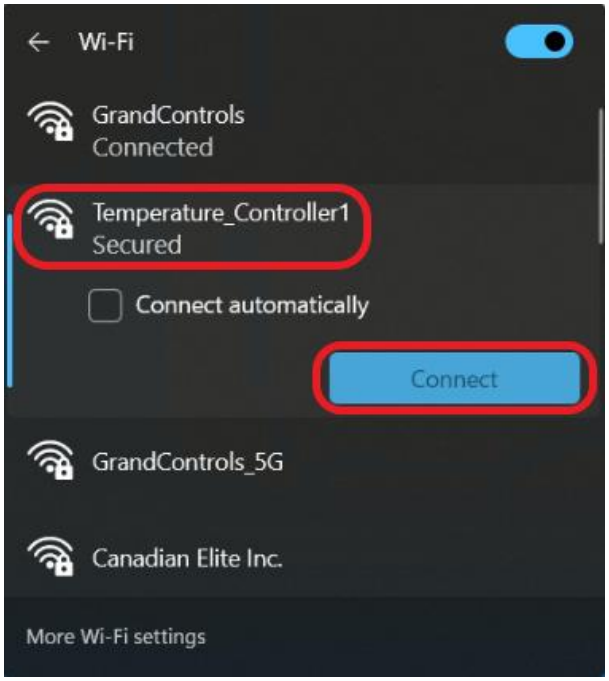


Figure 22: Wi-Fi Connection - Network connection menu

4. In the password field that appeared after clicking ‘Connect’, enter the password exactly as it is shown in Figure 23 below.

Wireless SSID: Temperature_Controller1

Password: GRANDCONTROLS

Figure 23: Wi-Fi Connection – Network credentials

5. Once connected to the network, open the HEAT VIEW computer application and proceed to Section 6 ‘ Adding Static Routes’ on Page 30 of this manual to add a static route and complete the connection process.

PLEASE NOTE: If you wish to connect to multiple controllers simultaneously using the Wi-Fi method, you must also employ either the ‘Ethernet Switch’ or ‘Daisy-Chain’ method to group the controllers into a single network. Perform the steps in either method until you reach the step you would normally connect the ethernet cable to your computer, and instead of connecting the cable, start from step 1 of this section.

6 Adding Static Routes

Physically – or wirelessly – connecting to a HEAT VIEW controller as you did in the previous section, is only the first half communicating with the controller. Once connected, HEAT VIEW controllers require a dedicated communication channel or 'Static Route' in order to communicate back and forth with your computer securely. This section will guide you through how to establish this connection and verify that it is functioning correctly.

If this is the first time you are connecting to a specific HEAT VIEW controller or it is the first time you are opening the software on this specific computer, you need to setup up a dedicated communication channel to the controller(s).

PLEASE NOTE: In order for you to successfully establish a connection in to your controller, it is critical that you or your IT department completed the steps in Section 4 (If using a Static IP) and you have chosen a connection method from Section 5. If you have not performed the steps outlined in Section 4 and chosen a method from Section 5 of this manual, please go back and do so now.

By now you should have downloaded and installed the HEAT VIEW computer application. Following the steps outlined in Section 3.3 'Opening The Software' on page 19, ensure you have launched the application and that your screen appears similar to that shown in Figure 24 below. (You can open the software by finding it in your start menu or double-clicking the icon it made on the desktop during installation.)

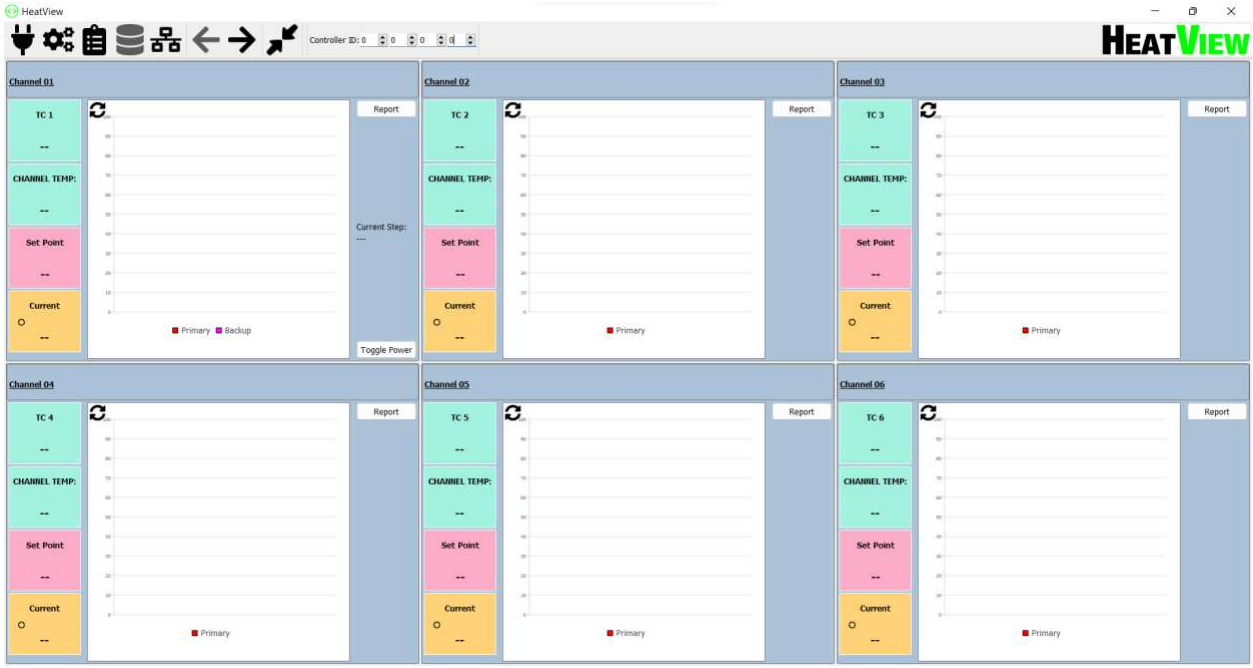


Figure 24: Static Routes – Main screen – No connection

PLEASE NOTE: The following steps appear before Section 0 ‘8 Welcome to the HEAT VIEW Application’ because there are several sections of the computer application that are not accessible while not connected to a controller. Any menus you interact with during the following steps will be explained further in Section 0 of this manual.

Follow the steps as outlined below to finalize your connection to your HEAT VIEW controller(s).

1. Click the ‘Run TwinCAT Route Setup’ button – highlighted in Figure 25 below – in the software’s ‘Title Bar’ along the top of the window.

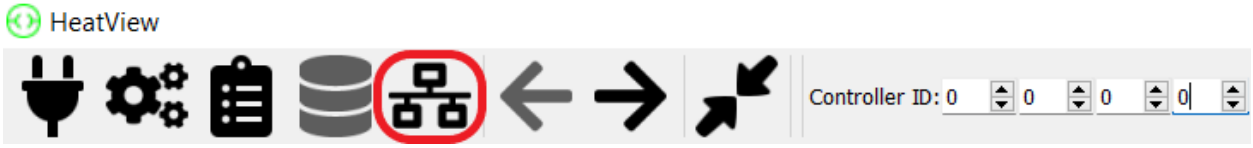


Figure 25: Title Bar – Run TwinCAT Route Setup Button

2. This will open the ‘TwinCAT Static Routes’ window. This window may already have one or more controllers listed depending on how many different controllers you have connected to previously on this computer. To setup a communications channel/add a static route, click the ‘Add…’ button at the bottom left of the window highlighted in Figure 26 below.

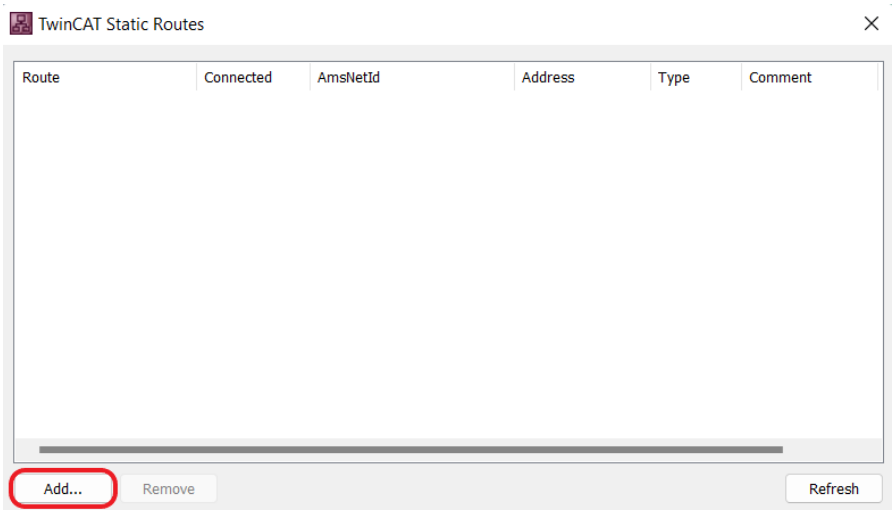


Figure 26: Static Routes – ‘TwinCAT Static Routes’ window

3. If this is the first time using the ‘Add Route Dialog’ window that opened, you will need to click on ‘Advanced Settings’ – highlighted in Figure 27 on the next page – to reveal additional settings you will need to change. If this is already enabled skip to the next step.

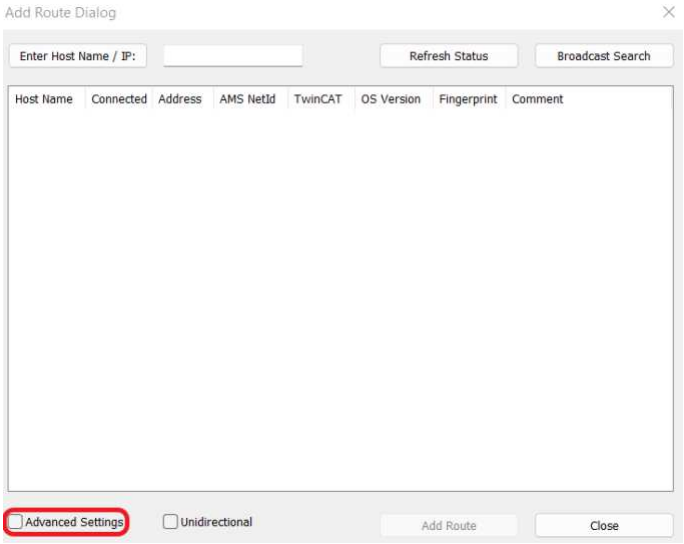


Figure 27: Static Routes – 'Add Route Dialog' window, basic settings

4. Once 'Advanced Settings' are enabled, click on 'Broadcast Search' in the top right of the window – highlighted in Figure 28 below – to have your computer scan your network for available HEAT VIEW controllers.

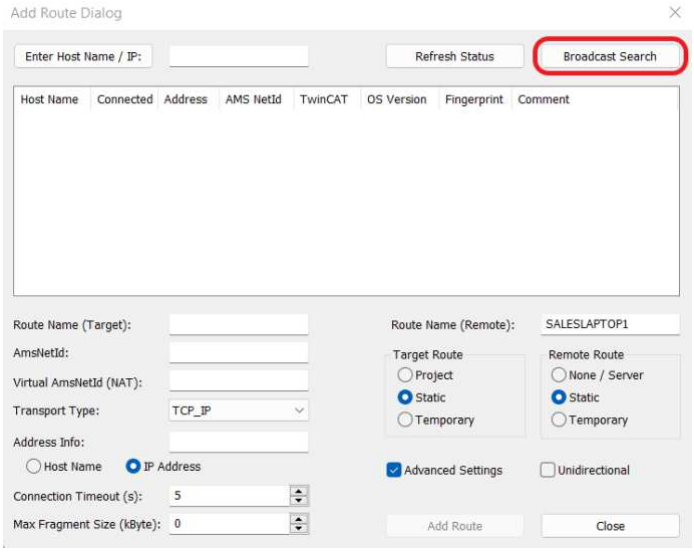


Figure 28: Static Routes – 'Add Route Dialog' window, advanced settings

5. Clicking 'Broadcast Search' will open the 'Select Adapter(s)' window. This window shows all available network adapters on your computer that currently have network devices configured. It is only necessary to select the adapter you are using, either Wi-Fi or ethernet, depending on what network configuration and connection method you are using to connect to the controller. However, there is no harm in leaving all adapters selected and simply pressing 'OK' – highlighted in Figure 29 on the next page – to start the scan.

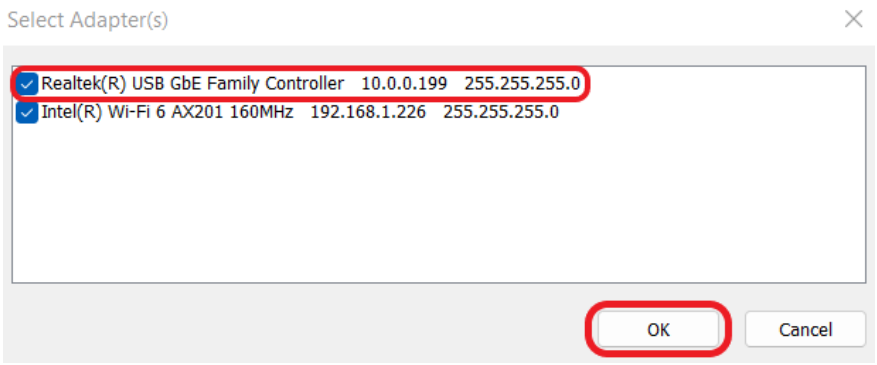


Figure 29: Static Routes – 'Select Adapter(s)' window

6. Any controllers the scan finds will appear in the 'Add Route Dialog' window once the scan completes. The scan may find items other than HEAT VIEW controllers if you left additional adapters enabled or have other similarly configured devices on your network. Only those listed as having a 'Win CE (7.0)' *OS Version* will be a HEAT VIEW controller. Figure 30 below shows that a single HEAT VIEW controller has been found by the scan; note that the field under the 'Connected' column is currently blank.

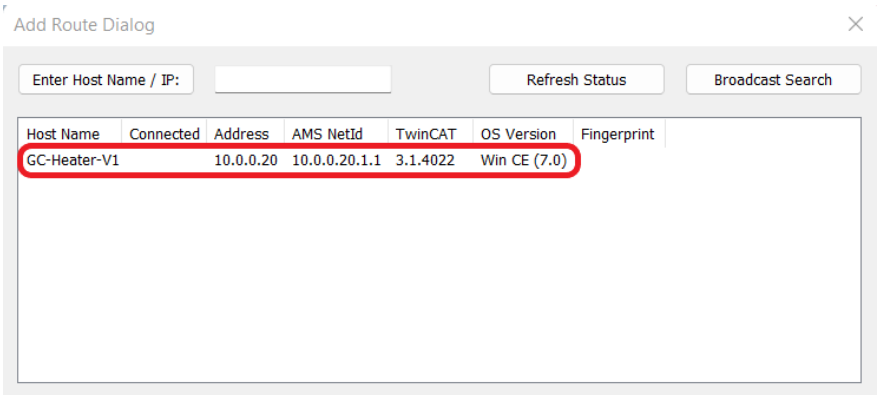


Figure 30: Static Routes – 'Add Route Dialog' window, controller found

PLEASE NOTE: By default, HEAT VIEW controllers ship with their 'Host Name' set to 'GC-Heater-V1'. It is possible to change this host name to a unique identifier specific to your organization, such as an asset number. Please contact your authorized HEAT VIEW distributor to have a technician assist you with this.

7. Click on the HEAT VIEW controller in the list of found network devices that you would like to connect to; it will become highlighted in blue when you do. Once a controller has been selected, you will notice that the fields in the lower half of the window auto populate data about the controller, for your convenience.

Under ‘Address Info. It is set to ‘Host Name’ by default, please change this to ‘IP Address’ – as highlighted in Figure 31 below – and then click the ‘Add Route’ button – also highlighted in Figure 31 – to proceed.

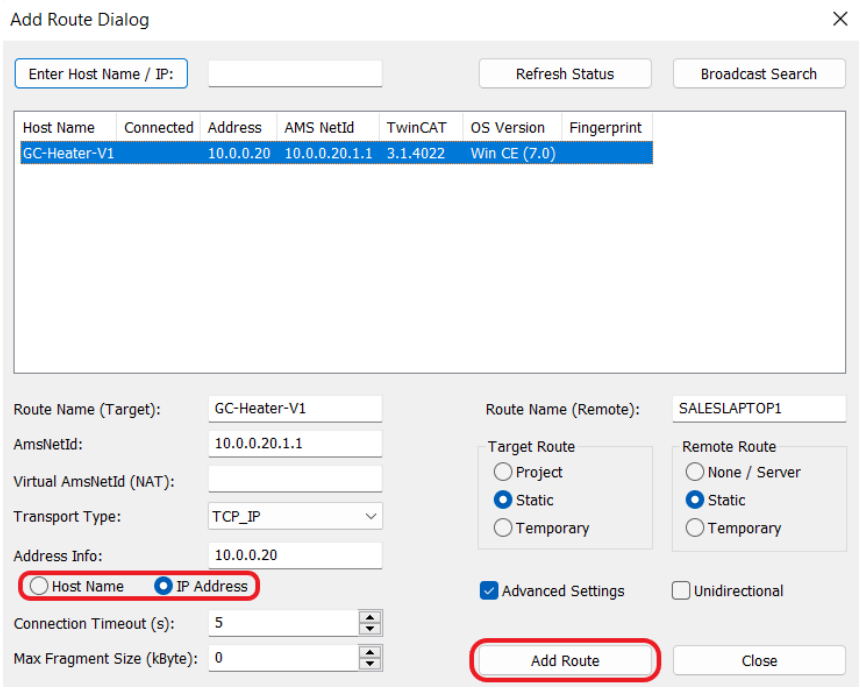


Figure 31: Static Routes – ‘Add Route Dialog’ window, address info & ‘Add Route’ button

8. Clicking the ‘Add Route’ button opens the ‘Add Remote Route’ window seen below. Please ensure that the ‘Secure ADS’ checkbox – highlighted in Figure 32 below – in the upper left corner is empty (unchecked), and that the ‘User’ field is set to ‘Administrator’ and the ‘Password’ field is left blank. Press ‘Okay’ – also highlighted in Figure 32 – to finish adding the route.

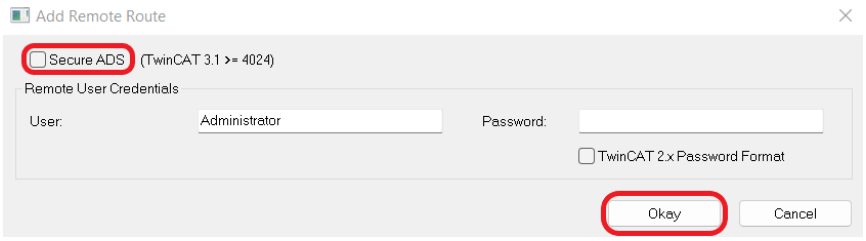


Figure 32: Static Routes – ‘Add Remote Route’ window, ‘Secure ADS’ & ‘Remote User Credentials’

9. If you were successful in adding the route you will now see an ‘x’ appear in the ‘Connected’ column next to the controller you added as is highlighted in Figure 33 on the next page. Without closing the ‘Add Route Dialog’ window, repeat steps 7 & 8 for any additional controllers the scan found that you wish to connect to (if applicable). If you were not successful in adding the route, please ensure you’ve completed all steps in the previous sections correctly and try again.

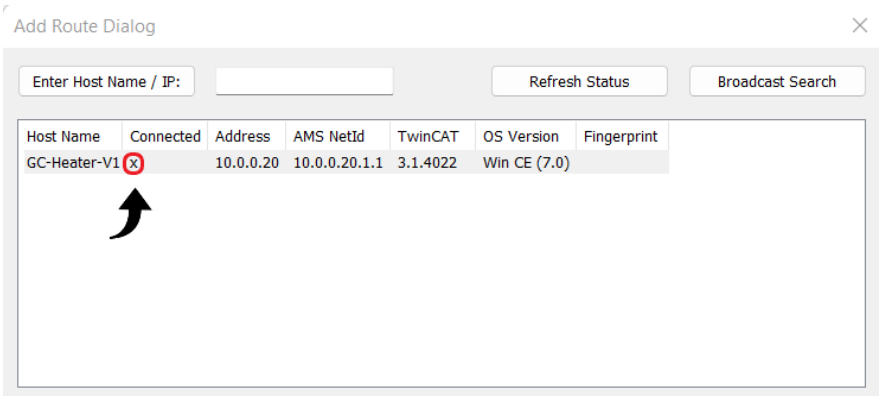


Figure 33: Static Routes – 'Add Route Dialog' window, connection indicator

10. Once you have established routes to all of the HEAT VIEW controllers you wish to connect to, you may now close all of the windows relating to this function using the 'Close' and 'X' buttons highlighted in Figure 34 and return to the 'Main Screen' of the application.

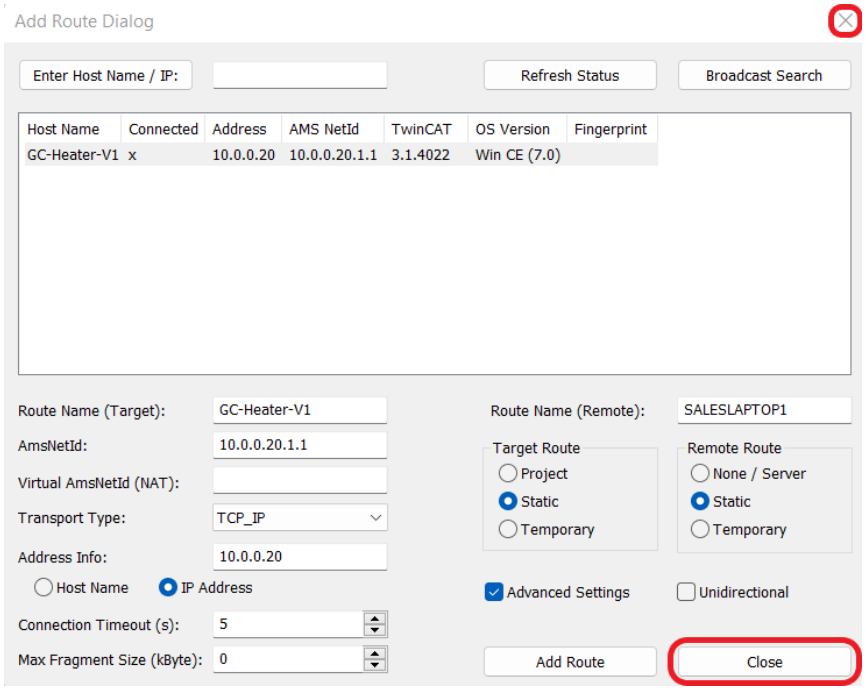


Figure 34: Static Routes – Closing the 'Add Route Dialog' window

As you close out of the 'TwinCAT Static Routes' window using the 'X' in the upper right corner, take note that this window now lists the HEAT VIEW controller(s) you successfully added in the previous steps and will also show you the connection status of each controller – as highlighted in Figure 35 below – without having to 'Broadcast Search.'

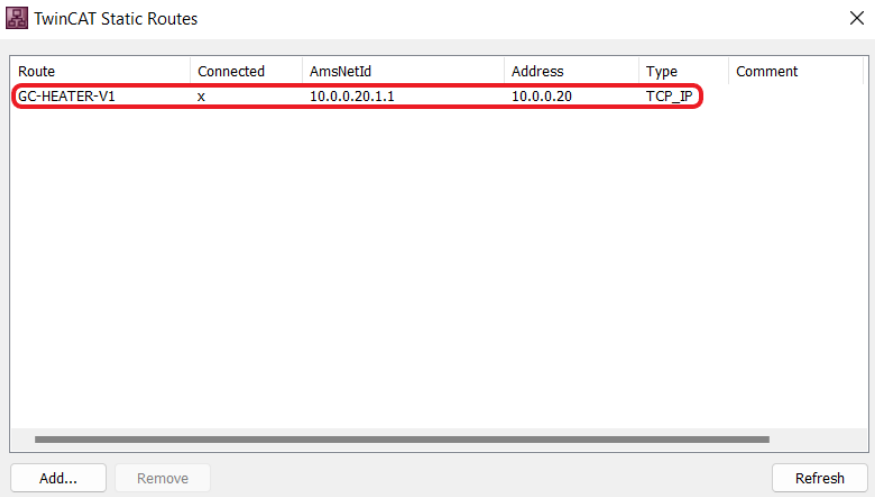


Figure 35: Static Routes – 'TwinCAT Static Routes' window, added routes

PLEASE NOTE: This window will list all controllers you've ever connected to/routes you've added with this computer; unless you select a controller, you don't want in the list and then click the 'Remove' button in the lower left corner. Keeping many routes in this list will slow down the TwinCAT static route functions over time and it is best to periodically clear old or unused devices from the list. Disregard this note if you will only ever be connecting to a very limited number of controllers with this computer.

Congratulations! You have successfully created a 'Static Route' to your HEAT VIEW controller(s). Section 7 ahead will guide an operator through powering on a controller, launching the software, and connecting the computer software to the controller.

If you are an IT professional (or just that guy who is more "tech savvy" than everyone else around) who has been setting this up for your colleagues this is the point you can hand the computer – and this manual – off to whomever will be operating and interfacing with this software and advise them to start from Section 7 ' Connecting to The Controller' on page 37.

7 Connecting to The Controller

Upon first opening the program, it should appear as it does in Figure 36 below, a simple screen with 6 channels but no channel data or thermocouple readings and only the 'Report' function available on each channel.

If it is the first time this computer is being connected to a HEAT VIEW controller the 'Controller ID' will be '0.0.0.0' by default in 'Title Bar'. Once you connect to any HEAT VIEW controller the 'Controller ID' will default to the IP address of whichever controller the software was last connected to. To connect the software to the controller, follow the steps outlined below.

PLEASE NOTE: The following steps outline how to connect to a single HEAT VIEW controller using only 1 running instance of the HEAT VIEW computer application. For instructions on how to open multiple instances of the software, and connect to multiple HEAT VIEW controllers simultaneously, please continue reading as this id covered in this manual.

1. If not already on, power on the HEAT VIEW controller and connect it to your computer via one of the methods outlined in Section 5 and wait for it to fully initialize – this can take up to 2 minutes.
2. If not already running, launch the HEAT VIEW computer application via your preferred method from Section 3.3. It should look similar to how it does in Figure 36 below.

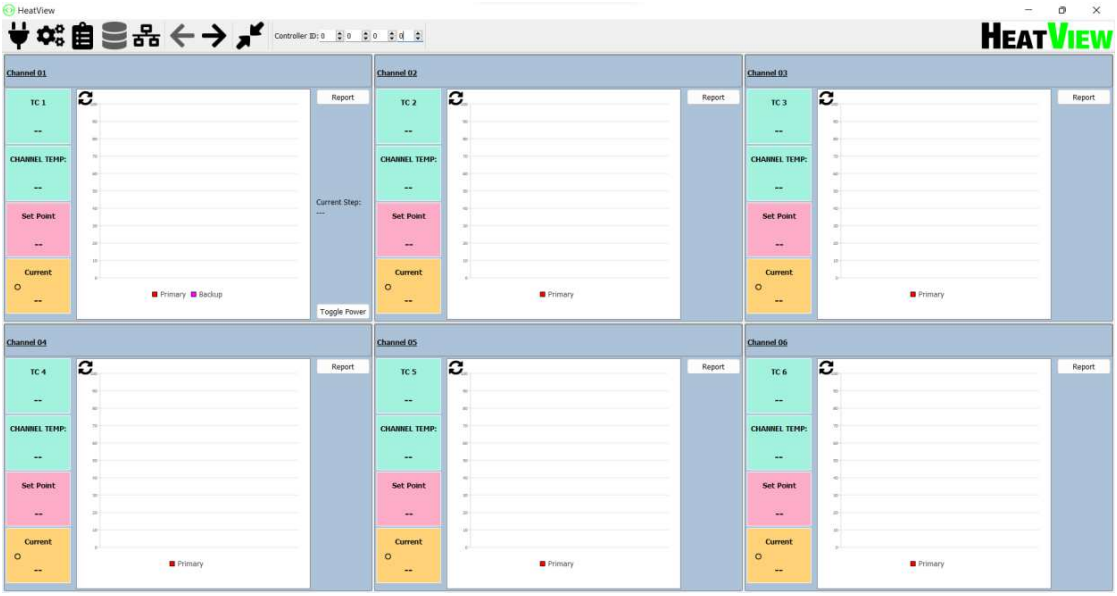


Figure 36: Connecting to The Controller – 'Main Screen', no connection

3. Locate the 'Controller ID' field in the 'Title Bar' along the top – highlighted in Figure 37 on the next page – and enter the IP address of the HEAT VIEW controller you wish to connect to here. In this example the IP address of the controller we will be connecting to is 10.0.0.20, however yours might be different.

Figure 37: Connecting to The Controller – 'Controller ID' field

4. Once you've typed in the IP Address of your HEAT VIEW controller and verified it's correct, click on the 'Connect to controller' button – highlighted in Figure 38 below. It will turn, and stay, blue to indicate that it has been activated and the system is either connected or attempting connection to a HEAT VIEW controller. At this point the system will now lock the 'Controller ID' fields so they can't be accidentally changed while running a cycle.

Figure 38: Connecting to The Controller – 'Connect to controller' button

PLEASE NOTE: The IP Address of your controller will appear next to the software name in the top left corner of the application if you successfully connect. If the connection was unsuccessful due to a Network Configuration error, you may see something similar to what is highlighted in Figure 39 below. Please correct any issues and try to connect again. Notice that the 'Controller ID' fields also do not become locked in this instance.

Figure 39: Connecting to The Controller – Connection not established

5. If connection to the HEAT VIEW controller was successfully established, the 'Main Screen' of the application should now look similar to that shown in Figure 40 on the next page. You'll notice that there is now channel data visible and there are many more options available to you. All of these will be explained in detail starting in Section 0 ahead.

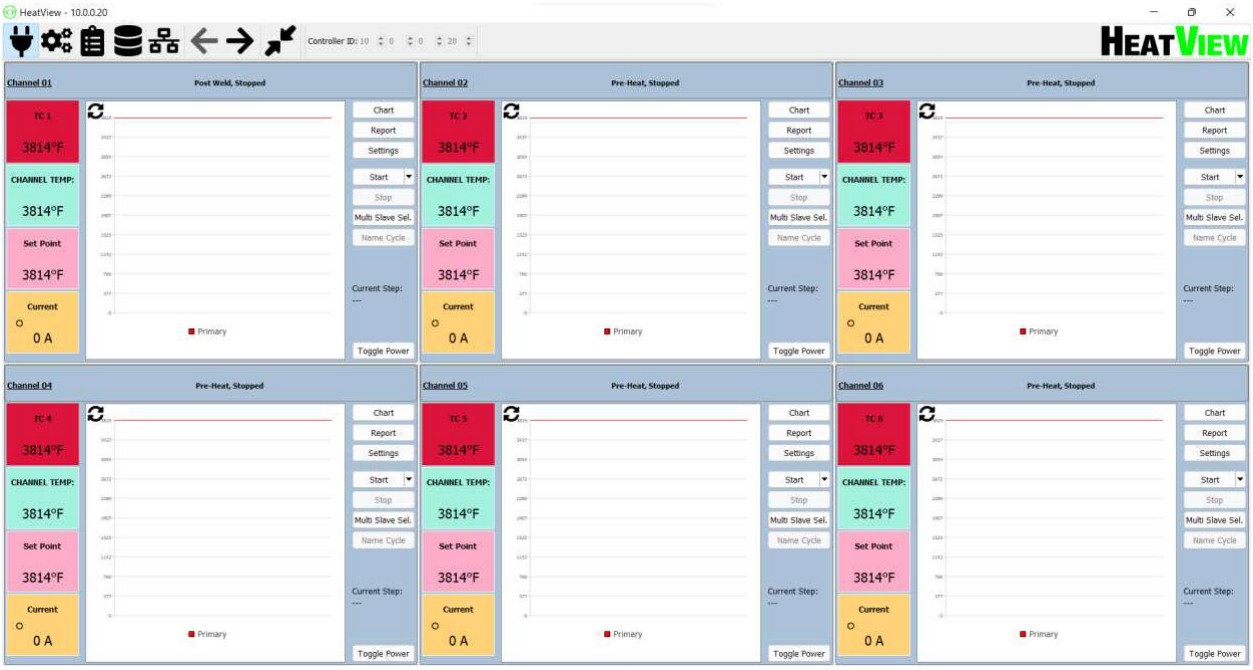


Figure 40: Connecting to The Controller – 'Main Screen', connected

Many of the features outlined in Section 8 ahead have their own dedicated sections further on in this manual, so if you feel you need more information on a topic, please refer to the Table of Contents to help you locate a specific section. It is recommended that you read through Section 0 thoroughly before jumping around to sections that may cover a specific function, so you become comfortable navigating the software.

8 Welcome to the HEAT VIEW Application

This section is an introduction and preliminary explanation to the 'Main Screen' of the application; it will explain the buttons you see on screen and highlight features specific to each window you can interact with from this screen. Steps to program and utilize various features will be explored in their own sections further in this manual.

8.1 Introduction to The Main Screen

Figure 41 below is an image of the HEAT VIEW computer applications 'Main Screen', separated into its important elements. From this 'Main Screen' an operator can interact with almost every other element of the application. The 'Main Screen' can be broken down into 2 key elements. These elements are:

1. The 'Title Bar' – highlighted in red in Figure 41 below – is always available along the top portion of the application and offers access to various system functions.

2. The 'Data Window' – highlighted in black in Figure 41 below – is the lower section of the program that shows an operator either channel data or chart data, depending on which 'Data Window' you are currently set to view.

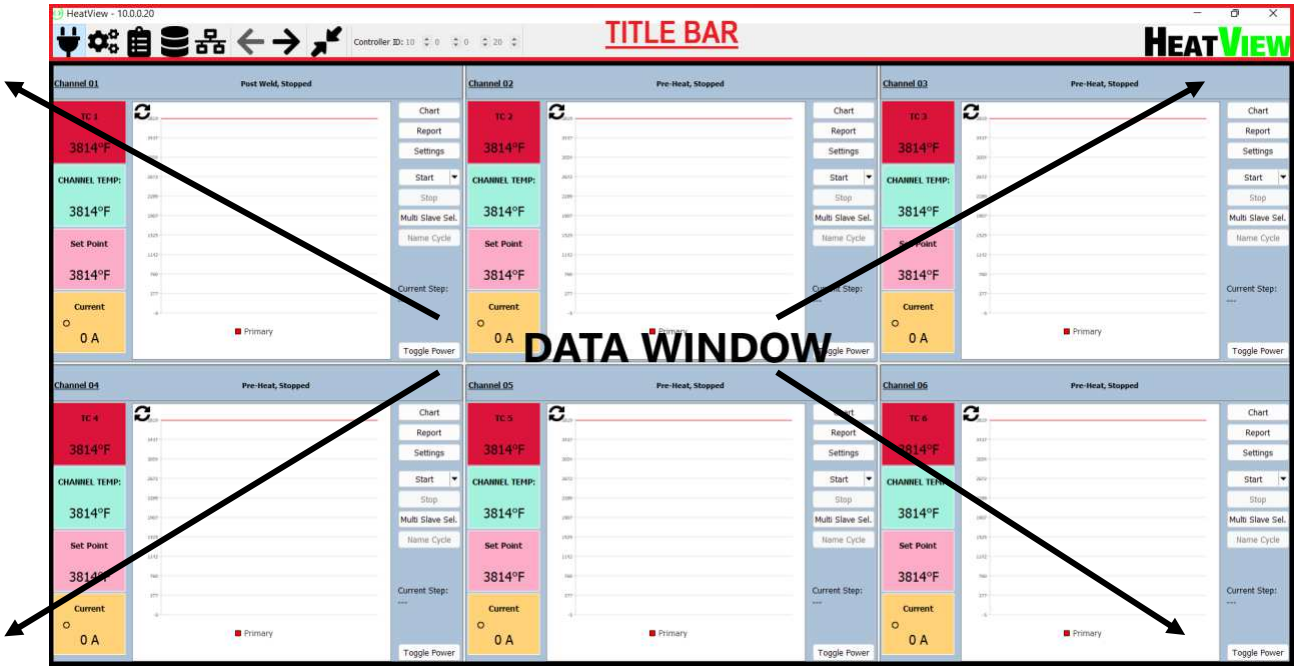


Figure 41: The Main Screen - Elements

PLEASE NOTE: As you proceed through the following sections you will notice that the HEAT VIEW computer application changes the color of the channels (and at times the whole window) to reflect specific functions and states. These colors and the states they correspond to are explained in Section 8.7 ' Channel States and Colors' on page 58.

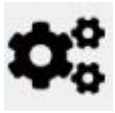
8.2 The Title Bar

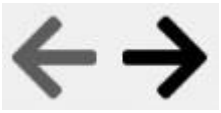
In this section of the manual, we will explore the 'Title Bar' of the HEAT VIEW computer application, its buttons and their functions. All the buttons that can be in the 'Title Bar' are shown in Figure 42 below, however not all the buttons are always present. More on this ahead.

Figure 42: Title Bar - All buttons

The table below offers a brief description of what each element of the 'Title Bar' does, in order of appearance from top-to-bottom then left-to-right, and references the section of the manual that covers the window each button opens – if applicable.

Icon	Description
 **Connection Confirmation**	The IP address of your controller appearing next to the application logo/title like this indicates that you've successfully connected the software to your controller. (In this example 10.0.0.20) If this status comes up "Connecting to 10.0.0.XX or 192.168.0.XX" instead; there is a configuration issue.
 **Connect/Disconnect**	This button by default upon opening the application will have a grey background, indicating that it is not currently attempting connection to a controller. Clicking this button, after typing in the IP address of the controller you wish to connect to in the 'Controller ID' field, will cause the background to change to blue and a connection attempt to take place. Clicking this button while it has a blue background will terminate the connection to the controller.

Icon	Description
 **Application Settings**	Clicking this button will open the 'Application Settings' window. In this window you can adjust application specific settings such as chart recording intervals and remote tripping of shunts (if installed). From this window you can also access advanced system settings if you have the proper login credentials. The Application Settings Window is covered in more detail in Section 9 'Application Settings Window' on page 63.
 **Recipe Editor**	This button will allow you to access the Recipe Editor. In this window you can create, save, and load custom heat cycles to be run in Post-Weld Mode. The Recipe Editor is covered in more detail in Section 11 'The Recipe Editor' on page 74
 **Get Backup Report**	The 'Get Backup Report' button will allow you to access the chart recovery function. Should you suffer a computer hardware failure or connection issue while you were running a cycle, this function will allow you to download the data from only your most recent cycles, directly from the controller. This function is extremely basic and limited in function and should only ever be used as a last resort. This function is explored further in Section 17.

Icon	Description
 **Run TwinCAT Route Setup**	The Run TwinCAT Route Setup button allows you to access all TwinCAT route functions including adding/removing a route, viewing what controllers are currently connected and list of all controllers you've ever connected to with this computer. This function is covered in more detail in Section 4 'Configuring Network Settings' on page 22.
 **I Previous Channels I Next Channels I**	The 'Detailed, 6-Channel' view shows multiple channels at once for easy and accurate viewing of channel data. Use these buttons to cycle between pages of channels. These buttons will also cycle between channels 1 at a time in the 'Chart' view. A black arrow means that you can change pages in that direction, while a grey arrow means that you have reached the furthest page in that direction. If both arrows are grey, it is because you do not have more than 6 channels configured for use – 'Detailed, 6 Channel View' only.
 **Show/Hide Summary Screen**	The 'Show Summary Screen' button allows you to change the view of the 'Data Window' on the 'Main Page'. The color and Icon of this button changes when pressed. A grey button with 2, inward pointing arrows, indicates the 'Data window' is set to either the 'Detailed, 6-Channel' or 'Chart' view. Clicking this button will switch the 'Data Window' to a 'Summary' view of all channels. A blue button with 4, outward pointing arrows, indicates the 'Data Window' is currently set to the 'Summary' view. Clicking this button will change the 'Data Window' back to the previous view.

Icon	Description
 **View Errors**	This button is used to view the 'Error List' window. This window shows any system or channel faults that have occurred. Note that this button only appears when a fault has occurred. This is by design so that operator will intuitively learn that this icon requires them to address a problem. The appearance of this button will always be accompanied by an audible alarm. Once the faults have been corrected and dismissed, this button will disappear until another fault is registered.
 **Controller ID**	These 4 fields are where you must input the unique IP address of the controller you wish to connect to. Even if a 'Static Route' has been added to the controller, incorrectly inputting the IP address into this field will result in the software failing to connect to the controller.
 **About**	Though not obvious that it is also a button, the HEAT VIEW logo doubles as the access point for the 'About' window for the software. Double-click this icon to bring up important information about both the computer application and the currently connected HEAT VIEW controller. These details will be critical when contacting your supplier for technical support should the need ever arise. The 'About' window is explained in more detail in Section X

8.3 The Data Window

The ‘Data Window’ of the HEAT VIEW application is where an operator can view most of the data about channels and their states, both running and not. This window can be changed between 3 separate views. These views are as follows:

1. **‘Detailed, 6 Channel’ view:** This is the default view that the HEAT VIEW computer application shows upon launching the program for the first time. This view allows an operator to see a large amount of data pertaining to channels in groupings of 6 at a time. It also provides the operator with channel specific control options that are not available in the ‘Summary’ View.

   Using the ‘Next/Previous Channel(s)’ buttons allows the operator to cycle between pages of channels in groups of 6. Figure 43 below is a broad example of the types of data you might see in this view.

Figure 43: Data Window – ‘Detailed, 6 Channel View’

2. **‘Summary’ view:** The ‘Summary’ view can be accessed by pressing the ‘Show Summary Screen’ button in the ‘Title Bar’. This can be done from either the ‘Detailed, 6 Channel’ view or from the ‘Chart’ view. Clicking the ‘Summary View Indicator’ button will return you to whichever view you were on before entering the ‘Summary’ view.

   This view shows all configured channels, up to a maximum of 24, with only the most relevant information about each channel and a button to access the ‘Channel Settings’ window for each channel. Figure 44 on the next page is a broad example of the types of data you may see on this screen.

Figure 44: Data Window – 'Summary' view

3. **'Chart' view:** Figure 45 below is a visual example of what the Chart View looks like when the system is running. Changing the Data Window over to the Chart View allows an operator to see highly detailed visual process information about the current cycle.

   Accessing the 'Chart' on a master channel in a master-slave configuration will bring up visual data for all channels in the configuration, on a single visual graph. The 'Chart' and its features are explained in depth in Section 8.6 ' Chart View' on page 53.

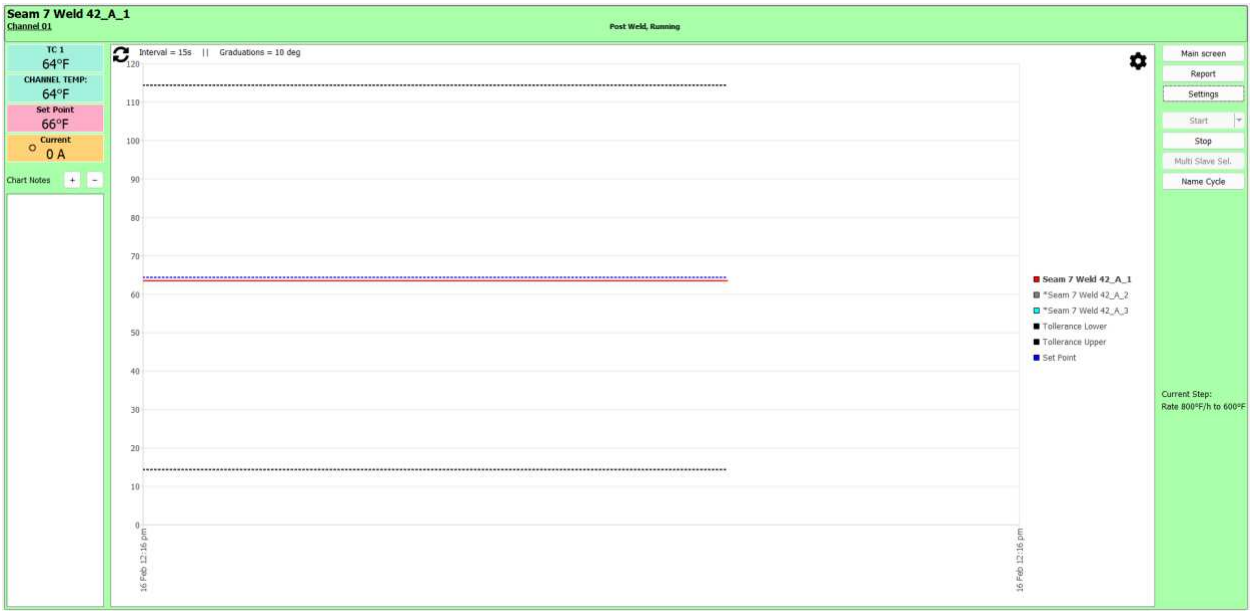


Figure 45: Data Window - Chart View

8.4 Detailed, 6 Channel View

This view of a channel provides multiple levels of data as well as control that is not available on the 'Summary' view. The operator receives rapidly updating, real time data that they can then use to visualize just how well a cycle is running and anticipate any problems that may occur. This view can be a key troubleshooting tool if experiencing thermocouple or power output issues.

Figure 46 below is a representation of the types of data you can find in this view, specifically those relating to a master channel.

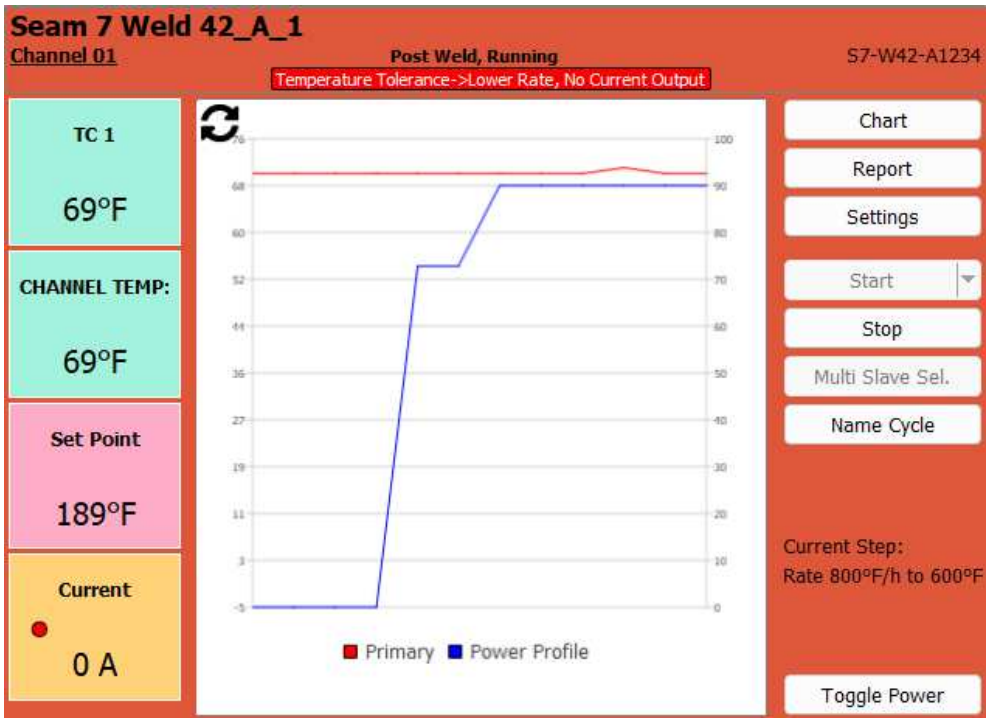


Figure 46: Detailed, 6 Channel View – Master channel example

PLEASE NOTE: This is only an example of the kinds of things that can be shown on a channel and not a guarantee of the items you will specifically see as you operate your system. Some of these element's change depending on how you have your system configured. Any configuration change that also changes the view of your system will be covered in detail further on in this manual and will always be accompanied by a screenshot of said change.

This view of a channel's data can be broken down into 4 key zones as seen in Figure 47 on the next page. These zones are each described in detail further down.

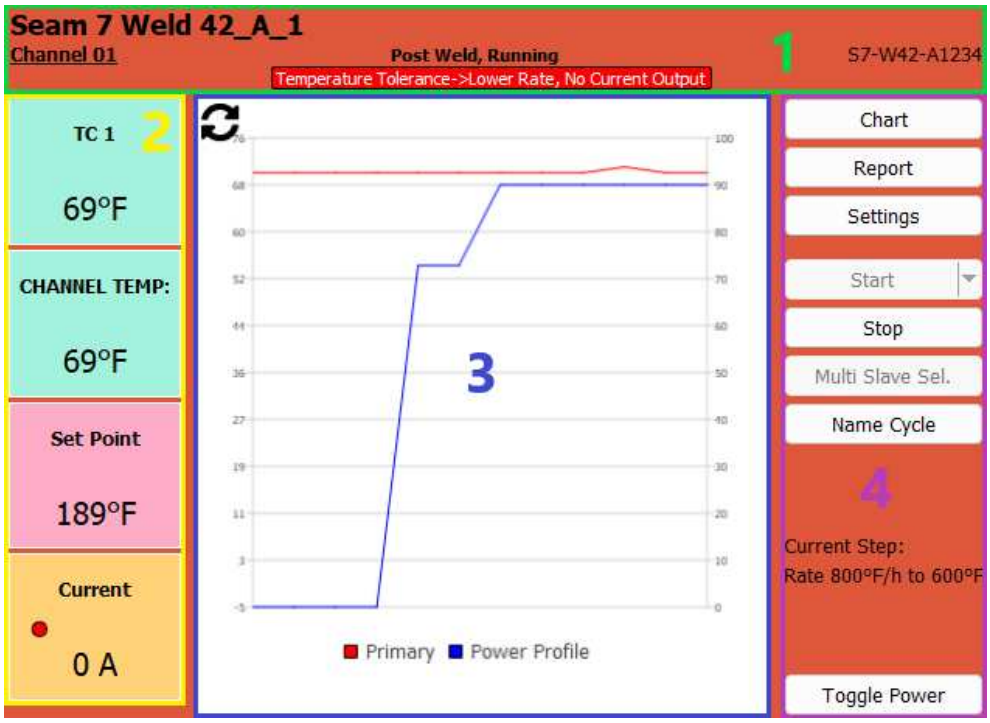


Figure 47: Detailed, 6-Channel View - Zones

8.4.1 Name & Status Information

This zone – shown in Figure 48 below – always contains the channel's number, and its currently selected Run Mode as well as its current State. Run Modes and States are explored further in Section X and Section X. This zone can also contain additional information including but not limited to, a specific user defined channel and cycle name, 'Slave State' information, as well as any currently active faults specific to the channel.

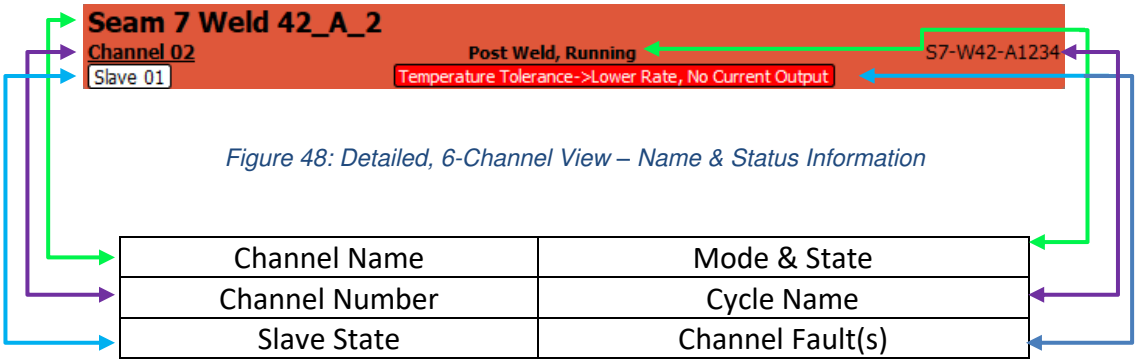


Figure 48: Detailed, 6-Channel View – Name & Status Information

Channel Name	Mode & State
Channel Number	Cycle Name
Slave State	Channel Fault(s)

Channel Name: This field is only populated if the operator has assigned a name to the channel in the 'Channel Settings' window. It is best to avoid special characters when creating channel names such as `~!@$^*/ \ as an example. However, dashes (-) underscores (_) hashtags (**#**) and ampersands (**&**) are okay to use freely. For more information, please see Section 12 'Channel Settings Window' on page 84.

Channel Number: The 'Channel Number' field is set by the system and always present in this view, unlike the 'Summary' view, where setting a custom channel name visually replaces the 'Channel Number.'

Slave State: This indicates whether a channel is a master channel or a slave Channel. If there is nothing in this field, then the channel is a Master, otherwise this field will be populated with the term "Slave" followed by the number of the master channel it is slaved to.

Mode & State: This field shows what mode the channel is currently set to; 'Post-Weld', 'Pre-Heat', 'Percentage Timer', or 'Monitor Only'. As well the systems current run state; 'Stopped', 'Running', or 'Paused'. Each of these modes and states is explained in greater detail further on.

Cycle Name: If the Operator uses the 'Name Cycle' button to give the entire process a name, this field is where that name will appear. It is critical to avoid all special characters other than dashes (-) and underscores (_).

Channel Fault(s): Should any channel specific faults occur while the process is running or while trying to start the heat cycle, the associated fault message will appear in this field as well as in the Error List. Faults are explored in depth in Section 15.

8.4.2 Process Control Information

Zone 2 – detailed in Figure 49 below – shows temperature, amperage and process information relevant to the channel being viewed. Each channel can be configured to have more than one thermocouple or 'TC' assigned to it as 'Backup' thermocouples.

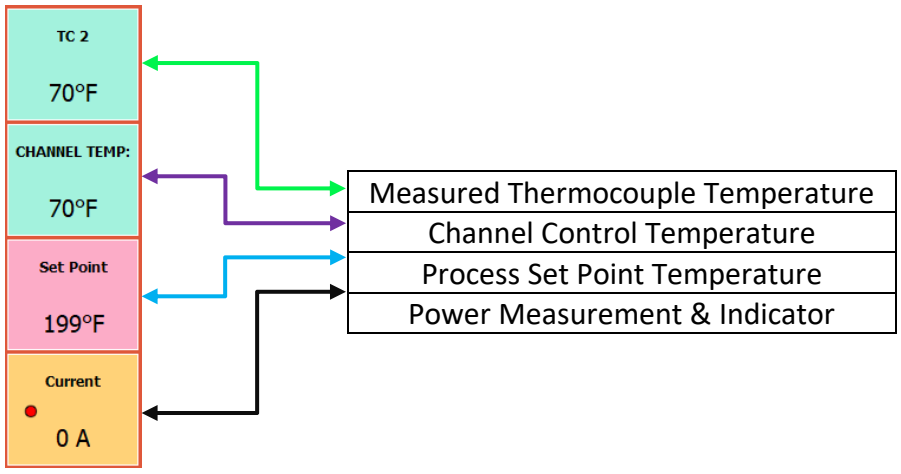


Figure 49: Detailed, 6-Channel View – Process Control Information

TC xx: The thermocouple temperature field or "TC xx" field (where xx is the number associated with a channel) at the top, is the current actual measured temperature of the thermocouple(s) assigned to the channel. Depending on how you have the system configured there may be more than one of these fields present per channel.

Channel Temp: The 'Channel Temp' field shows the current temperature of the thermocouple the system has selected to use as the process control thermocouple. For simple, single control thermocouple configurations this will always match the 'TC xx' field.

However, in complex control multi-thermocouple configurations that utilize 'Backup' thermocouples, the system will select the thermocouple reading that is the **hottest** in the configuration to use as the process control variable.

Set Point: This field is a direct representation of where the system currently expects the temperature of a channel to be. This number may increase/decrease in accordance with the user defined 'Ramp Rate' or may hold steady if the system has reached its final 'Soak' temperature and is now holding the process at the required temperature. If the channel is not currently running, this temperature will just read the same as the 'Channel Temp' field.

Current: This is the 'Power Measurement & Indicator' field. It lets the operator know just how many Amps a channel is drawing, as well as illuminating the small circular indicator to the left of the amperage reading, when the system is calling-for-power (engaging the contactor). **This measurement is only an indicator and is not accurate!**

8.4.3. Temperature & Power Snapshot Graph

Zone 3 – detailed in Figure 50 below - is a highly detailed 30-minute live 'Snapshot Graph' of the channels current running process. This graph shows temperature data, for all thermocouples associated with the channel, at all times. It also provides the operator with the ability to view the channels power output data, shown as a percentage between 0 and 100. This can be toggled on or off with the 'Toggle Power' button shown in Figure 51 further down.

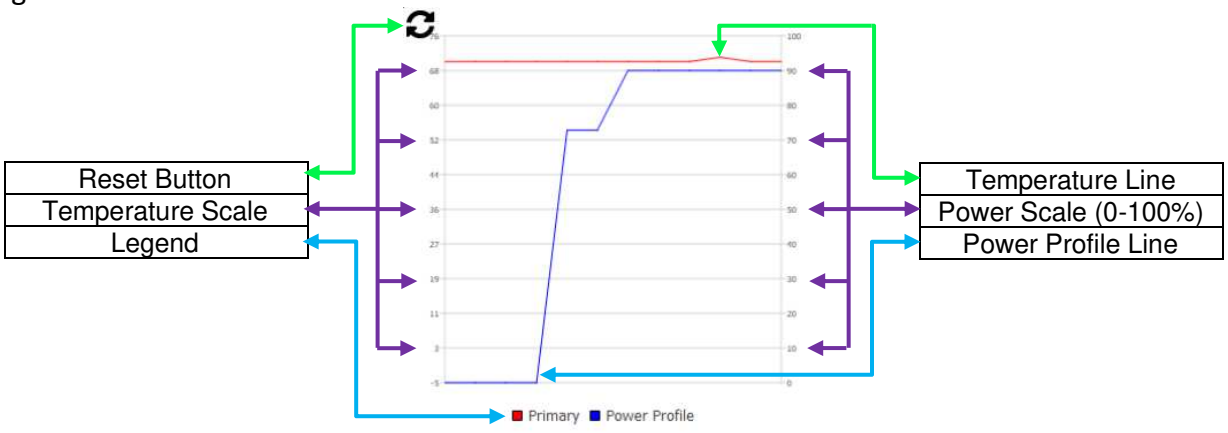


Figure 50: Detailed, 6-Channel View - 'Snapshot Graph'

Reset Button: This button will reset the graph to the default zoom level if you have used the click-and-drag zoom function to see even greater detail. At any time you can simply click and drag a rectangle on the chart for it to zoom into that rectangle so you can see greater detail in that area.

Temperature Scale: The scale that runs vertically along the left side of the graph is the temperature scale. This scale is automatically adjusted as necessary by the software.

Legend: The legend details and highlights what elements are currently being tracked on the 'Snapshot Graph.' The control thermocouple for a channel will always be the 'Primary' line on the graph.

Temperature Line: This line is an extremely detailed raw temperature data line showing exactly what is occurring with the associated thermocouple. This line is an excellent troubleshooting tool for operators, as it is normally very smooth and with only mild fluctuations in temperature. Large or erratic fluctuations appearing, indicates the thermocouple is experiencing environmental or signal interference, or is about to fail.

Power Scale: The scale that runs vertically along the right side of the graph is the 'Power Profile' scale. This scale always has a standard constant range of 0-100%.

Power Profile Line: This line is an exact representation of the amount of power the system is calling for each time it engages the contactors of that channel on the heat treatment console. Operators can observe this line to help them troubleshoot issues with the system such as when the controller is calling for a high percentage of power over a longer period, but the temperature isn't rising.

8.4.4 Menu & Control Buttons

Zone 4 – Shown in Figure 51 below – Is where the operator interacts with channel specific control and information functions. These functions include switching the 'Data Window' to the 'Chart' view, opening the 'Report', 'Channel Settings', and 'Multi Slave Select' windows, run state controls, and the 'Toggle Power' button for the 'Snapshot Graph.' This zone also shows the current process step when running the channel in 'Post-Weld' mode.

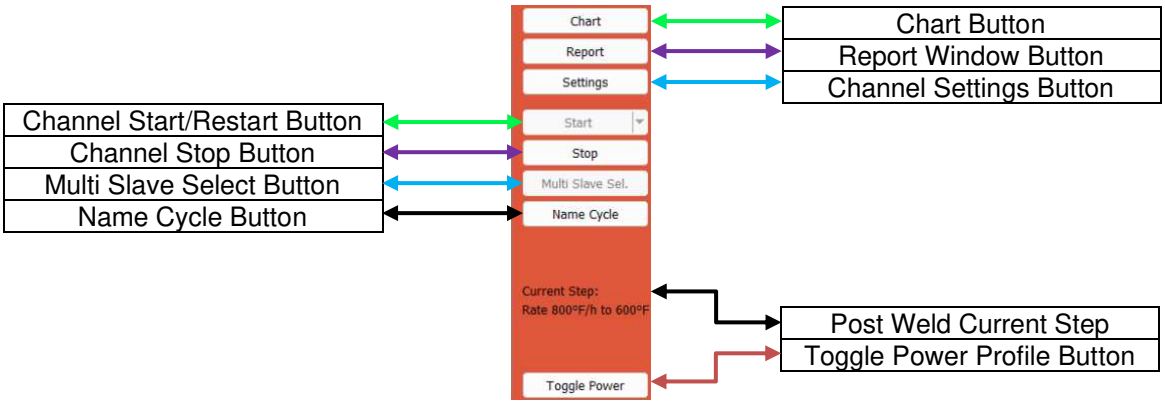


Figure 51: Detailed, 6-Channel View - Menu & Control Functions

Chart: This button switches the view of the 'Data Window' on the 'Main Screen' from the 'Detailed, 6 Channel' view, to a highly detailed view of the channels, as well as any of its slaves, recorded

temperature(s) over the course of the entire cycles' timeline. The 'Chart' view and its features are explored in depth in Section 8.6 ' Chart View' on page 53.

Report Button: Clicking the 'Report' button will open the 'Report' window. In this window an operator can pick which controller, channel(s) and information they would like to compile into a PDF document that can be kept as a record or provided to clients for proof of completed work. The 'Report' window is covered in depth in Section 0.

Settings Button: This button opens the 'Channel Settings' window. This window contains settings specific to each channel such as 'Run Mode' and their variables, 'Temperature Tolerances', 'Channel Name', and a 'Channel Test' function are just a few that at standard in this window. This window is covered in greater detail in Section 12.

Start↓ Button/Drop-Down: The 'Start' button is two buttons nested together. Clicking 'Start' on a channel will change it from 'Stopped' to 'Running' and start whatever process it has been configured for. If for any reason the channel was accidentally stopped by an operator, clicking the down arrow next to 'Start' will open a drop-down button and the operator can then click 'Restart' to have the cycle pick back up from where it left off.

Stop Button: Clicking the 'Stop' button will end the running process on the channel, changing its status from 'Paused' or 'Running' to 'Stopped', as well as any channels that may be slaved to the channel that has been stopped. This stops the channel from calling for power and ends the chart recording process, finalizing the entry in the 'Database.'

Resume Button: Not pictured above, the 'Resume' button appears below the 'Stop' button when a channel has been transitioned to a 'Paused' state; either by a thermocouple related fault or the operator manually clicking the 'Pause' button in the 'Channel Settings' window. Once the fault is cleared, this button will enable an operator to 'Resume' the cycle and transition it back to a 'Running' state, continuing the progression of the heat cycle from where it became paused.

Multi Slave Sel.: This button opens the 'Multi Slave Select' window. In this window you can add and remove slave channels to/from the channel this window was opened from. This button becomes greyed out once a cycle is running.

Name Cycle: This allows a user to give the running process a unique name so it can be found in the 'Report' window more easily. This button is accessible only while the channel is in a 'Running' state.

Current Step: This section of the 'Channel Data' is only present when the system is set to run in 'Post-Weld' mode. It shows the current process step of either a 'Ramp Rate', or 'Soak Timer', which will show the time remaining in the 'Soak' step.

Toggle Power: Pressing this button will toggle the 'Power Profile' line on the 'Snapshot Graph' On/Off. The 'Power Profile' line and 'Snapshot Graph' were explained in Section 8.4 Subsection 0, '8.4.3. Temperature & Power Snapshot Graph' on Page 50.

8.5 Summary View

The ‘Summary’ view is far more limited in its features and function in comparison to the ‘Detailed, 6 Channel’ view. It does, however, allow an operator to see the most basic process information of all configured channels simultaneously. This enables an operator to monitor all running processes on the controller without having to cycle between charts or pages like the other views do. An example of some of the things you may see in this view are shown in Figure 52 below.

Figure 52: Summary View – Example

As you can see in Figure 53 below, the data shown in the ‘Summary’ view is similar, but less than that shown on the others. The key differences being, no ‘Snapshot Graph’ or ‘Chart’, no control buttons, user defined ‘Channel Names’ take the place of the ‘Channel Number’, and the ‘Temperature’ field in this view only shows the control temperature of a channel instead of any additionally allocated backup TC’s. Operators can access each channels settings from this screen.

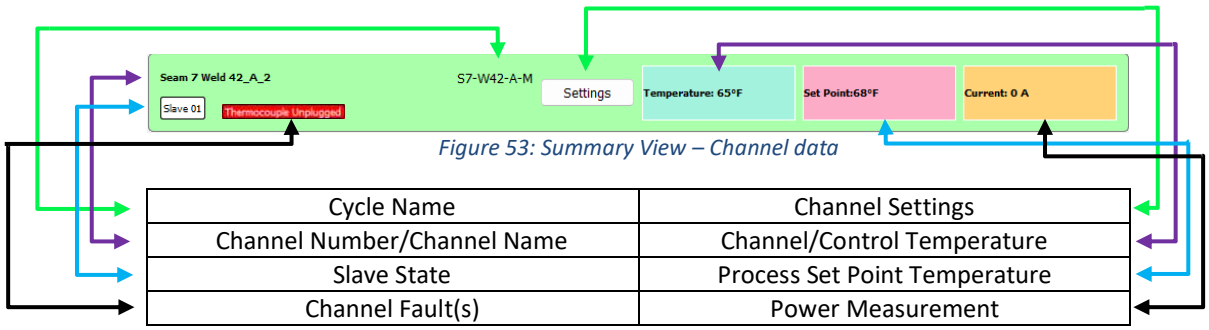


Figure 53: Summary View – Channel data

Cycle Name	Channel Settings
Channel Number/Channel Name	Channel/Control Temperature
Slave State	Process Set Point Temperature
Channel Fault(s)	Power Measurement

PLEASE NOTE: A Fault Indicator was added to the above figure for display purposes only. Faults will always result in a channel turning red to indicate its current state. Faults and States are discussed in detail further on in this manual.

8.6 Chart View

The ‘Chart’ – shown in Figure 54 below – in many ways is the core feature of the entire program. It is a live visual record of exactly what has occurred during a heat cycle and allows an operator to highlight

and document any abnormalities that arose during the cycle. It also becomes the final delivered product once transferred to the ‘Report’ window at the end of the cycle.

An Operator should always keep this chart in mind while programming cycles, entering channel names, and documenting events since those factors will all contribute to the final visual product that they store for their own records or pass on to a client as proof of work completed.

As the cycle progresses, this chart provides critical data to the operator about just how things are progressing. In this view the operator can see whether the actual temperature of the workpieces is keeping in sync with the user defined parameters. These parameters including things such as the ‘Ramp Rate’, ‘Soak’ temperature, or ‘Positive & Negative Temperature Tolerances.’

The ‘Name & Status Information’, ‘Process Control Information’, and ‘Menu & Control buttons’ zones are identical to those that were detailed in Section 8.4 “Detailed, 6 Channel View” Subsections 8.4.1, 8.4.2, and 8.4.4. This section introduces you to the 2 zones unique to this view.

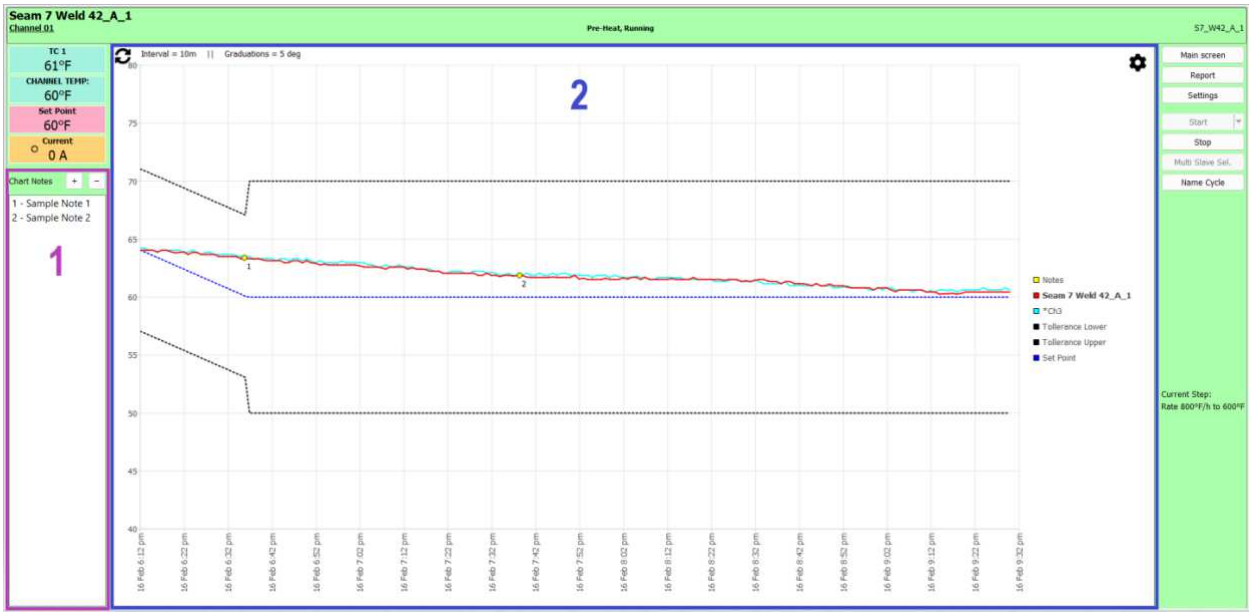


Figure 54: Chart View – Zones

8.6.1 Chart Notes

The first zone unique to the ‘Chart’ view, is the ‘Chart Notes’ segment. Here an operator can choose to add and remove notes to and from specific points on the chart as well as view any notes currently tagged to the chart. It is common practice to tag the chart with a note when a channel faults, or environmental factor affects the heat cycle.

This same function can be found in the ‘Report’ window so that notes can be added to, or removed from, a cycle’s recorded data before generating a final report. All notes added to a chart appear on the final report.

Figure 55 below highlights this zone’ features and buttons.

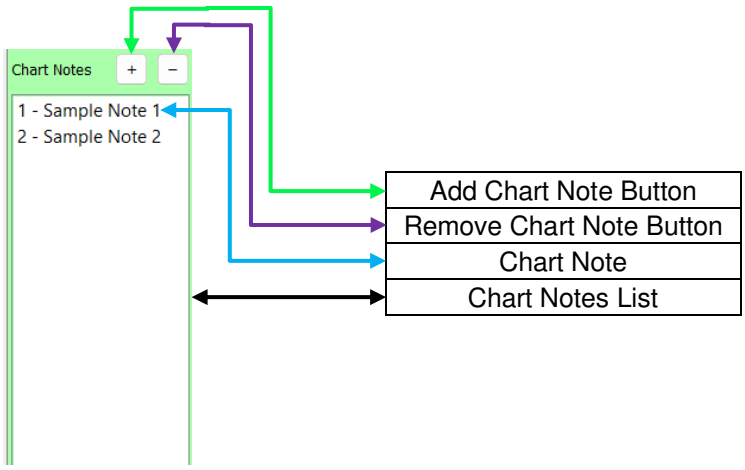


Figure 55: Chart View – 'Chart Notes'

[+]: The 'Add Chart Note' button opens the 'Add New Note' window and allows a user to add notes to a currently running cycle before the cycle ends. Notes must be tagged to a specific point on a channel' recorded temperature line. Once placed, they will appear on the chart as a yellow dot with number next to it and in the 'Chart Notes List'. The number on the chart corresponds with the same numbered note in the list.

[-]: The 'Remove Chart Note' button allows an operator to remove an existing 'Chart Note' from the 'Chart Notes List'. Clicking on the note you wish to remove in the list and then clicking the 'Remove Chart Note' button will permanently remove the note from both the chart and the list. Alternatively, an operator can also right-click on a note in the list they wish to remove and select the "Delete Note" option that appears.

Chart Note: After adding a note to the chart this is where the data associated with that note will appear. Should you need to edit a note after it has been added, simply double click on the note in the list and it will re-open the 'Add New Note' window and allow you to alter the details of your note.

Chart Notes List: This is where all notes added to a cycles chart will appear, sequentially in the order they appear on the chart, from left to right. Notes are tagged with the date and time they were added for record keeping purposes.

8.6.2 Adding a note to a chart

The process of adding a note to the chart is as simple as clicking on the [**+**] button on top of the list of charts and then moving your mouse of the point on one of the lines in the chart and clicking **on** the line. Then a small pop-up screen will come up and allow you to enter the note you desire. Click OK afterwards and the note is added to the chart and will appear in any future reports you generate from the given cycle.

8.6.3 The Chart

Functionally the 'Chart' allows an operator to see in depth details about a channels current running process and interact with it in multiple ways. It can be thought of as a much more interactive version of the 'Snapshot Graph' in the 'Detailed, 6 Channel View'. Here an operator can visualize, document, and control the process of not only one channel, but all channels in a master-slave configuration, or even observe data relating to all running channels if the right configuration settings are selected.

By default, the software is set to automatically adjust both the time and temperature scales as it sees fit to create a smooth flowing chart. However, it is possible to force these scales to adhere to user defined temperature and time increments for a more traditionally uniform chart.

Operators can also choose to click-and-drag on the chart to select a segment of recorded process data that they wish to zoom in on and inspect more closely. This and the other features specific to the chart are broken down in Figure 56 below.

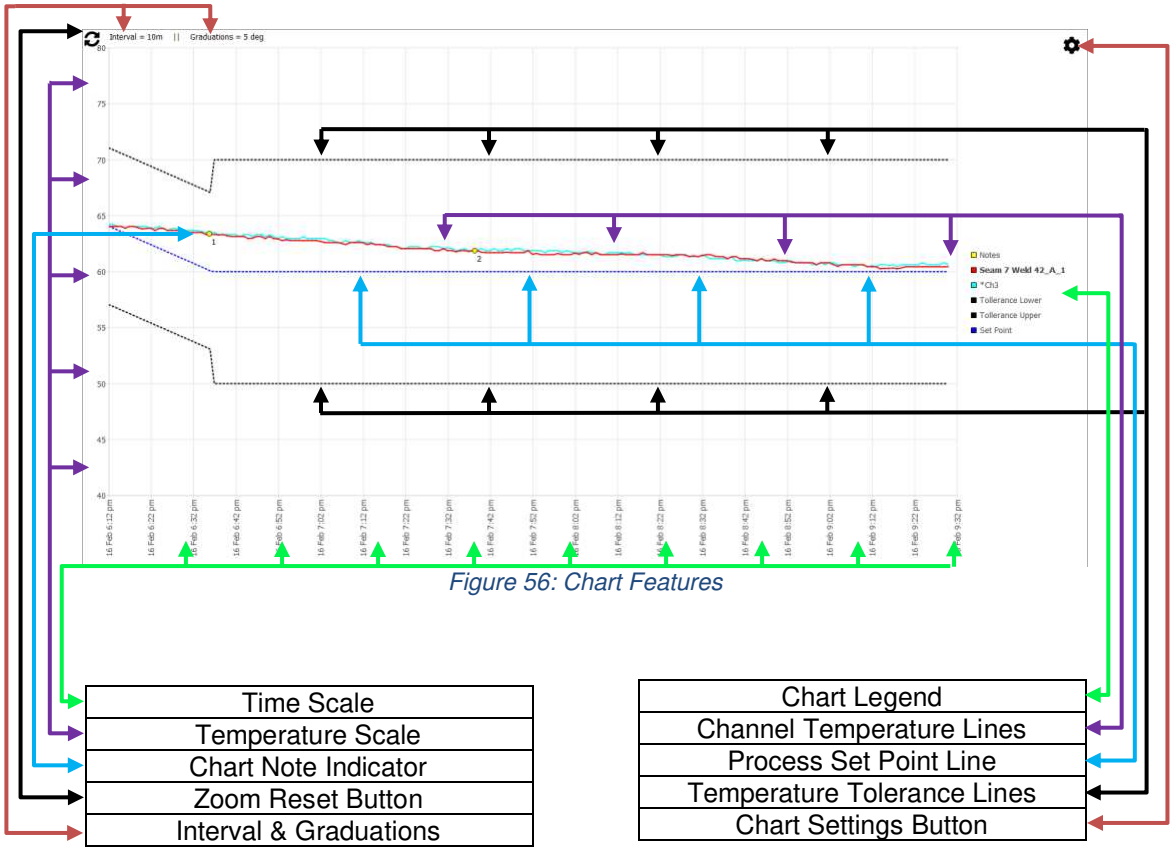


Figure 56: Chart Features

Time Scale: The 'Time Scale' runs horizontally along the bottom of the chart; by default, the software will automatically adjust this scale as the length of time the cycle has been running, increases. If at any time the operator wants to set a specific time scale interval to be shown on the chart, they can do so from the 'Chart Settings' window.

Temperature Scale: The 'Temperature Scale' runs vertically along the left side of the chart; by default, the program will automatically adjust this scale to accurately reflect the changes in temperature that occur throughout the heat cycle. If at any time the operator wants to change the temperature graduations of the scale on the chart, they can do so from the 'Chart Settings' window.

Chart Note: Seeing this little yellow dot with a number beside it on the chart indicates that the operator has added a 'Chart Note' documenting something that happened during the heat cycle. The details of the 'Chart Note' can be found in the 'Chart Notes List' to the left of the 'Chart'.

Reset Button: This button will reset the 'Chart' to the default zoom level if you have used the click-and-drag zoom function to see even greater detail.

Interval & Graduations: In the top left corner of the 'Chart' the operator will see the current denominations the system is using, whether automatic or user defined, to adjust both the 'Time' ('Interval') and 'Temperature' ('Graduation') scales.

Legend: On the right side of the chart is the 'Legend'. This 'Legend' automatically changes and adapts to changes in the configuration of channels, 'Channel Names', 'Temperature Tolerances', and 'Chart Notes'. By default, the number of a channel appears in this legend, however it is replaced with text if the user sets a specific name for a channel. These channel names as they appear in the legend will also appear in the chart in the 'Report' window.

Temperature Lines: When viewing an individual channel, the 'Temperature Line' will always be red, however the addition of slaves to a channel causes the 'Temperature Line' of each additional channel on a chart to be is given its own individually colored line. This is to differentiate them from each other when viewing the 'Chart'. Monitor only channels will appear in the 'Legend' with an asterisk (*) next to their name and can be hidden from view using the 'Chart Settings' window, to enable an operator to see only data relevant to the master channel if necessary. These lines will be recorded to the 'Chart' at whichever interval has been set in the 'Applications Settings' window under the 'Chart Sample Interval' option. The 'Application Settings' window is explored in Section 9 'Application Settings Window' on page 63.

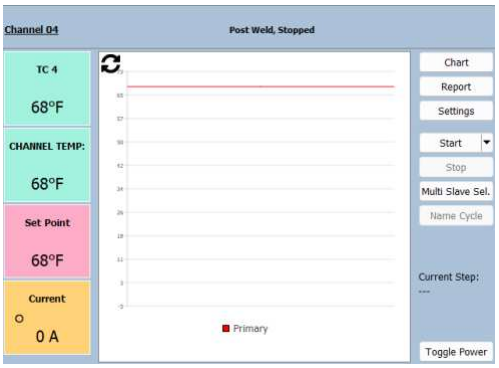
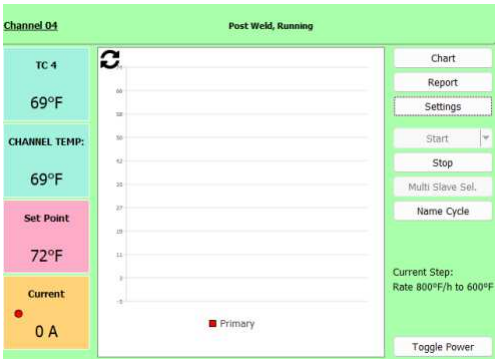
Set Point Line: This dotted blue line is a visual, plotted representation how the programmed heat cycle should be progressing. It allows an operator to see whether their cycle is running efficiently and whether the system is struggling in any way to achieve the programmed 'Ramp Rate' or maintain the 'Soak Temperature'. This line can be hidden from view using the 'Chart Settings' window.

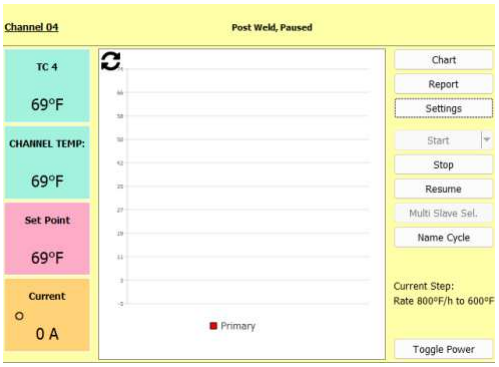
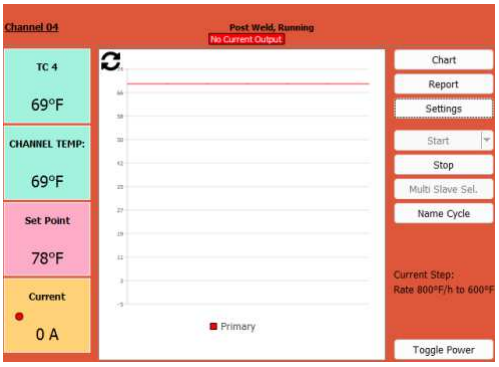
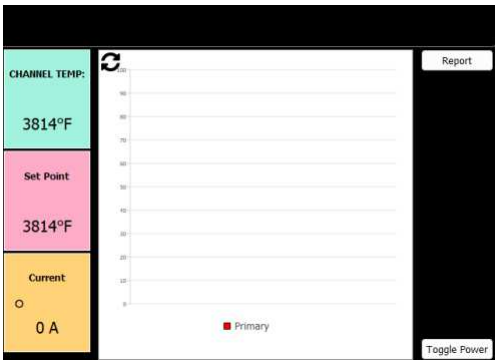
Tolerance Lines: These dotted black lines are a plotted representation of the 'Positive and Negative Temperature Tolerances' set by the operator in the 'Channel Settings' window. On the 'Chart' they are an additional visual cue that enable an operator to view just how well a heat cycle is running. If the 'Temperature Line' crosses these 'Tolerance Lines', the system will throw an 'Over/Under Tolerance' fault on the offending channel, accompanied by an audible alarm to notify the operator that their heat cycle has exceeded the allowable parameters.

Settings Button: Clicking this button will open the 'Chart Settings' window. From this window an operator can choose to show or hide channels, the set point and tolerance lines, as well as slave channels. This window is also where an operator can 'Force Interval Values' to make the chart appear how they want.

8.7 Channel States and Colors

By now you've probably noticed that the HEAT VIEW application is quite colorful by nature and that these colors change in sync with certain system functions and events. Colors and their associated state are universal throughout the application, so no matter what view you are using to observe a channels data, it will be color coordinated to match a channels 'State'. These states and colors are detailed in the table below.

Color & State	Description
Blue = Stopped - No Faults 	Blue is used to indicate that a channel is currently in a 'Stopped' state and has no active channel specific faults that have not been addressed and cleared. This is the default state and color of a channel within the HEAT VIEW computer application.
Green = Running - No Faults 	Green indicates that the channel has been started by the user and is currently in the "Running" state without fault or error and is within the user defined parameters. The "Running" state is present when the application is actively pursuing its programmed 'Set Point', whether 'Ramping' or 'Soaking' and not 'Paused.'

Color & State	Description
Yellow = Paused – No Fault 	Yellow indicates that the channel has been placed in a “Paused” state with no channel specific faults affecting it. A paused channel will hold temperature wherever the ‘Set Point’ was at when the ‘Pause’ occurred until resumed by the operator. A yellow-colored channel is the result of a channel being manually paused by the operator or a ‘Thermocouple Unplugged’ fault occurring and being repaired and summarily dismissed.
Red = Faulted 	A channel turning red is a visual queue to the Operator that the channel is currently in a ‘Fault’ state. The ‘Fault’ state and color can appear in conjunction with all states discussed previously. A fault being generated will always be accompanied by both a visual readout of what fault has occurred as well as an audible alarm. The fault must be corrected and dismissed before the channel will change back to either yellow or green, depending on the fault generated.
Black = Allocated 	A channel that appears black in color with no thermocouple reading, settings menu, or control functions, has been allocated as a backup control thermocouple to another channel. Resetting the allocation will return this channel to normal.

It is important to note that the 'Fault' state can happen simultaneously alongside the 'Running', 'Paused', and 'Stopped' states, causing these normally colored channels to turn red. A channel experiencing a 'Fault' state will never stop its already 'Running' cycle as the result of a fault, not even if it experiences a 'Shunt Tripped' fault. Only a 'Thermocouple Unplugged' fault will cause a channel to change its state. 'Stopped' channels that are also in a 'Fault' state cannot be started and transitioned to a 'Running' state until the fault is corrected and dismissed from the 'Error List.'

When a 'Thermocouple Unplugged' fault occurs, the channel it occurred on will first change to red and then yellow once the issue has been fixed **and the you click th button 'clear errors'**. Any other channels that are in a Master-Slave configuration with the faulted or manually paused channel will also pause and turn yellow if no faults are present with those channels.

You must manually resume the channel(s) after correcting and dismissing the 'Thermocouple Unplugged' fault to switch the process back to a green – 'Running' state. Faults and their associated cause are explained in greater detail in Section 15.

8.7.1 Resuming a Cycle After Being Paused

It is important to highlight that the HEAT VIEW Controller behaves in a very specific way when channels that have been configured in a 'Master-Slave' configuration are 'Resumed' from a 'Paused' state. The controller continues to hold all thermocouples where they were at when the 'Pause' occurred.

It then identifies the lowest temperature thermocouple in the configuration and increases its temperature at the ramp rate set in the 'Run Mode' parameters until this lowest temperature thermocouple reaches the same temperature as the next lowest thermocouple in the group. The system then brings both thermocouples up in temperature to the next lowest in the group. It continues this pattern of uniformly raising the temperatures of each thermocouple until it reaches the last, highest temperature thermocouple in the configuration.

Only once all thermocouples have been brought up in temperature uniformly does the controller truly resume the heat cycle and continue progressing the cycle to its user defined end point.

8.8 The 'About' Window

Double-clicking the HEAT VIEW logo in the title bar will open the software's 'About HeatView' window. Here an operator can view important information about the software and controller they are connected to. This window is detailed below in Figure 57.

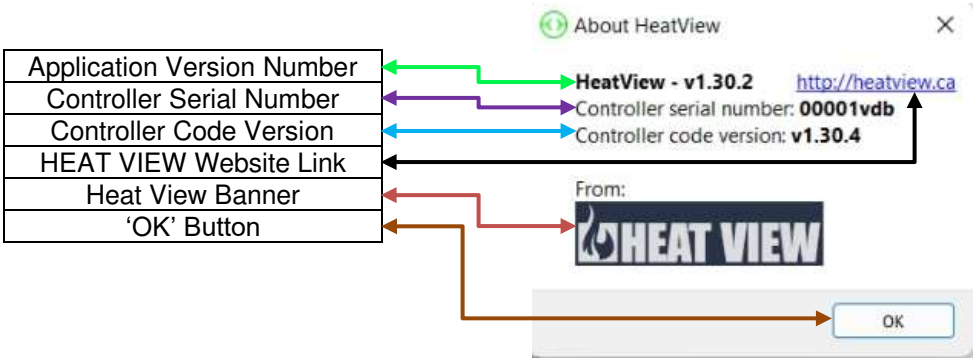


Figure 57: The About Window - Detailed

Application Version Number: This field lists the currently installed and running version of the HEAT VIEW computer application.

Controller Serial Number: If for any reason the serial number physically marked on your controller becomes illegible, it can be found here in the 'About HeatView' window.

PLEASE NOTE: This serial number must also appear, exactly as shown here, on any calibration certificates you acquire each time you have the controller calibrated to verify functionality and certify the accuracy of the device. The industry standard is to have the controller calibrated yearly and maintain traceable calibration records.

PLEASE NOTE: The industry standard calibration interval has been shifting in the last few years, with many applications demanding 3- or 6-month calibration intervals as a standard requirement. Please contact your authorized HEAT VIEW distributor to arrange calibration at the routine interval you require for your application or clients, and they will be happy to assist you in maintaining whichever calibration interval you require.

Controller Code Version: This is the current version of the code running on the HEAT VIEW controller you're connected to.

PLEASE NOTE: It is imperative that you know your 'Software Version' 'Controller Code Version' and 'Serial Number' when calling your authorized HEAT VIEW distributor for support. This information will allow them to pull up system configuration and warranty information directly related to you controller and expedite the support process.

Website Link: Should you ever wish to quickly access the HEAT VIEW website, to check for new software updates, products, or service bulletins, simply click this link in the ‘About HeatView’ window to automatically open the website in your default internet browser.

‘OK’ Button: Clicking this button will dismiss the ‘About HeatView’ window.

9 Application Settings Window

On the surface, the 'Application Settings' window of the HEAT VIEW computer application appears simplistic in nature; however, it also acts as the login portal to access multiple tiers of additional application, channel, and controller settings. The different access levels are explored further in this section. Figure 58 below is an example of what the 'Application Settings' window looks like when connected to a 24 Channel HEAT VIEW Temperature Controller before logging in to the advanced settings.

9.1 Basic Application Settings

There are only 3 basic functions available to an operator upon first opening the 'Application Settings' window. These functions are detailed below.

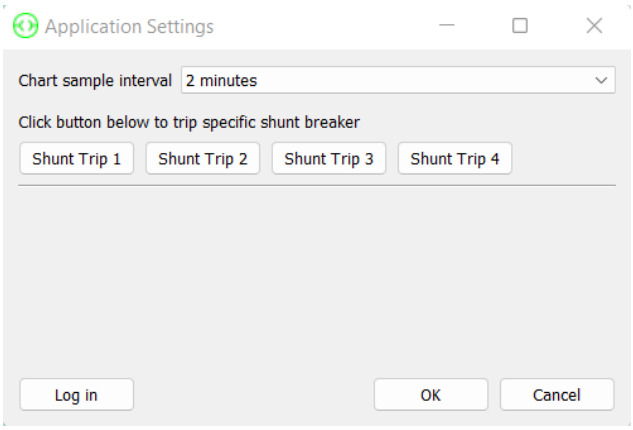


Figure 58: Basic Application Settings

Chart Sample Interval: The 'Chart Sample Interval' setting allows an operator to choose the frequency they want the computer application to sample a channels temperature data and record it to the chart, and by extension the database, when a heat cycle is running. This option, upon connecting to a controller for the first time, or after a major code update, will be set to a 2-minute interval, however, intervals of 10 seconds, 30 second, 1 minute, and 5 minutes are also available.

Setting your 'Chart Sample Interval' is important to how your controller captures cycle data. A short sample interval will capture large amounts of data and will be more likely to capture fluctuations in temperature and log abnormal events. This is helpful in certain applications when you need to see exactly what occurred with a cycle. However, if working on an application where precision is less important or the cycle will be running for potentially days at a time, a long sample interval will ignore negligible fluctuations and events. Best practice is to choose either a 1- or 2-minute sample interval.

Shunt Trip X: The 'Shunt Trip X' (where X is the associated console number) function in this window allows and operator to trip the shunt inside of a heat treatment console (if equipped) and remotely disengage the consoles 'Main Circuit Breaker'. Depending on how they are configured, portable HEAT VIEW Controllers can be connected to a maximum of 4, 6-Channel consoles.

Each controller is configured and marked externally with up to 4 console connection ports. The 'Shunt Trip' 'X' number corresponds with the number of the connection port and thus by extension, the console they have been connected to. Thought of more simply, 'Shunt Trip 1' will trip the shunt of the console connected to channels 1-6, 'Shunt Trip 2' will trip the shunt of the console connected to channels 7-12, and so on.

PLEASE NOTE: If you have a custom configuration of the HEAT VIEW Controller built directly into your panel; a portable, generator powered heat treatment console or electric furnace for example, your shunt controls may function differently than described above. Please speak with your authorized HEAT VIEW distributor to discuss how your shunts function in your custom application.

Login: This button will open a separate smaller window with options to enter a 'Username' and 'Password'. Depending on your credentials, you can access Supervisor or Service level 'Advanced Settings' for several sections of the application and controller. The Supervisor level is explored in the next section.

9.2 Advanced Settings

The 'Operator' level login provides access to 'Advanced Settings' window as well as a couple other options in the 'System Settings' window. The image below shows the options available to you when you are logged in as an Operator or higher level.

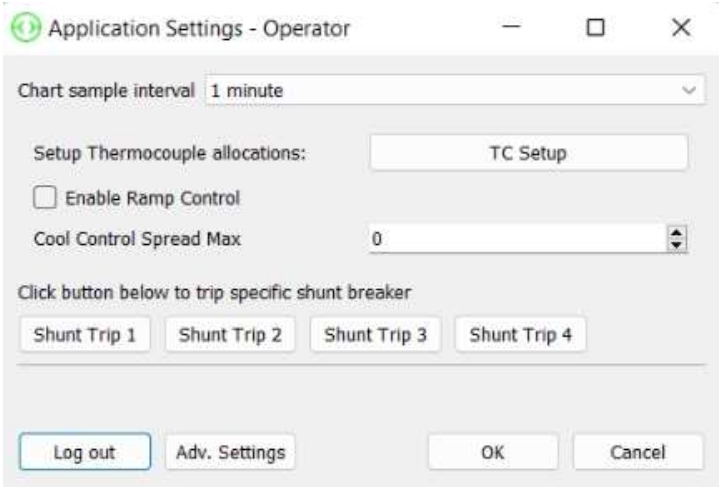


Figure 59: Applications setting screen once logged in

9.2.1 Thermocouple setup button

The "**TC Setup**" button will allow you to change how to allocate which thermocouple should be used as inputs to which channel. This is covered in detail later in this manual. But essentially each channel can have 1 or more thermocouple inputs assigned to it and the channel will select the hottest one as its control value. If one of the thermocouples comes open, the channel can keep running with the other

thermocouples as inputs to the channel.

The **Enable Ramp Control** check box allows the system to automatically adjust any ramp step while the system is running in order to make sure that any channel can heat correctly and does not come out of the tolerance bands on the lower end. The image below shows how a real system was requested to heat a work piece at a rate much higher than it could. If you look at the blue dotted line, you will notice that the slope of the line is decreasing at different intervals. The image below that highlights one of the first rates and the one of the last ones so you can see what the difference in slope is.

Essentially the system looks at all the temperatures in a master/slave chain and if any of them drop below the lower tolerance value for the cycle (and this check box is turned on) then the system will reduce the ramp rate by 20% and then will start heating again from the lowest channel temperature in the master slave chain.

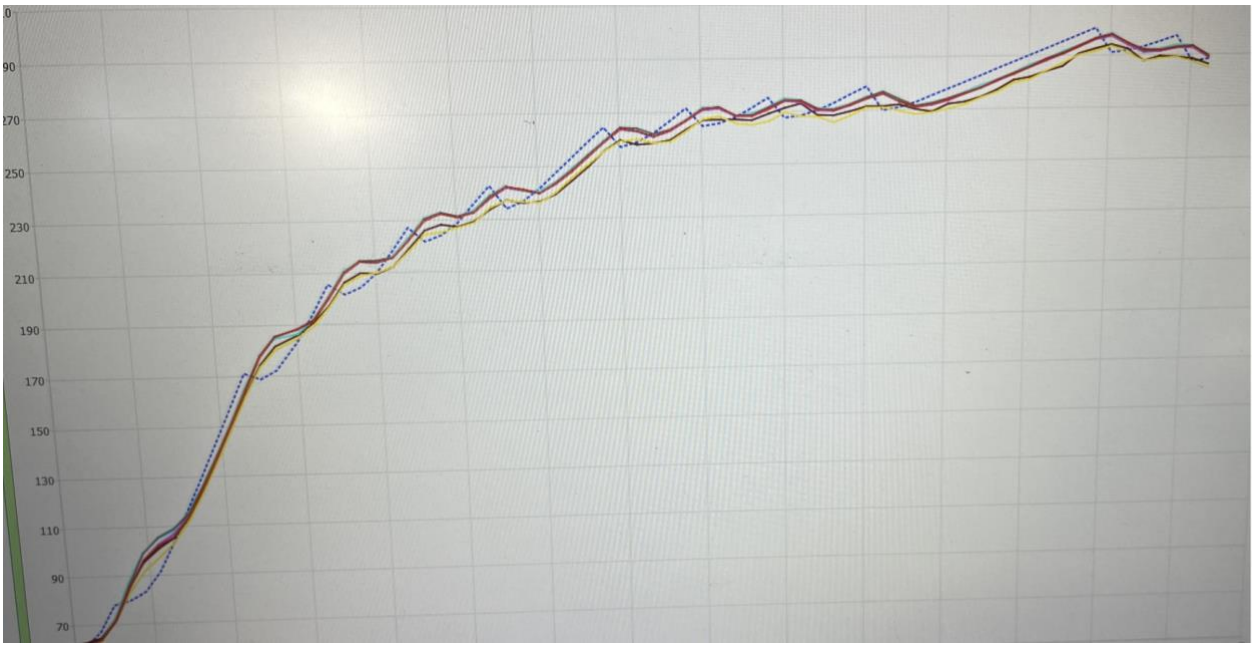


Figure 60: The system adjusting the ramp rate during a cycle as the system did not have enough power to heat the workpiece as fast as the operator desired

Figure 61: highlighting the difference in ramp rate after the system kept automatically adjusting the ramp rate because the system did not have enough power to heat at the desired rate.

9.2.2 Controlling the maximum cooling spread

The **Cool Control Spread Max** value is the maximum spread allowed between channels in a master-slave chain DURING A COOLING STEP. Essentially if this value is 10 and there is a difference in temperature between the hottest and coolest channel of more than 10 degrees, the system will heat the coolest channel.

If you look at the image below, you will see that the coolest channel in the master- slave chain was starting to cool too quickly relative to the hottest channel. So, the system started applying heat to it even though it was over the desired temperature.

This feature was added when heating/cooling larger vessels where temperature differentials can induce stress in the material.

Please note that if the value in the cool control spread max option is 0, then the system will not perform any cooling spread control.

When in doubt keep this value at 0, or use a higher value where possible. It can happen in some scenarios where there is a feedback loop from this and the channels will heat themselves continuously while they should be cooling.

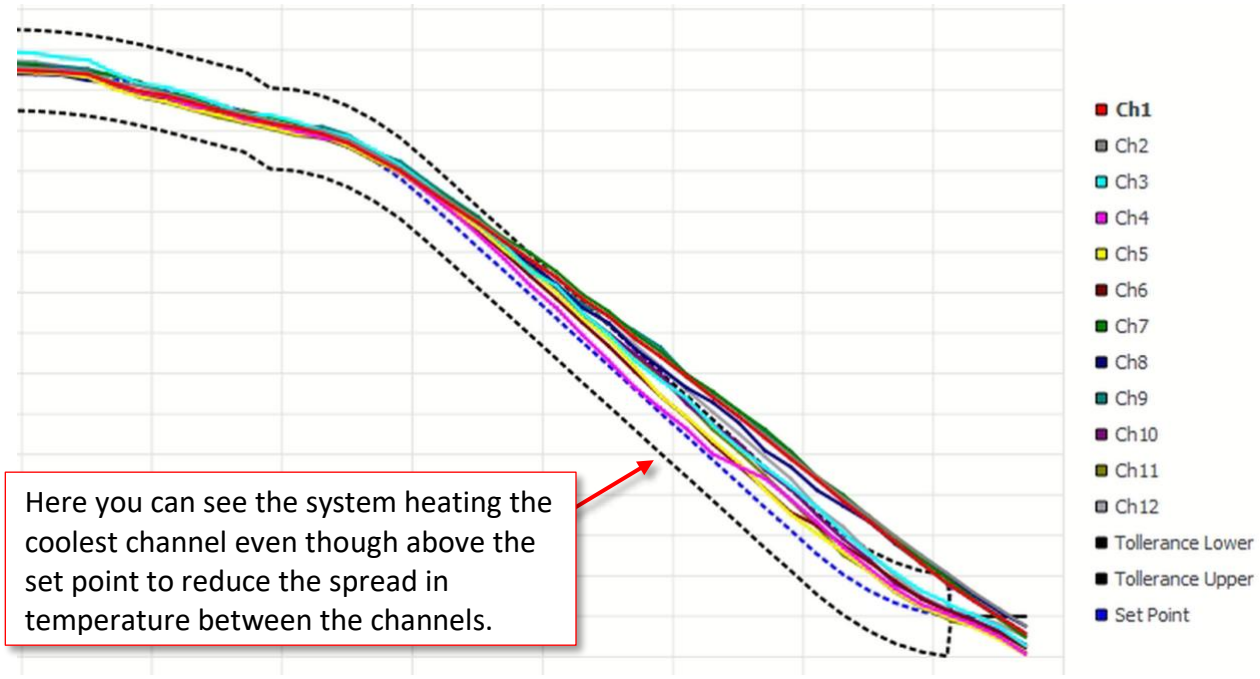


Figure 62: Chart showing how the system worked to keep channels cooling at the same rate

9.2.3 Advanced Settings button

Once logged in, the advanced settings button will appear. This will allow the user to open a new window to allow you to make more in depth settings changes to the application. Please note that not all tabs will be available to you, and in dependant on whether you logged in as a supervisor or an operator. Each tab is shown in an image below and then its functions are then explained below it.

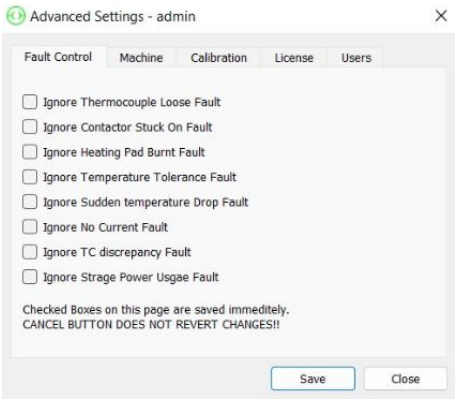


Figure 63: Advanced settings - Fault control tab

In the fault control tab, you can enable and disable any faults listed there from showing up on the computer application. They do not disable them in the controller, but simply hide them from your computer application. There is no need to press the ‘save’ button to store the checked/unchecked items in this list as it is immediate.

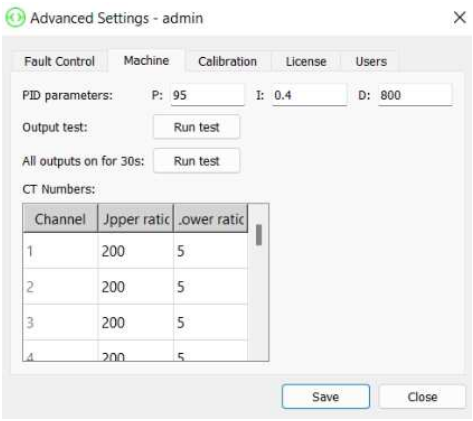


Figure 64: Advanced settings - Machine tab (only available to supervisor login)

The machine settings tab is available to Supervisor login only. This tab holds the PID parameters for the given controller. DO NOT MAKE ANY CHANGES TO THESE VALUES UNLESS YOU KNOW WHAT YOU ARE DOING!

The Output test button will sequentially turn on all the outputs in the system starting at channel 1 and then will trip all shunts too. It is placed here such that you can test the wiring inside your console.
The All outputs on for 30s option should only be used by trained technicians as it turns on all contactors simultaneously for 30 seconds for wiring testing.

The CT Numbers table shows the values in the system that will be used to calculate the output current. This is the CT ratio on the physical CT's in the console. These values are changes on the channel settings screens.

To apply any of these settings to the controller, you need to press the Save button before pressing the close button to exit the window.

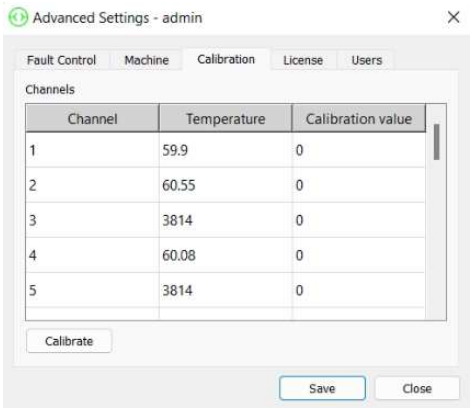


Figure 65: Advanced settings - Calibration tab (only available to supervisor login)

The channels calibration tab will show you the calibration values in the table for each channel. There is also a button to bring up the calibrating screen. The calibration procedure is supplied in another document that can be obtained through your HEAT VIEW distributor.

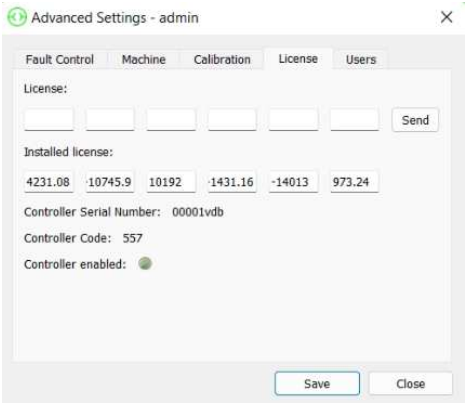


Figure 66: Advanced settings - License tab (only available to supervisor login)

The license tab has information on the HEAT VIEW hardware license. This license is installed at the factory and should never be modified. It is a feature added to the system to prevent system duplication. This license will only ever disappear if you try and modify the system in a way that you should not.

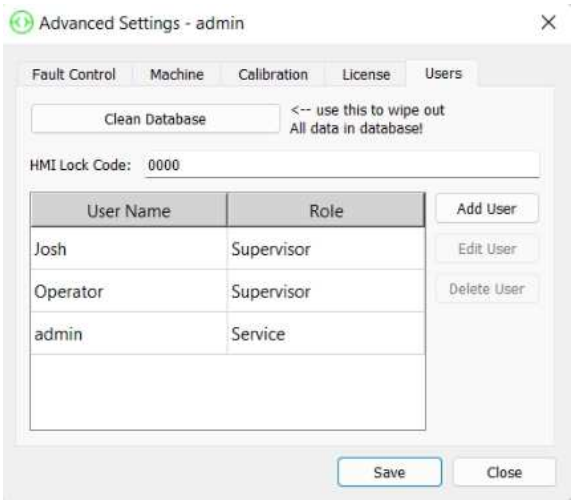


Figure 67: Advanced settings - Users tab

Finally, the Users tab is there for you to be able to add or remove logins for the system. To do this simply press the Add, Edit or Delete User. When logged in as a supervisor, you can add either Operator or Supervisor logins. If logged in as an Operator, you can only add other Operator level logins.

The “Clean Database” button will delete all data in a local database on your computer. This can be necessary if you have been running the system for a long time and your list of available heat cycles in the report generation dialog is getting too long.

The HMI lock code sets the code to unlock the touch screen of the controller. If the controller touch screen is locked, then the system cannot be controlled from the touch screen. To unlock it, the code given in this section is what is required to unlock it. If you change the lock code, MAKE SURE TO PRESS THE SAVE BUTTON BEFORE CLOSING THIS WINDOW TO MAKE SURE IT IS WRITTEN TO THE CONTROLLER.

10 Chart Settings Window

The graph or 'Chart' that is present in both the 'Chart' view of the 'Main Screen', as well as in the 'Report' window, can be adjusted to suit an operators view preference within the 'Chart Settings' window. This window can be accessed via the 'Chart Settings' button in the upper right corner of the graph, and is identical in both features and function, no matter where it is accessed from.

When in the 'Chart' view, the 'Channel Settings' window changes the view of only the chart for the channel currently being viewed. In the 'Report' window, since there is only one chart, changing settings in this window affects just the 'Report' window chart. The image below explores the features of the 'Chart Settings window'.

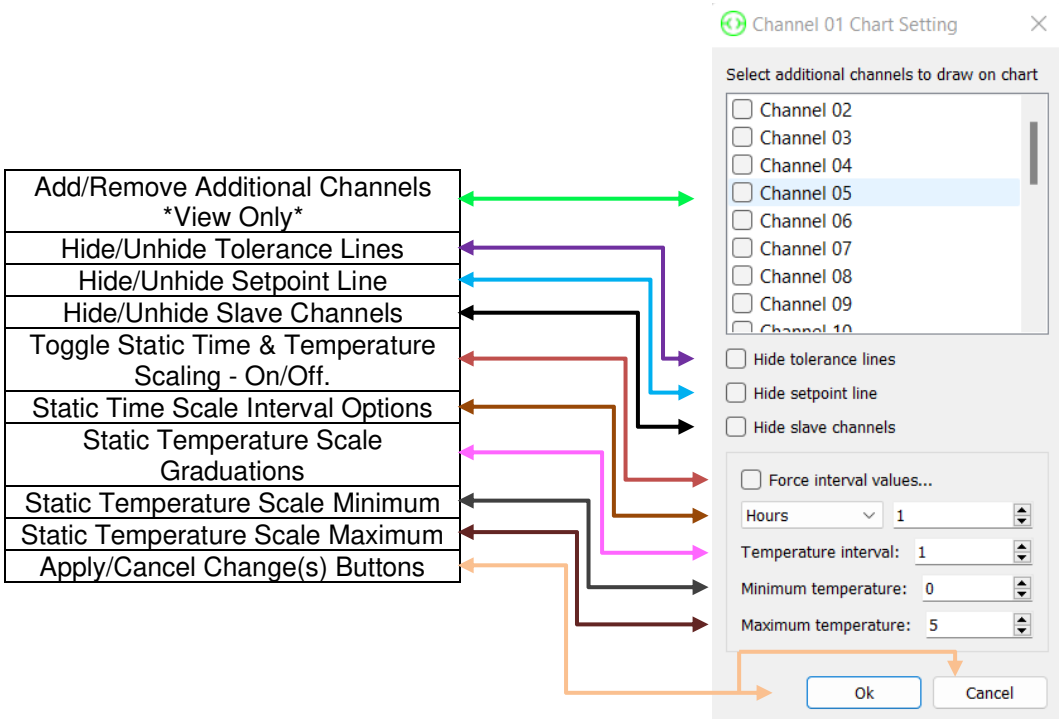


Figure 68: Chart Settings Window - Features

Select Additional Channels To Draw On Chart: This is where an operator can choose additional channels to view while in a channels 'Chart' view on the 'Main Screen'. Once selected, the charts for the additionally selected channel(s) get drawn on the chart currently in view and remain until deselected. These additional channels do not get recorded to the original channel' chart or database entry from its heat cycle and are *View Only*. If you wish to add all the channels from another heat cycles entire 'Master-Slave' configuration, you need only select the 'Master' channel from the list.

Hide Tolerance Lines: Selecting/deselecting this checkbox will allow an operator to hide/unhide the black, dotted, 'Temperature Tolerance' lines (if configured in the channel settings) from appearing visually on the chart. The system still logs all data relevant to these lines to the 'Database' and they will still appear on the final 'Report' unless also configured to be hidden in the 'Report' window' 'Chart Settings' window.

Hide Setpoint Line: Selecting/deselecting this checkbox will allow an operator to hide/unhide the blue, dotted, 'Setpoint' line from appearing visually on the chart. The system still logs all data relevant to the 'Setpoint' line, to the 'Database' and it will still appear on the final 'Report' unless also configured to be hidden in the 'Report' windows 'Chart Settings' window.

Hide Slave Channels: When viewing the chart of a 'Master' channel, the 'Master' channel and all channels slaved to it, appear on the chart by default. Should the operator wish to view only the recorded line of the 'Master' channel on the chart, selecting this checkbox will hide all slaved channels from view. The system still logs all data relevant to the 'Slave' channel(s) to the 'Database' and they will still appear on the final 'Report' unless also configured to be hidden in the 'Report' window' 'Chart Settings' window if attempting to create a chart specific to only the data concerning the 'Master' channel.

Force Interval Values…: Enabling this option disables the auto-scaling features of the chart and allows an operator to choose exactly how they wish to view both the 'Time' and 'Temperature' scales. This is accomplished via the 5 fields discussed below that become available once the checkbox for this option has been selected. Deselecting this checkbox returns control of the 'Time' and 'Temperature' scales back to the system.

Time Interval Options: The two options directly below the 'Force Interval Values…' checkbox adjust the horizontal 'Time Scale' along the bottom of the chart. The drop-down list on the left is for choosing the 'Time Scale' modifier – minutes, hours, or days – while the text box on the right is where the operator enters the number of the selected modifier. I.e., setting the drop-down to 'Hours' and typing '1' into the text box, will force the chart to draw the channel data on the chart with the 'Time Scale' now increasing hourly from the start of the cycle. Depending on the length of the cycle, an operator may have to re-adjust this scale to cleanly view the chart data.

Temperature Interval: The number an operator enters in this field adjusts the graduations of the 'Temperature' Scale', which runs vertically along the left side of the chart. I.e., setting this to '100' would forcibly adjust the 'Temperature Scale' so that it now increases vertically in graduations of 100°; starting from the user defined 'Minimum temperature' and increasing at the set graduation until reaching the user defined 'Maximum temperature'.

Temperature Minimum: This field allows an operator to choose the lowest temperature that will appear on the vertical 'Temperature Scale'. The 'Temperature scale' will start at this temperature and increase by the graduation value you entered in the 'Temperature interval' field until reaching the user defined 'Maximum temperature'.

Temperature Maximum: This field allows an operator to choose the highest temperature value that will appear on the vertical 'Temperature Scale'. The 'Temperature scale' will end at this temperature, decreasing by the graduation value you entered in the 'Temperature interval' field until reaching the user defined 'Minimum temperature'.

PLEASE NOTE: When defining custom static scales, it is best practice to set you your 'Minimum temperature' 5-10% lower than the heat cycles starting temperature, and 'Maximum temperature' 10-25% higher than the maximum temperature the heat cycle will reach so that chart has room to draw any large fluctuations or cycle events that occur.

'Ok' & 'Cancel' Buttons: Pressing the 'Ok' button will cause any changes you made in this window to be applied to the chart you are currently viewing. Make sure you click 'Ok' and not 'Cancel' when exiting this window if you want to use the settings you enabled. If you make changes but decide you don't wish to use them, the 'Cancel' button will close the 'Chart Settings' window without applying any of your changes. All changes to the chart from inside this settings window stay in effect until disabled by the operator.

PLEASE NOTE: The system always records time and temperature data from the heat cycle to the database in such a way that, at any time, an operator can freely change between using scales of their choosing, or letting the system auto-scale the chart. This allows an operator to quickly choose the best-looking view of their chart.

11 The Recipe Editor

A recipe in the HEAT VIEW system is a collection of steps the controller needs to follow. Each step is either a ‘Rate’ step to change the temperature of the workpiece at a defined rate, or a ‘Soak’ step to keep the temperature steady for a given period of time.

If temperature overshooting the setpoint line is a concern, there is a ‘Corner Rounding Percent’ feature that will essentially force the controller to reduce power output and slow the process down as it transitions between steps.

The ‘Recipe Editor’ is opened via the ‘Recipe Editor’ button in the title bar and is used to program the steps necessary to run a post-weld stress relief cycle; once programmed the system will follow these steps automatically to the completion of the heat cycle. Figure 69 below shows an example of a ‘Post-Weld’ recipe in the ‘Recipe Editor’.

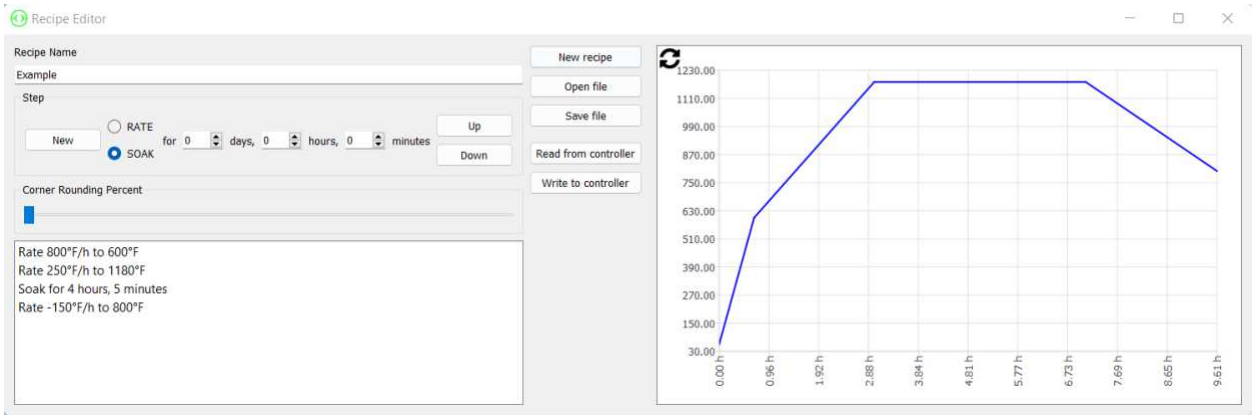


Figure 69: Recipe Editor - Example Recipe

11.1 Creating a Post-Weld Recipe

The steps for creating a ‘Post Weld’ recipe in the ‘Recipe Editor’ window are detailed below. Sections further on will cover how to read/write a recipe to/from a channel, as well as saving/loading a recipe to/from your computer.

1. Open the ‘Recipe Editor’, it should appear empty as it does in Figure 70 below.

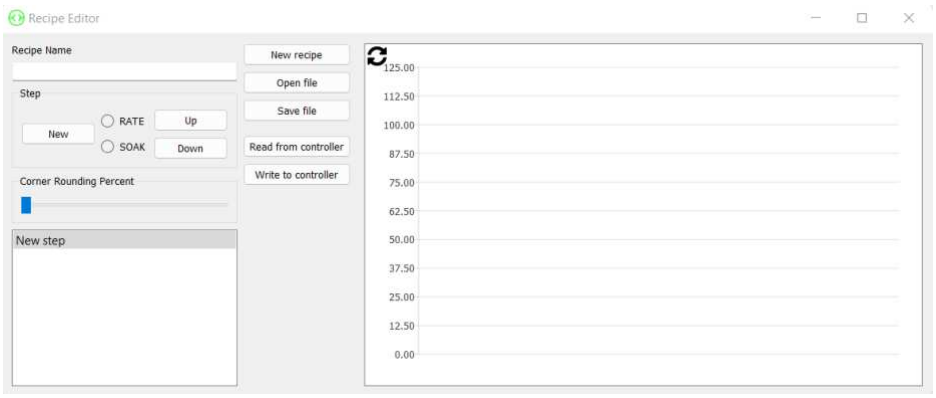


Figure 70: The Recipe Editor - New Recipe

2. Name your recipe by entering a name of your choosing in the 'Recipe Name' field highlighted in Figure 71 below. It is best to avoid special characters when creating recipe names such as `~!@$^*/ \+= as an example. However, dashes (-) underscores (_) hashtags (#) and ampersands (&) are okay to use freely.

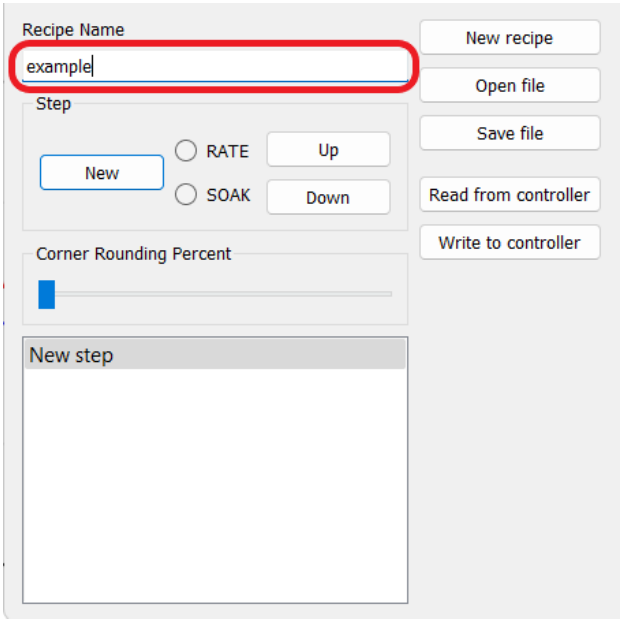


Figure 71: Recipe Editor – 'Recipe Name' Field

3. Click on "New Step" in the 'Step List' in the lower left corner of the window as highlighted in Figure 72 below to program the first step in the recipe. It will turn blue once selected to highlight which step you are modifying.

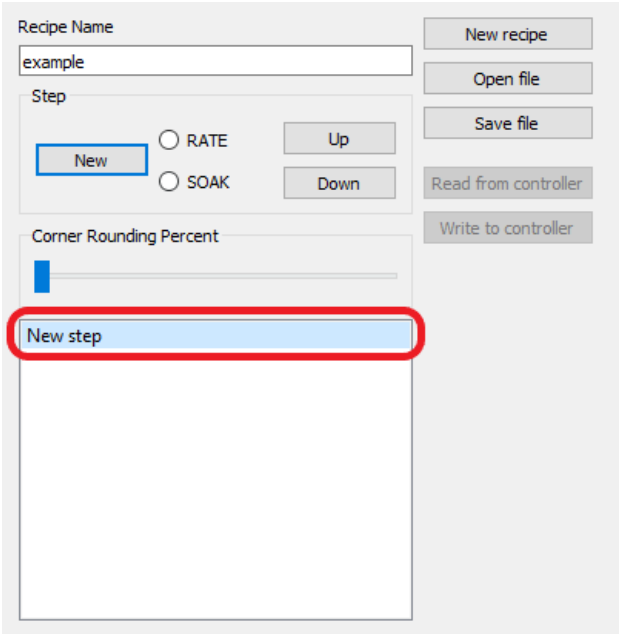


Figure 72: Recipe Editor – First Step

4. Choose “Rate” and enter the ramp rate parameters for the first step of your ‘Post-Weld’ cycle in the new fields that appear. An example is highlighted in Figure 73 below. The ‘Recipe Viewer’ window on the right will start to illustrate a visual version of your recipe.

Figure 73: Recipe Editor – ‘Rate’ Step

5. Click the New Step button – highlighted in Figure 74 below – to add the next step in your recipe. The new step will appear in the Step List as “New Step”. In our example the second step is also a Rate step and we’ve added it before proceeding to the next example.

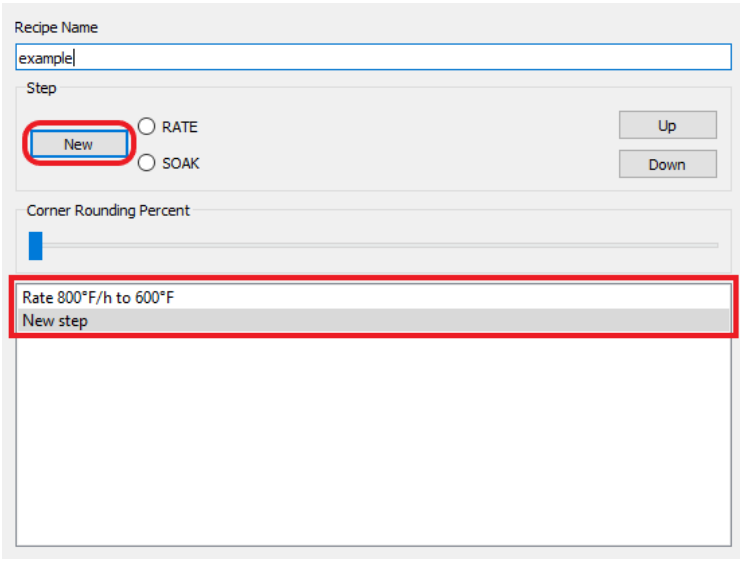


Figure 74: Recipe Editor – ‘New’ Step Button

6. Once you are ready to add a Soak step, make sure you have a “New Step” in the list and then select “Soak” and enter the amount of time your cycle needs to be held at temperature – as is highlighted in Figure 75 on the next page. If your parameters don’t require a controlled cooling step, you can proceed to step 8. Otherwise continue to step 7 to add a cooling step.

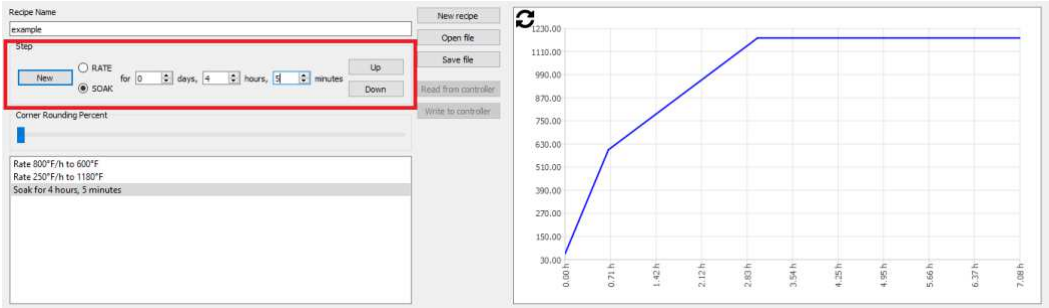


Figure 75: Recipe Editor – 'Soak' Step

7. If your heat cycle parameters require a controlled cooling step, add another 'Rate' step and set a negative ramp rate as well as the temperature the piece must cool to before the cycle ends. An example of this is shown in Figure 76 below.

PLEASE NOTE: It is not necessary to type in a negative value such as -150 to get the system to add a negative ramp rate. So long as you type in the number of °/h and the end temperature is lower than the 'Soak' temperature, the system will automatically turn the 'Rate' step into a 'Negative Rate' step.

Figure 76: Recipe Editor – 'Negative Rate' Step

8. If you are satisfied with your recipe, you can now choose to either write it to a channel or save it to your computer to be easily recalled and written to channels or other controllers in the future. For detailed instructions on how to read/write or save/load recipes continue to the next section of this manual.

   If you have additional recipes to create, you can now press the 'New recipe' button – highlighted in Figure 77 on the next page – to clear all fields in the 'Recipe Editor' window and return it to how it was in Figure 70.

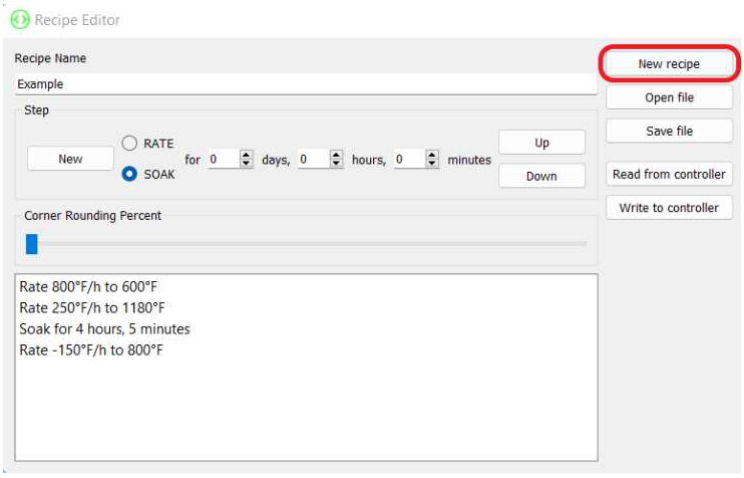


Figure 77: Recipe Editor – 'New Recipe' Button

11.1.1 Changing the Order of Steps

If at any time an operator enters a step in the wrong order while creating a 'Recipe', instead of deleting steps, they can click on the step that is out of order and then click either the 'Up' or 'Down' buttons highlighted in Figure 78 below, to shift it up or down freely through the recipe until it is where it should be. **Make sure that you select the step you want to move first, before clicking on the up or down buttons.**

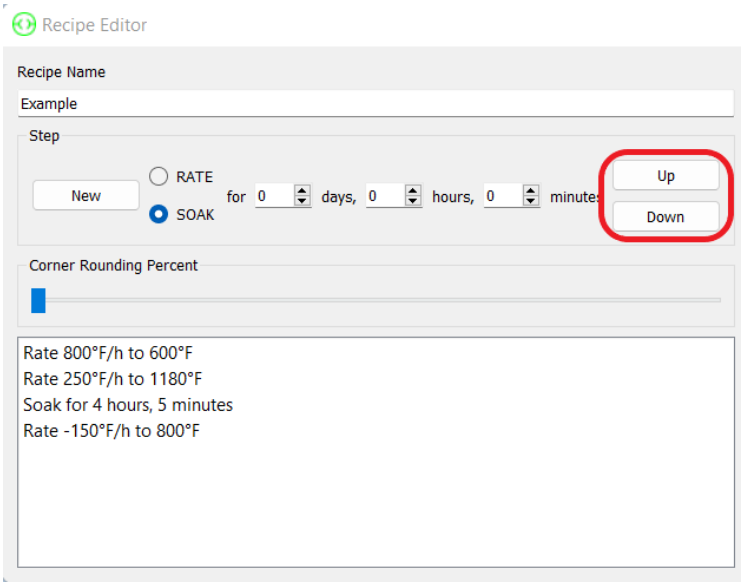


Figure 78: Recipe Editor – Shift steps up or down buttons

11.1.2 Corner Rounding Percent Slider

If performing a post-weld stress relieving cycle on a workpiece or workpieces that are critical path and would be costly to repair or replace should something go wrong or if the materials heat cycle parameters have very narrow control tolerances, the operator can choose to add 'Corner Rounding' between 0-100% to a 'Recipe' via the 'Corner Rounding Percent' slider in the 'Recipe Editor'.

This 'Corner Rounding' forces the controller to reduce power and slow down as it transitions between each step in the recipe. Figure 79 below highlights where this slider is and shows a zoomed in example of what happens at each transition between steps in the recipe.

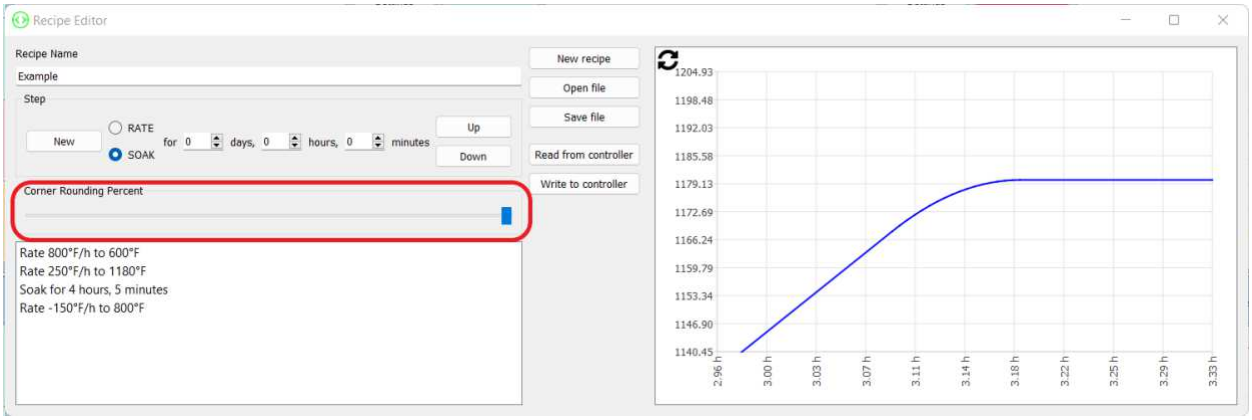


Figure 79: Recipe Editor – Corner Rounding Percent Slider

PLEASE NOTE: Adding 'Corner Rounding' to a 'Recipe' WILL increase the time it takes to complete the cycle due to this feature slowing the controller down as it transitions between steps. Program your 'Recipe' and then drag this slider to adjust the amount of rounding. You will notice the preview of your recipe change to match this rounding and the time scale along the bottom will show just how long your cycle should theoretically take to complete. If the time to completion is critical, simply remember that even some rounding is better than no rounding.

11.2 Writing a Recipe to a Channel

Once you have your recipe steps programmed to your liking, you have to "write" that recipe to the channel(s) that will be running a Post-Weld cycle with those parameters. Follow the steps listed below to accomplish this.

1. Click the 'Write to controller' button highlighted in Figure 80 below to open the 'Select Channel' window.

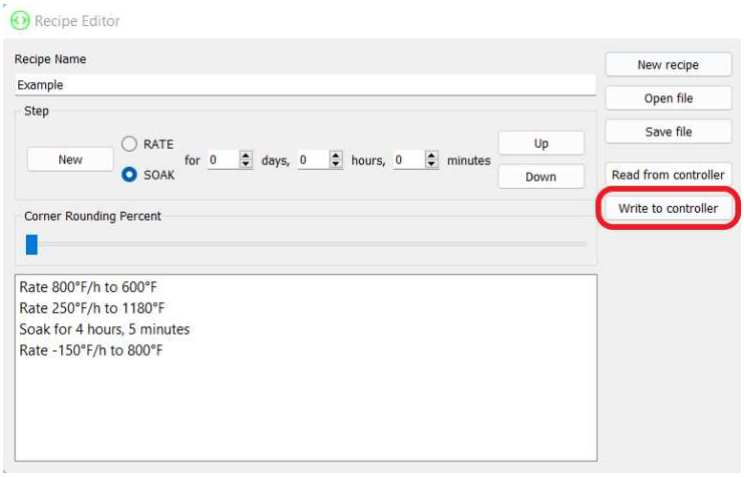


Figure 80: Recipe Editor – 'Write to Controller' Button

2. In the 'Select Channel' window that opened, using the drop-down menu, select which channel you would like to write the recipe to and click the "OK" button highlighted in Figure 68 below.

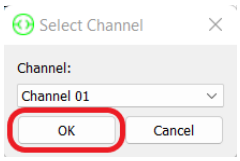


Figure 81: Recipe Editor – 'Select Channel' Window

3. On the pop-up window confirming that your recipe was successfully written to the channel, click the "OK" button highlighted in Figure 82 below to dismiss the pop-up and complete the process.

Figure 82: Recipe Editor – Recipe Written to Channel Notification

PLEASE NOTE: If the recipe you created is going to be used in a master-slave configuration, the recipe only needs to be written to whichever channel you have designated as the master. The master channel will transfer the recipes process variables to its slave channels automatically.

11.3 Reading a Recipe from a Channel

If you want to save a recipe or make changes to a recipe you have already written to a channel, it can be recalled into the 'Recipe Editor' for modification via the 'Read from controller' button. The steps outlined below will demonstrate how to accomplish this.

1. Open the 'Recipe Editor' window and click the 'Read from controller' button highlighted in Figure 83 below to open the 'Select Channel' window.

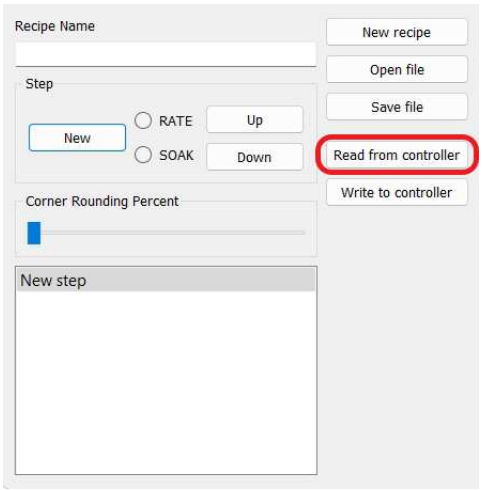


Figure 83: Recipe Editor – 'Read from controller' button

2. In the 'Select Channel' window that opened, using the drop-down menu, select which channel you would like to read an existing recipe from and click the "OK" button highlighted in Figure 84 below.

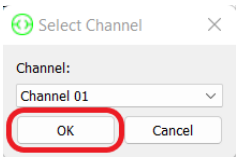


Figure 84: Recipe Editor – 'Select Channel' window

If you successfully manage to read a recipe from the selected channel, you will see its name, steps, and visual profile populate in the 'Recipe Editor' window. Once populated, you can modify, save, or write it to another channel.

11.4 Saving a Recipe File

If you regularly switch between common recipes and wish to save a recipe to your computer for easy access to it in the future, this section will guide you through how to save a recipe to a location of your choosing. The steps are as follows:

1. Create a new recipe or read a recipe from a channel to populate the fields of the 'Recipe Editor' window. Once you have a recipe that is satisfactory to you, click the 'Save file' button – highlighted in Figure 85 below – to open the 'File Explorer' window.

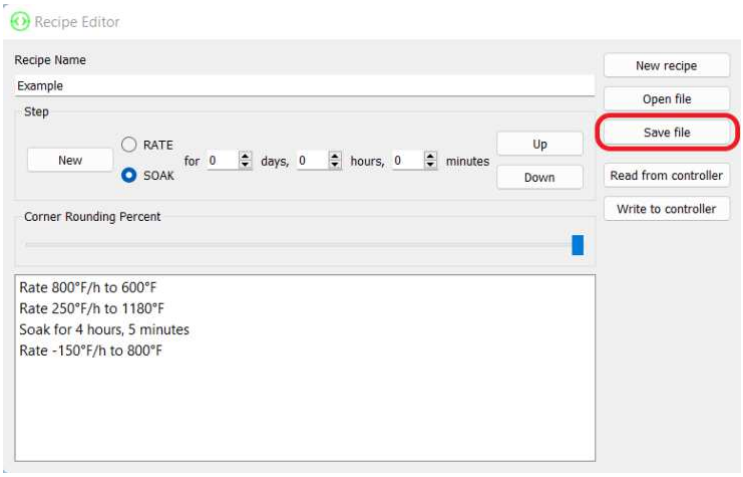


Figure 85: Recipe Editor – 'Save file' button

2. In the 'File Explorer' window that opened you can choose where to save the recipe file and name it whatever you want. The default location that opens when clicking this button is the HEAT VIEW software install directory, however you can save them anywhere that is convenient for you. Recipes files will always be ".HVR" format. Click on the 'Save' button – highlighted in Figure 86 below – to complete this process.

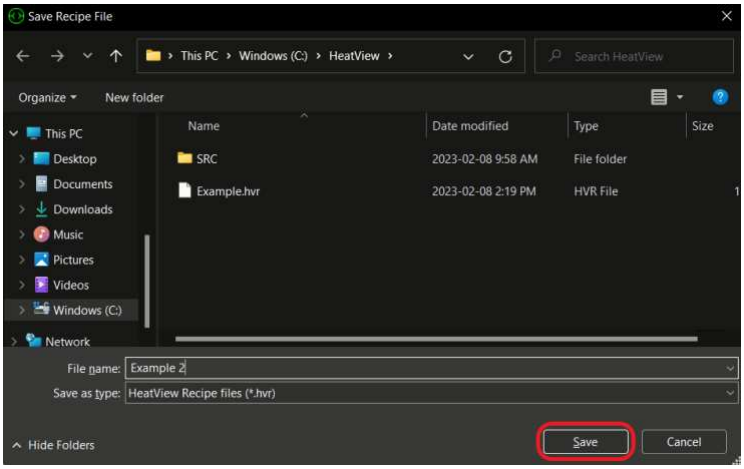


Figure 86: Recipe Editor – Recipe file save location

11.5 Loading a Recipe File

If you have saved recipe files to your computer for regular access, they can be loaded directly into the 'Recipe Editor' and then modified, written to a channel and resaved if necessary. The steps to accomplish this are outlined below.

1. Open the 'Recipe Editor' and click the 'Open file' button highlighted in Figure 87 below. This will open the 'File Explorer' window.

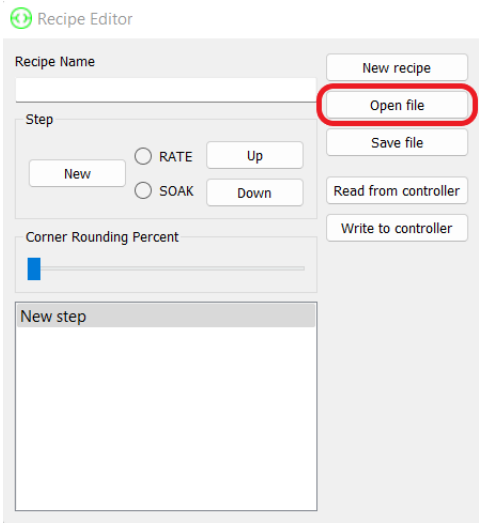


Figure 87: Recipe Editor – 'Open file' button

2. In the 'File Explorer' window that opened, navigate to the folder where you have stored your recipe files. As a reminder, recipes will always be in the ".HVR" format. Select the recipe file you wish to load into the 'Recipe Editor' and click the 'Open' button – highlighted in Figure 88 below – to complete this process.

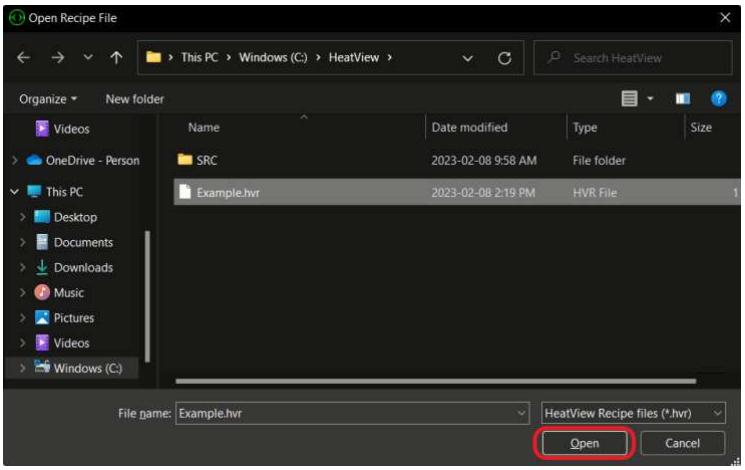


Figure 88: Recipe Editor – Recipe file location

If you successfully manage to load a recipe from your recipe rile, you will see its name, steps, and visual profile populate in the 'Recipe Editor' window. Once populated, you can modify, save, or write it to a channel.

12 Channel Settings Window

Each channel of a HEAT VIEW controller is essentially an individual mini controller, capable of completing heat cycles entirely independent of all other channels. Because of this, each channel has its own 'Channel Settings' window. Here the operator can choose what 'Mode' the channel will run in and adjust its cycle parameters, define temperature tolerances, give the channel a unique name to appear on the chart and in the final report, as well as test the output and thermocouple reading of the channel.

This settings window gains additional settings and options depending on the credentials used to access the 'Advanced Settings' in the 'Application Settings' window. For information about how to login and access advanced system settings please refer to Section 9 'Application Settings Window' on page 63. The settings windows for each 'Mode' are detailed below.

12.1 Universal Master Channel Settings

This section details the settings that are universal between all modes and settings access levels when viewing a 'Master' channel' 'Settings' window. These universal settings are highlighted in Figure 89 below. Settings that appear in this window, specific to each 'Mode', as well as 'Slave' specific settings, are explored in their own sections further down.

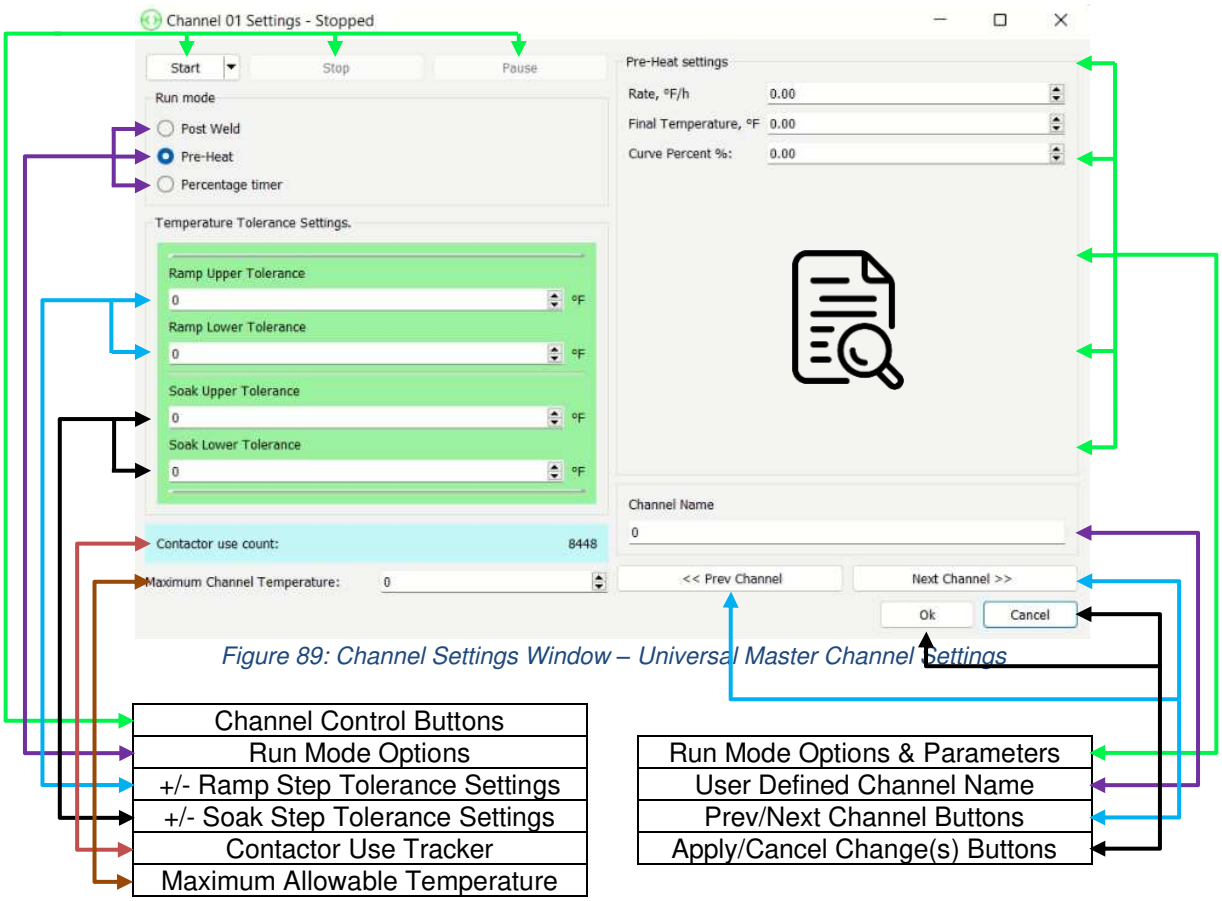


Figure 89: Channel Settings Window – Universal Master Channel Settings

Channel Control Buttons: Identical in function to those covered in Section 8.48.4.4 'Menu & Control Buttons' beginning on page 51. These buttons allow an operator to change the 'State' of the channel and any configured 'Slaves'. The only difference between these and the ones described in Section 8.4.4, is the addition of the 'Pause' button.

Pause Button: Currently, the 'Channel Settings' window is the only place to access the 'Pause' button. This button allows the operator to manually change the state of a channel, as well as any configured 'Slaves', from 'Running' to 'Paused'. It may be beneficial to pause channels if the operator notices an issue that may result in a fault soon and wishes to correct it before it fails, becoming a potentially larger issue. Within the 'Channel Settings' window, once paused this button is replaced with the 'Resume' button.

Resume Button: Not pictured above, the 'Resume' button physically replaces the 'Pause' button when a channel has been transitioned to a 'Paused' state; either by a thermocouple related fault or the operator manually clicking the 'Pause' button in the 'Channel Settings' window. Once the fault is cleared, this button will enable an operator to 'Resume' the cycle and transition it back to a 'Running' state, continuing the progression of the heat cycle from where it became paused.

Run Mode: This section of the 'Channel Settings' window is where an operator selects what 'Mode' they wish to run each 'Master' channel in. Remember, all channels are considered 'Master' channels until added as a 'Slave' channel to another, separate, 'Master' channel. These 'Run Mode' settings do not appear in the 'Channel Settings' window of a 'Slave' channel.

Slave Settings: The 'Slave To' checkbox and drop-down list allow an operator to add/remove an individual channel as a 'Slave' to another 'Master' channel. This feature is separate from the 'Multi Slave Select' function and primarily used to add/remove 'Slaves' if an issue occurs when a cycle is running. This is covered in more detail in Section 13.4.2.

Temperature Tolerance Settings: Depending on the material and application of the workpiece, each heat cycle will have positive and negative 'Temperature Tolerances' detailed in the engineering document for the material. These tolerances determine whether the workpiece was properly heated treated. These 4 fields allow an operator to define temperature values that will cause the system to generate a fault, notifying the operator of an issue, if the 'Control/Actual Temperature' of a channel rises or falls outside these tolerances.

Tolerances can be defined for both the 'Ramp' and 'Soak' steps of a heat cycle in all 'Run Modes', however 'Percentage Timer' Mode does not follow a set rate to a definite temperature. Please see Section 13.3 for information on 'Percentage Timer' mode and suggestions on how to set the 'Temperature Tolerance' settings for that mode.

Leaving these fields set to '0' instructs the system to ignore the 'Temperature Tolerance' settings, and not draw these tolerances on the chart. This can be problematic, since if left at '0', the system will fail to register/be extremely slow to register that a channel' temperature isn't rising in accordance with the 'Ramp Rate'. Such as in the event of a shorted thermocouple connection causing a perpetually ambient temperature reading. This will result in the channel constantly calling for power, until an operator physically observes that the channel temperature is not rising, most likely resulting in the channel far exceeding the temperature programmed by the operator.

Such overheats can damage the workpiece resulting in 'Cut-Out' or 'Scrap' scenarios that incur heavy financial cost to repair. It is best to always program a value into these fields even if your material does not specify failure tolerances. Use your best judgement, depending on your ramp rate, properly decide what these values should be in this instance.

Contactor Use Count: This information field displays the number of times the HEAT VIEW Controller has closed the contactor in the heat treatment console associated with that channel. The system is pre-set to generate a 'Contactor Usage Warning' fault to notify the operator when a channel's contactor has reached 90% of its manufacturer specified life cycle.

The 'Contactor Usage Warning' fault will appear each time the controller is powered on and can be cleared by an operator in the 'Error List/Fault' window, until the next time the controller is power cycled. Once this count reaches 100% of the manufacturers specified life cycle, the fault generated will change to 'CONTACTOR OVER USED' and can only be muted, not cleared by an operator. Once this fault has occurred, the contactor must be replaced, and the 'Contactor Use Count' reset to 0 by a Supervisor.

PLEASE NOTE: If using a portable HEAT VIEW Controller and not a console with the HEAT VIEW Control System built in, whenever practicable, it is best to designate a console as always being channels 1-6, 7-12, etc. That way the 'Contactor Use Count' accurately reflects the actual number of cycles on a contactor.

Maximum Channel Temperature: This feature is a failsafe feature for critical path work where any form of an overheat scenario can result in costly repairs. If this field has been programmed in a channel' settings, exceeding this value will cause the controller to trip the shunt associated with that machine. This includes the temperature of all channels in a 'Master-Slave' configuration (including monitors), and channels of 'Control + Backup TC' configuration. It is highly recommended that the HEAT VIEW controller is not plugged directly into the heat treatment console, if using a portable controller, so that it does not also lose power in the event the shunt trips due to this setting.

Mode Settings/Parameters: Once you have selected a 'Mode', the settings or parameters and options associated with that mode will appear in this section of the 'Channel Settings' window. These 'Mode' specific items are discussed in detail further on in Section 12.

Channel Name: As discussed in Section 8.4.1, this is where an operator can choose to give each channel a unique name that will appear in the chart in both the 'Chart' view and 'Report' window. It is best to avoid special characters when creating channel names such as `~!@$^*/ \ as an example. However, dashes (-) underscores (_) hashtags (**#**) and ampersands (**&**) are okay to use freely. Channel names can be changed freely until the heat cycle naturally ends or is 'Stopped' by the operator. Once the channel(s) transition to a 'Stopped' state, the channel name is locked and stored 'as-is' in the 'Database'.

PLEASE NOTE: The user defined 'Channel Name' is a persistent setting, meaning it does not automatically clear after each heat cycle. It is important that the operator edits or removes the custom name between heat cycles. Failure to do so will result in an incorrect channel name being saved to the 'Database'. This can be corrected in the 'Report' window, but only if changed via a 'Supervisor' settings access level.

Output Test: This feature enables an operator to verify output functionality of a channel as well as the validity of the thermocouple reading, without having to 'Start' & 'Stop' the channel for a few seconds, thereby creating a tiny 'Database' entry of a heat cycle having been run. In this field there are 3 points of interest, the 'TURN ON' button, a 'Current' reading field as well as a 'Temperature' reading field. Once activated, this will close the contactor for only the associated channel for 15-20 seconds allowing the operator to observe the channels output amperage and thermocouple reading and then automatically deactivate itself so that overheating cannot occur. You DO NOT need to have a thermocouple reading to engage this test, so it can be used to verify power functionality only if so desired.

TURN ON: Clicking this button engages the channel test function, closing the contactor for the associated channel. Once activated this button will change to a 'Running' button and automatically change back to 'TURN ON' once the test completes. If at any point the operator wishes to abort the test, they can click the 'Running' button and the contactor will disengage, stopping power output and ending the test.

Current: This field is where the power output, measured in amps, will appear if the circuit to the heating pads is connected correctly enabling the operator to quickly visually confirm that the right number of pads are connected to the circuit. General rule of thumb being 40-45 amps extra per additional pad. Though it is not uncommon to see values that are +/- 5-10 amps per pad. The operator should only have cause for concern if they see values greater than 20-25 amps difference from what they expect to appear here.

Temperature: If there is thermocouple connected, its reading will appear in this field. During/shortly following the test the temperature reading should rise by a few degrees. If it does not, attempt the test once more. If you still do not see the temperature reading rise after a second test, and you had a valid 'Current' reading for the channel, the thermocouple is either shorted, or plugged into the wrong port of the controller.

Prev/Next Channel Buttons: These two buttons allow the operator to quickly page forward and backward sequentially through the 'Channel Settings' windows without having to close and re-open the 'Channel Settings' window for multiple channels, multiple times. Clicking these buttons automatically applies any changes the operator made to a channel' settings as it transitions to the next channel in the sequence.

If you rapidly change back and forth between channels via these buttons you may see data and settings, you already changed show as they were prior to your change. This is simply caused by a delay between the controller accepting the new settings and communicating that acceptance back to the computer application. Closing and re-opening the window will show the settings were properly applied and do not need to be readjusted.

Ok/Cancel Buttons: as discussed in multiple previous sections, clicking 'Ok' will apply any changes you made and close the window, whereas clicking 'Cancel' will revert any changes you made and close the window. The 'Prev/Next Channel' buttons also apply any changes made to a channel as discussed above.

12.1.1 Universal Master Channel Settings – Supervisor Level

There are a few additional items availble to a channels settings if you are logged in as a supervisor. These additional items are as follows:

Output channel: The checkbox when selected will enable the channel to put power out to the work piece. If this checkbox is not selected then the channel will only record temperature while 'running'.

Machine Number: This is the machine number the channel is part of. The number is used when deciding which shunt trip to through if the fault is severe enough. It corresponds to the shunt trip number in the application settings screen.

Reset Contactor Count (button): This button will reset the contactor usage count to 0. If the fault ever occurs where the contactor usage is too high, replace the contactor and then press this button.

Maximum channel temperature: This is the maximum allowable temperature a channel can get to before faulting out whether the operator set it to run hotter than this or not.

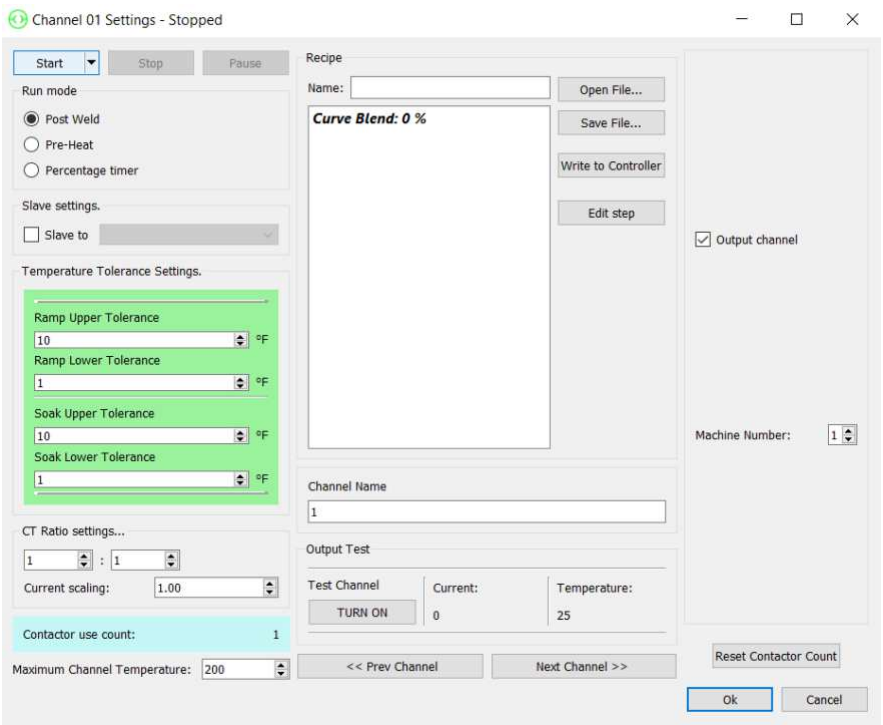


Figure 90: Channel settings while logged in as supervisor

12.2 Post-Weld Mode Channel Settings

The 'Recipe' zone and associated controls specific to the 'Channel Settings' window when a channel is set to 'Post-Weld' mode are highlighted in Figure 91 below and discussed in greater detail.

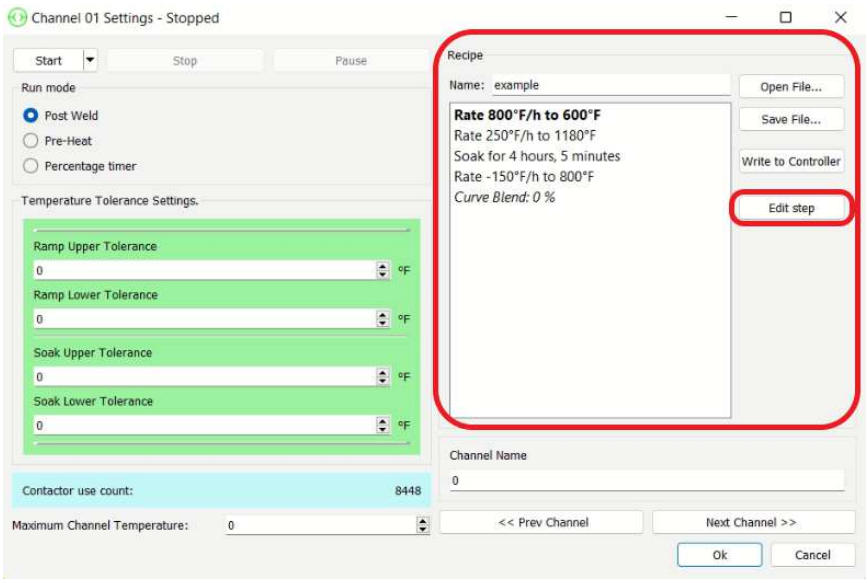


Figure 91: Channel Settings Window – Post-Weld Mode Settings

Recipe: This section of the settings highlighted above, is where an operator will find the details about the recipe they've created – the recipe name and steps involved – and written to a channel using the steps outlined in Sections 11.1 & 11.1.1. This section also contains 4 buttons, 3 of which – 'Open File…', 'Save File…' and 'Write to Controller' – their function being near identical as described Section 11, and the fourth described below. The exact function of these buttons as they apply and can be used in this menu will be outlined in Section 13.1.

Edit Step: This button allows an operator to edit the 'Recipe' that has been written to the channel both while 'Stopped' and while the channel is 'Running'. This enables the operator to make on the fly adjustments to their heat cycle should they need to. Editing a recipe step from the 'Channel Settings' window is covered in Section 13.1.2. To edit a step, you first need to select the step in this window and then click on the edit step button to edit it. It will bring up a small dialog box to allow you to change the step values.

12.3 Pre-Heat Mode Channel Settings

The 'Pre-Heat settings' zone and associated fields specific to the 'Channel Settings' window when a channel is set to 'Pre-Heat' mode are highlighted in Figure 92 below and discussed in greater detail.

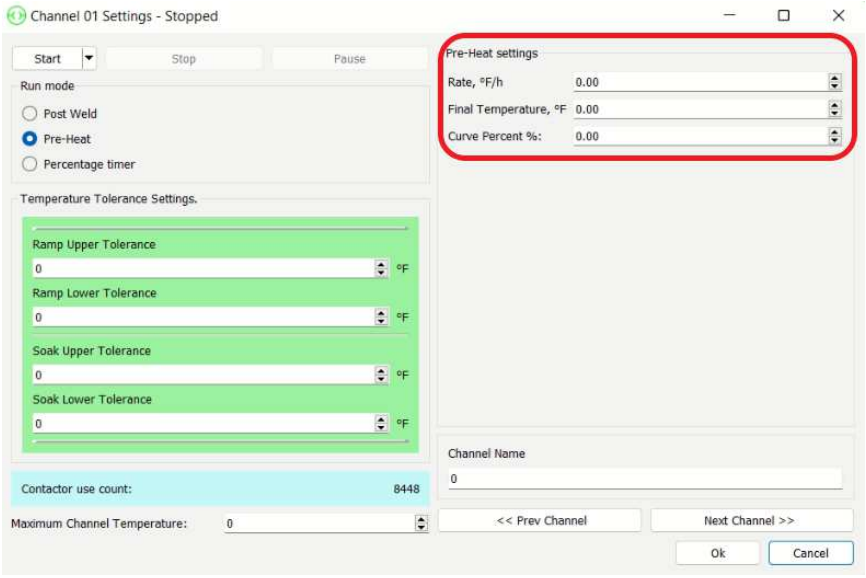


Figure 92: Channel Settings Window – Pre-Heat Mode Settings

Rate, °/H: Depending on what temperature format your controller is configured and calibrated for, this field may appear as '°F/h' or '°C/h'. This is where an operator designates the rate at which they would like their 'Pre-Heat' cycle to rise in temperature.

Final Temperature, °X: Depending on what temperature format your controller is configured and calibrated for (where 'X' is the temperature format) may appear as '°F' or '°C'. This field is where an operator enters the 'Soak' or 'Hold' temperature for their 'Pre-Heat' Cycle.

Curve Percent %: Or 'Corner Rounding Percent' as was previously discussed in section 11.1.2 allows the operator to slow the system down as it transitions between the 'Ramp' and 'Soak/Hold' steps of a heat cycle in the event there are concerns about the cycle overshooting the 'Final Temperature'. This version of the setting is not a slider and does not include a preview of what the cycle will look like. The operator can choose any value between 0-100% rounding based on their level of concern. When in doubt, remember that some round is better than none.

12.4 Percentage Timer Mode Channel Setting

The 'Percentage timer' zone and associated function specific to the 'Channel Settings' window when a channel is set to 'Percentage Timer' mode is highlighted in Figure 93 below and explained in further detail.

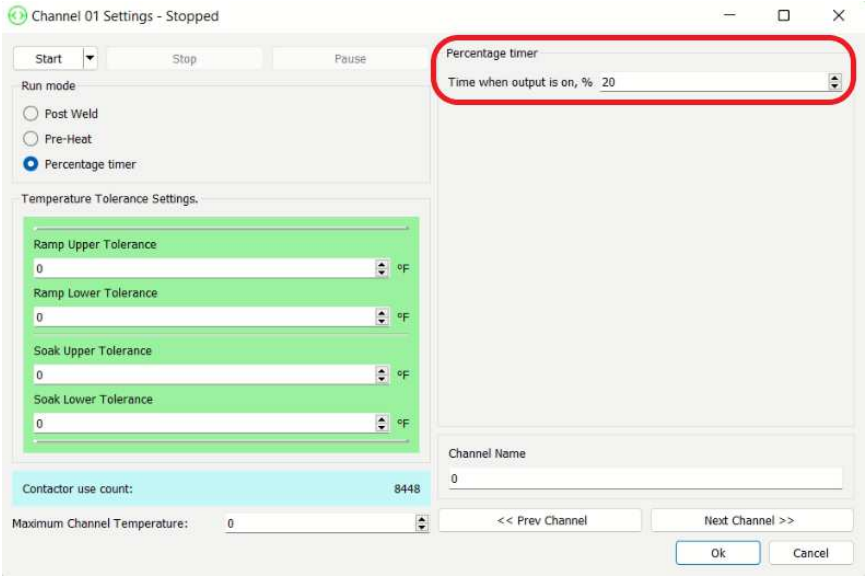


Figure 93: Channel Settings Window – Percentage Timer Mode Settings

Time when output is on, %: This is the only field associated with the 'Percentage Timer' mode. The operator can choose a value between 0-90% (all channels, no matter which mode they are set to, are limited to 90% maximum output). Once started, the channel will run for the user defined percentage of the output timer. This is explored further in Section 13.2.1.

12.5 Universal Slave Channel Settings

A 'Slave' channel' settings window differs only slightly from a 'Master' channel'. The key difference being that the 'Run Mode' Section disappears entirely from the window and the 'Run Mode' parameters that appear in the right side of the window now appear greyed out and locked. Figure 94 on the next page is an example of how this window may appear.

These parameters will now read the same as they appear in the 'Master' Channel' settings. All other options – 'Temperature Tolerances', 'Channel Name', 'Test Channel' – should be the same as a master save for one. The 'Slave to' box should be check marked and the channel number of its 'Master' should be locked in the field to the right of it.

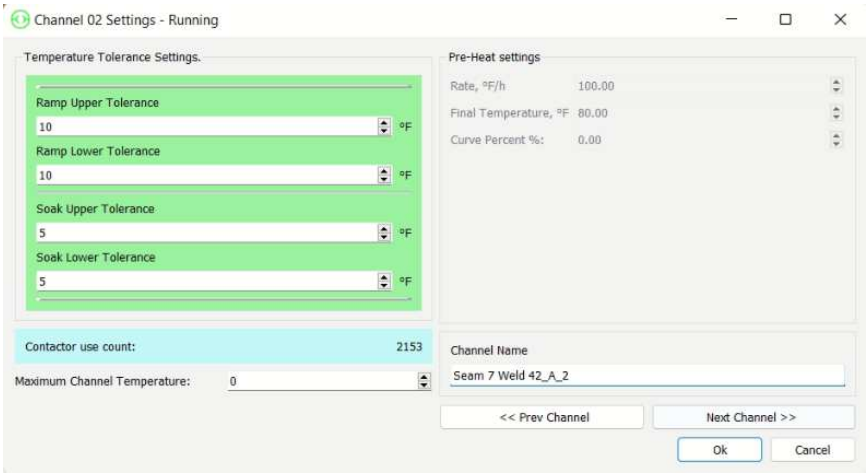


Figure 94: Channel Settings Window – Universal Slave Channel Settings

13 Channels and Modes – Setup & Control

With 3 uniquely different 'Run Modes' and the ability to configure channels to work together in multiple ways such as 'Master-Slave configurations, or allocating additional thermocouples to a channel as backups, the HEAT VIEW Controller can be rapidly adapted to the requirements and parameters of the heat cycles they need to perform and control heat cycles in a variety of highly versatile ways that other more traditional temperature controllers cannot. These modes and features are detailed in the sections below.

13.1 Post-Weld Mode

'Post-Weld' mode is used when performing post-weld, stress relieving heat treatment of a workpiece. Stress relief heat cycles do exactly as their name suggests, they relieve the 'Stress' or misalignment of molecules caused by the rapid injection of heat into a material while welding. This 'Stress' causes the material to become hard and brittle, leading to failure if not properly rectified. Running this type of cycle in accordance with the established parameters for the material being treated, will realign the molecules that were affected by the welding process and strengthen the material, eliminating any brittleness if performed to proper specification.

To accomplish this, the material must be heated or 'Ramped' at a specific rate or rates, to within pre-determined tolerance of a precise temperature, then held or 'Soaked' at that temperature for a pre-determined amount of time; usually based on the type and thickness of the material being treated. The parameters may also require that following the 'Soak', the material be brought down in temperature or 'Cooled' at a specific rate to specific temperature.

This mode automates the control and transitions between 'Ramp' and 'Soak' phases using an operator defined collection of steps called 'Recipes' so that an operator does not have to manually adjust the controller at specific stages throughout the cycle. Details on 'Recipes', their steps, and how to create and apply them to a channel can be found in Section 11 'The Recipe Editor' on page 74.

Once a channel or group of channels setup to run in 'Post-Weld' mode have been started by the operator and are 'Running', the cycle will automatically begin progressing the cycle as laid out in the 'Recipe'. It is important to program the 'Temperature Tolerance' settings found in the 'Channel Settings' window (Section 12) of the master before starting the cycle since the 'Soak' timer will not start until all channels in the group are at 'Soak' temperature or within the allowable tolerance, if a channel or multiple channels are struggling for some reason.

It is common practice to stress relieve batches of workpieces using a 'Master-Slave' configuration to make one consolidated chart for all pieces in the batch. In this scenario, naming the cycle with the batch number, and each thermocouple in the 'Master-Slave' configuration with the Serial Number of workpieces associated to that channels thermocouple, is highly recommended for record keeping purposes.

13.1.1 Post-Weld Setup & Control

The steps for programming a channel to run in 'Post Weld' mode are as follows:

1. Using one of the methods outlined in Section 11, create or load a recipe in the 'Recipe Editor' window.
2. Once you are satisfied the recipe is correct, 'Write' the 'Recipe' to whichever channel will be the 'Master' channel for the cycle.
3. Navigate to the 'Channel Settings' window for the 'Master' channel you wrote the 'Recipe' to. Once there, change the 'Run Mode' of the channel to 'Post-Weld' mode by clicking either the radio button beside, or directly on the text for the name of the mode, in the list of modes available.
4. Verify that the 'Recipe' you've chosen now appears in the right portion of the 'Channel Settings' window and that the steps match those of the recipe you've written to the channel.
5. Program the positive and negative 'Temperature Tolerance' settings with the allowable deviation/tolerance parameters for the material you will be treating.
6. Close the 'Channel Settings' window using the 'Ok' button to apply your settings.
7. On the Main Screen, while in either the 'Detailed, 6-Channel' or 'Chart' view, use the 'Multi Slave Sel.' button to add any other channels you will be using as 'Slave' channels.
8. Verify that all the selected channels now indicate that they are in a 'Slaved' to the 'Master' Channel.
9. Return to the 'Channel Settings' window for each channel and name the channels with data relevant to each thermocouple or workpiece if applicable.
10. Using the 'Test Channel' function (Section 12.1) verify that each channel in the configuration shows the proper 'Current' (amps) for the number of pads used, as well as a valid thermocouple reading that increased by a degree or two over the period of the test.
11. Once all these conditions have been met, and you are satisfied everything is programmed and connected properly, use the 'Start' button in either the 'Detailed, 6-Channel' or 'Chart' view or from within the 'Channel Settings' window of the 'Master' channel to start the cycle and transition it from 'Stopped' to 'Running'. This starts the charting/recording of data and generates an entry in the 'Database'.
12. From either the 'Detailed, 6-Channel' or 'Chart' view, give the heat cycle a unique or serialized name using the 'Name Cycle' button. This name is how the cycle will appear in the list of completed cycles when viewing the 'Database' in the 'Report' window to generate a PDF report.
13. The cycle will run in accordance with the parameters defined in the 'Recipe'. Once the recipe has completed all the steps, the cycle will automatically end without the user having to press 'Stop' and store all of the relevant data about the cycle in the 'Database'. An operator can also choose to manually 'Stop' the cycle at any point if they wish. Just note that once a cycle name has been used, it cannot be re-used.

13.1.2 Loading or Editing a Recipe from the Channel Settings

As an alternative to the 'Recipe Editor' window, an operator can choose to load a 'Recipe' they have saved previously and write it to the channel directly from within the 'Channel Settings' window while a channel is set to 'Post-Weld' mode. This is accomplished the same way as in Section 11.5, where an operator uses the 'Open File' button, selects the recipe they want that is already saved to their computer, and clicks 'Open' to import the 'Recipe' data into the application.

Once loaded, it will appear in the 'Channel Settings' window on the right-hand side under 'Recipe'. Here the operator can choose to 'Write' it to the channel the same way they did in Section 11.2. The only difference being, there will not be a pop-up window asking which channel to write it to, it will only be written to the channel in question. Alternatively, or in addition to this they can also load a saved 'Recipe' with values similar to what they need, and then by selecting a step in the list and clicking on the 'Edit Step' button – highlighted in Figure 91 on page 89 – they can adjust the values for the selected step in the 'Recipe step editor' window that appeared – Figure 95 below. They can also rename the recipe at the top of this section if they wish.

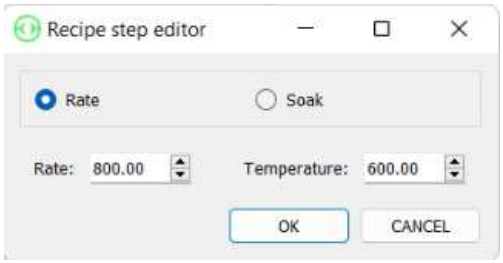


Figure 95: Post-Weld Mode - 'Recipe Step Editor' window

Once the step(s) and or name of a recipe have been edited, the operator can choose to save it to their computer using the 'Save File' button and following the steps outlined previously in Section 11.4 and/or or apply it to the channel using the 'Write to Controller' button. Ensure you've saved or written the recipe to the channel before closing out of the 'Channel Settings' window as any changes made to the recipe are not saved or applied otherwise with only 1 exception.

The 'Edit Step' button also allows an operator to adjust recipe steps while a channel is running in the event a step was programmed incorrectly or the 'Soak' timer needs to be increased/decreased. This accomplished via the same process as before, only in this instance, with the channel 'Running', you do not need to click 'Write to Controller' as any changes made will immediately take effect.

13.1.3 Manually Changing the Current Step

Should the need ever arise, an operator can choose to force the cycle to move forward or backwards a step in the 'Recipe' while the channel or group of channels is 'Running'. The active step is the one that appears in the list in **bold** font. This is accomplished via the 'Previous Step' and 'Next Step' buttons that appear in the 'Channel Settings' window once a channel in 'Post-Weld' mode has been started. The **bold** current step and 'Previous/Next Step' buttons are highlighted in Figure 96 on the next page.

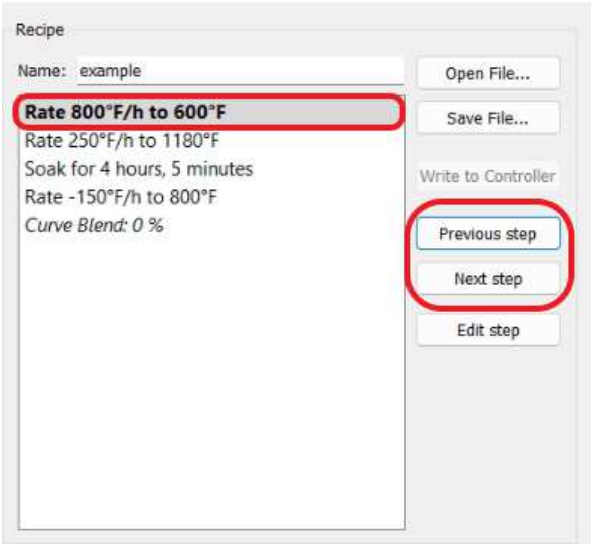


Figure 96: Post-Weld Mode – Manually Changing the Current Step

Once either the 'Previous Step' or 'Next Step' button has been pressed, the system will take a moment or two to readjust, and then the step that is now the new 'Current Step' will be **bolded** in the list of steps as shown in Figure 97. Simultaneously the operator will notice that the 'Set Point' or 'Soak Timer' has changed in response to this input and the system is resuming the cycle from the newly selected step.

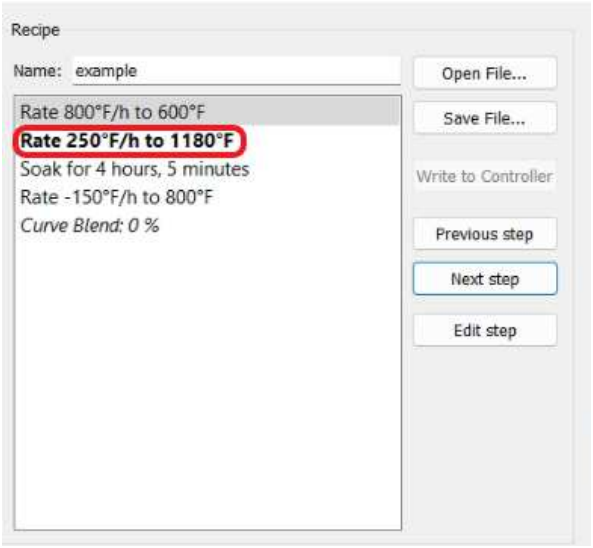


Figure 97: Post Weld Mode – Current Step Changed

13.2 Pre-Heat Mode

'Pre-Heat' mode is used when it is necessary to bring a workpiece up to a specific temperature before welding commences on it. This 'Pre-Heating' of the material causes less misaligning of molecules as heat is rapidly introduced to the workpiece during welding and enables the welder to apply a better, deeper rooting, weld to the workpiece, resulting in stronger, less porous welds.

Depending on the application of the workpiece being heat treated, it may also need to undergo a post-weld stress relieving heat cycle before it is considered complete.

In 'Pre-Heat' mode a channel or group of channels will rise in temperature at the rate defined by the operator in the 'Rate, °X/h' field and then remain at the temperature entered in the 'Final Temperature, °X' field (where X is either Celsius or Fahrenheit depending on your configuration) until the channel is manually 'Stopped' by the operator upon completion of the work. In terms of this manual the 'Rate, °X/h' is considered the 'Ramp' Step of this mode while the 'Final Temperature, °X' is considered 'Soak' step. The operator can also opt to add 'Corner Rounding' (Section 11.1.2) via the 'Curve Percent, %' field to have the system slow its ramp rate as it transitions between the 'Ramp' and 'Soak' Steps so that the system does not overshoot the final temperature setpoint.

Curve percentage in 'Pre-Heat' mode is not an exact science, and my require a bit of experimentation to find just how much or how little benefits your application or material. If overshooting the final setpoint is not of concern, then do not adjust this field. Where overshooting the Final Temperature is of concern, the operator must use their best judgement as to how critical it is that the system does not surpass the final temperature. Best practice with 'Corner Rounding' is that a little is better than none and a lot will definitely help prevent overshooting, however the more rounding added, the longer the time to will be to reach the 'Final Temperature' or 'Soak' step.

13.2.1 Pre-Heat Mode Setup & Control

The steps for programming a channel to run in 'Pre-Heat' mode are as follows:

1. Navigate to the 'Channel Settings' window for the 'Master' channel you will be using for this cycle. Once there, change the 'Run Mode' of the channel to 'Pre-Heat' mode by clicking either the radio button beside the mode name, or directly on the text for the name of the mode, in the list of modes available.
2. In the 'Pre-Heat Settings' portion of the 'Channel Settings' window that appeared on the right-hand side, input the ramp rate and final temperature parameters required for your cycle and add 'Corner Rounding' via the 'Curve Percentage' field if warranted.
3. Program the positive and negative 'Temperature Tolerance' settings. These settings are less stringent during a 'Pre-Heat'. Some values are always better than no values so that the system alerts of any temperature related problems. Common practice is to set the 'Soak Upper Tolerance' to the allowable Inter-Pass temperature so the channel will generate a fault as well as an audible alarm so an operator can notify a welder he needs to stop until the temperature falls back below Inter-pass.
4. Close the 'Channel Settings' window using the 'Ok' button to apply your settings.
5. On the Main Screen, while in either the 'Detailed, 6-Channel' or 'Chart' view, use the 'Multi Slave Sel.' button to add any other channels you will be using as 'Slave' channels.
6. Verify that all of the selected channels now indicate that they are in a 'Slaved' to the 'Master' Channel.
7. Return to the 'Channel Settings' window for each channel and name the channels with data relevant to each thermocouple or workpiece if applicable.

8. Using the 'Test Channel' function (Section 12.1) verify that each channel in the configuration shows the proper 'Current' (amps) for the number of pads used, as well as a valid thermocouple reading that increased by a degree or two over the period of the test.
9. Once all these conditions have been met, and you are satisfied everything is programmed and connected properly, use the 'Start' button in either the 'Detailed, 6-Channel' or 'Chart' view or from within the 'Channel Settings' window of the 'Master' channel to start the cycle and transition it from 'Stopped' to 'Running'. This starts the charting/recording of data and generates an entry in the 'Database'.
10. From either the 'Detailed, 6-Channel' or 'Chart' view, give the heat cycle a unique or serialized name using the 'Name Cycle' button. This name is how the cycle will appear in the list of completed cycles when viewing the 'Database' in the 'Report' window to generate a PDF report.
11. The cycle will run indefinitely, maintaining the user defined 'Soak' Temperature until manually 'Stopped' by an operator once the welding procedure has been completed. Once 'Stopped' the application will finish storing all of the relevant data about the cycle in the 'Database'. Just note that once a cycle name has been used, it cannot be re-used.

The 'Ramp' rate, 'Soak' temperature, and amount of 'Corner Rounding' can be adjusted by the operator at any time while the cycle is running without having to 'Stop' or 'Pause' the channel(s).

13.3 Percentage Timer Mode

'Percentage Timer' mode increases the temperature of a channel not via a user defined 'Ramp' rate to an exact 'Soak' temperature, but to whatever temperature may be achieved by outputting only a specific, pre-set, amount of power and never more than that.

The HEAT VIEW Controller increases temperature in all modes by closing the contactor for up to 90% of the pulse timer. In 'Post-Weld' and 'Pre-Heat' this equates to the system automatically determining how long to hold the contactor closed each time it is engaged based on the process data it receives from the control thermocouple. As an example to make things simpler, if the pulse timer that held the contactor closed was set to 10 seconds, and the system was calling for 50% power, the contactor would cycle closed for 5 seconds or 50% of the timers 100% value and then open for 5 seconds.

Because HEAT VIEW Controllers are limited from factory to 90% maximum output, in the above example, the longest pulse cycle would be 9 seconds closed, 1 second open, followed by another 9 seconds closed if the next call for power was also at 90%. The longer a contactor is closed, the longer a heating pad will receive power, and by extension, the more heat generated and transferred to the workpiece.

'Percentage Timer' mode gives the operator control over this pulse timer, enabling them to choose how long the contactor closes for. The percentage of power directly correlates to the amount of heat that can possibly be generated. So if the system was set to 10% for example (contactor = 1 second closed, 9 seconds open if related to the previous example) and left to run, it would eventually reach a temperature (near impossible to predict precisely but relatively low) and remain at that temperature indefinitely, due to no additional power being called for, meaning no additional heat being added above and beyond what was capable of being generated by engaging the contactor for only 1 second with a 9 second interlude.

13.3.1 Percentage Timer Mode Setup & Control

The steps for programming a channel to run in 'Percentage Timer' mode are as follows:

1. Navigate to the 'Channel Settings' window for the 'Master' channel you will be using for this cycle. Once there, change the 'Run Mode' of the channel to 'Percentage Timer' mode by clicking either the radio button beside the mode name, or directly on the text for the name of the mode, in the list of modes available.
2. In the 'Percentage Mode' portion of the 'Channel Settings' window that appeared on the right-hand side, input a number between 1-90 to set the output power of the channel(s).
3. Program the 'Upper/Lower Ramp Tolerance' settings so that the system will notify you of problems such as a shorted thermocouple causing the temperature to not rise. Otherwise leave all tolerance fields set to '0' to ignore these settings. The system will not be able to output more than the defined amount of power, therefore eliminating any overshoot potential caused by a shorted thermocouple.
4. Close the 'Channel Settings' window using the 'Ok' button to apply your settings.
5. On the Main Screen, while in either the 'Detailed, 6-Channel' or 'Chart' view, use the 'Multi Slave Sel.' button to add any other channels you will be using as 'Slave' channels.
6. Verify that all the selected channels now indicate that they are in a 'Slaved' to the 'Master' Channel.
7. Return to the 'Channel Settings' window for each channel and name the channels with data relevant to each thermocouple or workpiece if applicable.
8. Using the 'Test Channel' function (Section 12.1) verify that each channel in the configuration shows the proper 'Current' (amps) for the number of pads used, as well as a valid thermocouple reading that increased by a degree or two over the period of the test.
9. Once all these conditions have been met, and you are satisfied everything is programmed and connected properly, use the 'Start' button in either the 'Detailed, 6-Channel' or 'Chart' view or from within the 'Channel Settings' window of the 'Master' channel to start the cycle and transition it from 'Stopped' to 'Running'. This starts the charting/recording of data and generates an entry in the 'Database'.
10. From either the 'Detailed, 6-Channel' or 'Chart' view, give the heat cycle a unique or serialized name using the 'Name Cycle' button. This name is how the cycle will appear in the list of completed cycles when viewing the 'Database' in the 'Report' window to generate a PDF report.
11. The cycle will run indefinitely, only ever outputting the programmed amount of power until manually 'Stopped' by an operator. Once 'Stopped' the application will finish storing all the relevant data about the cycle in the 'Database'. Just note that once a cycle name has been used, it cannot be re-used.

The output percentage can be adjusted by the operator at any time while the cycle is running without having to 'Stop' or 'Pause' the channel(s).

13.4 Master-Slave Channel Configurations

By default, every single channel of the HEAT VIEW Controller is considered a ‘Master’ channel and can therefore be considered an independent controller capable of running in any mode, being started, and stopped individually; essentially running their own heat cycles independent of one another.

However, it can be extremely beneficial and at times completely necessary to group several channels together into a seamless cohesive whole. This is possible through ‘Master-Slave’ configurations where a normally independent ‘Master’ channel (with no other slaves assigned to it) can be converted to a ‘Slave’ channel.

‘Slave’ channels do not act independently, instead, they follow the exact cycle parameters provided to them by their ‘Master’ channel. This enables an operator to spend far less time performing the setup of their heat cycle, since they only need to apply parameters (aside from individual channel names) to the ‘Master’ channel and then select the number of channels to run in unison with it.

There are two methods to allocate channels as ‘Slaves’ and each serve their own purpose.

13.4.1 Adding/Removing Slaves – Multi Slave Select Method

When a ‘Master’ channel is in ‘Stopped’ state, the ‘Multi Slave Sel.’ button is available as shown and discussed in Section 8.4.4. Clicking the ‘Multi Slave Sel.’ button will open the ‘Multiple Slave Selection’ window shown in Figure 98 below. This method of adding/removing slaves is the fastest when making large configuration changes between cycles.

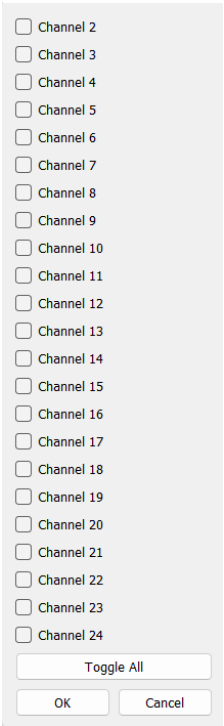


Figure 98: Adding/Removing Slaves - Multiple Slave Selection Window

1. While in either the 'Detailed, 6-Channel' or 'Chart' views, click the 'Multi Slave Sel.' button to open the 'Multiple Slave Selection' window.
2. Click on the checkbox(es) of the channel(s) you wish to add/remove to/from the 'Master' Channel. Deselecting the checkbox will convert an allocated 'Slave' channel back to a 'Master channel. Selecting the checkbox next to an available 'Master' channel in the list will convert that channel to a 'Slave' channel and allocate it to run in unison with the channel you're performing this configuration for

PLEASE NOTE: Only available channels can be added to a master and will appear in the 'Multiple Slave Selection' window alongside any channels already assigned to the 'Master' channel being configured. A channel is only marked available in this window if it is currently a 'Master' channel with no 'Slave' channels allocated to it. If you do not see the channel you are looking to add in the list, first remove it from its previous 'Master-Slave' configuration then try again.

3. If you wish to quickly remove all currently configured 'Slaves' channels from the channel, click the 'Toggle All' button to select all available channels and then press the 'Toggle All' button a second time to de-select all currently selected channels.
4. Once you have added or removed the channels required, press the 'OK' button to apply the changes.

At any time if you don't want to apply the changes you've made in this menu, simply click the 'Cancel' button to undo all current unapplied changes and exit the menu.

13.4.2 Adding/Removing Slaves – Channel Settings Method

Sometimes it is necessary to add/remove 'Slave' channels from an 'Master-Slave' configuration while a heat cycle is running, such as in the event of a thermocouple or contactor failing beyond repair. An operator has two choices when using this method, depending on the scenario they are facing.

They can choose to completely remove a problematic 'Slave' channel from the configuration, resuming the cycle and allowing the rest of the channels to finish the heat cycle, if are heat treating multiple individual workpieces as part of a batch; where a failed item could be added to the next batch easily enough.

Alternatively, they can remove the problematic channel and substitute a properly functioning channel in it's place, effectively replacing it in the 'Master-Slave' configuration. This may be necessary in the event an output on the heat treatment console fails for one of many potential reasons, resulting in the operator having to hook the thermocouple and power leads to an alternate channel to complete the cycle.

This is accomplished via the 'Slave To' setting in the 'Channel Settings' menu as was highlighted in Figure 89 on page 84 in Section 12.1. The following steps will cover how to add and remove an individual channel from a 'Master-Slave' configuration while it is 'Running'.

If the 'Master' Channel is the one experiencing issues, please jump ahead to Section 13.4.3, completing the steps outlined there before returning to this section.

1. Navigate to the ‘Channel Settings’ window of the ‘Slave’ channel that needs to be removed from the configuration.
2. De-Select the checkbox next to the ‘Slave To X’ field (where X denotes the channel number of the ‘Master’ channel)
3. Press the ‘Ok’ button at the bottom of the ‘Channel Settings’ window to apply this change.
4. If adding a replacement ‘Slave’ channel to the configuration, transfer the thermocouple and power lead wires to an available channel on the heat treatment console.
5. Navigate to the ‘Channel Settings’ window for the channel associated with where you transferred the power and thermocouple leads.
6. Select the empty checkbox next to ‘Slave To’ and in the now available drop-down menu, find and select the correct master from the list.
7. Press the ‘Ok’ button to convert the available ‘Master’ channel to a ‘Slave’ channel, adding it to the current ‘Master-Slave’ configuration.
8. Clear any faults that occurred as a result of the problematic channel and click the ‘Resume’ button to have the entire group of channels continue the heat cycle.

13.4.3 Promoting a Slave Channel to a Master Channel

When a ‘Master’ channel in a ‘Master-Slave’ configuration is the channel experiencing problems that the operator is not able to quickly and easily resolve and needs to be either removed or replaced, there few extra steps that must be performed before those in Section 13.4.2. This is possible via the ‘Make Master’ button highlighted in Figure 99 below. This button only appears in the ‘Menu & Control Buttons’ zone of ‘Slave’ channels while in the ‘Detailed, 6-Channel’ or ‘Chart’ view and is not available from the ‘Summary’ View. The steps are as follows:

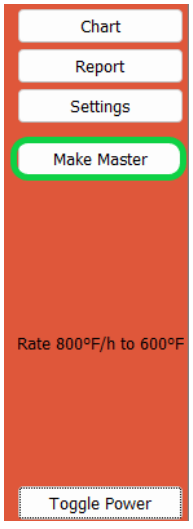


Figure 99: Master-Slave Channel Configurations - 'Make Master' button

1. Choose a properly functioning ‘Slave’ channel, with a valid thermocouple reading, that is configured to the current ‘Master’ channel that is experiencing issues.
2. Click the ‘Make Master’ button on this channel to promote it to the ‘Master’ Channel.

3. Wait while the system automatically makes all the necessary configuration changes. The system may not respond for several seconds as it performs these actions. Once complete, the 'Slave' channel that was promoted will now be the 'Master' channel for the entire 'Master-Slave' configuration and all other channels (including the old 'Master' channel) will now show that they are 'Slaved To X' – where X denotes the channel number of the newly promoted 'Master'.
4. Return to and complete the steps outlined in Section 13.4.2 above to remove the problematic channel completely or replace it with a properly functioning one.

13.5 Multi-Thermocouple Control Configurations

Should the operator ever encounter a scenario where success is of the utmost importance, and/or there is little to no access to a workpiece once the cycle has been started (such as in a nuclear facility) they can opt to allocate control thermocouples from one or more other channels as backup control thermocouples or 'Backup TC's' for a channel.

When channels are configured with 'Backup TC's' in 'Multi-Thermocouple Control' configurations, they behave differently in response to 'Thermocouple Unplugged' faults. Normally in single thermocouple control or 'Master-Slave' configurations when a thermocouple goes open and generates a fault, the individual or group of channels transition from a 'Running' state to a 'Paused' state.

That however is not the case in 'Multi-Thermocouple Control' configurations. In these instances, the system selects the hottest thermocouple reading from amongst all allocated to a channel and uses that reading as the control thermocouple reading while the process is running. The system will automatically transition to whichever thermocouple is hottest should this change at any point during the heat cycle.

Because of this, if the system detects that a thermocouple has failed, come unplugged or is 'Open' for any reason thus generating the 'Thermocouple Unplugged' fault, the channel will still turn red, and the alarm will sound, notifying the operator that one of the thermocouples allocated to the channel has experienced a problem. However, the cycle will continue in a 'Running' state towards its defined completion parameters instead of being transitioned to a 'Paused' state, temporarily halting the cycle.

Only when all thermocouples allocated to a channel in a 'Multi-Thermocouple Control' configuration simultaneously experience this fault, and no temperature data is being transmitted to the controller, will the system transition the channel to a 'Paused' state requiring the operator to intervene and affect repairs to clear the faults and be able to 'Resume' the cycle.

Once configured, these 'Backup TC's appear in the 'Process Control Information' zone of both the 'Detailed, 6-channel' and 'Chart' views of the 'Main Screen' – as highlighted in Figure 100 on the next page – but not in the 'Summary' view.

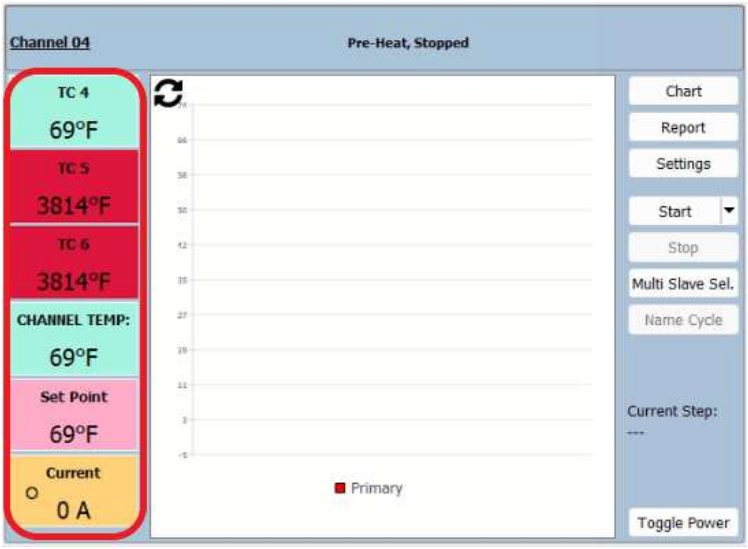


Figure 100: Multi-Thermocouple Control – Process Control Information Zone

Channel's that have been allocated to another as 'Backup TC's will change their background appearance to black and only have the 'Report' and 'Toggle Power' buttons accessible since these channels are no longer an independently recognized control channel. An example of this is shown in Figure 101 below.

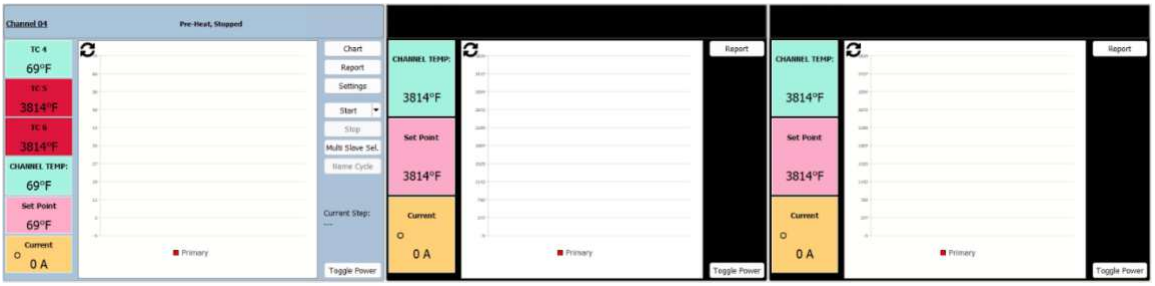


Figure 101: Multi-Thermocouple Control - Allocated Thermocouple Color Change

13.5.1 Allocating Backup Control Thermocouples

To allocate channels as 'Backup TC's' follow the steps outlined below.

1. Open the 'System Settings' window.
2. Click the 'Login' button.
3. Enter either your operator or supervisor level credentials to enable the 'Advanced Settings' options.
4. Close the 'Advanced Settings' window that automatically opens upon successfully entering your credentials.
5. In the modified 'System Settings' window that has appeared, next to 'Setup Thermocouple Allocations' click the 'TC Setup' button to open the 'Thermocouple Setup' window shown in Figure 102 on the next page.

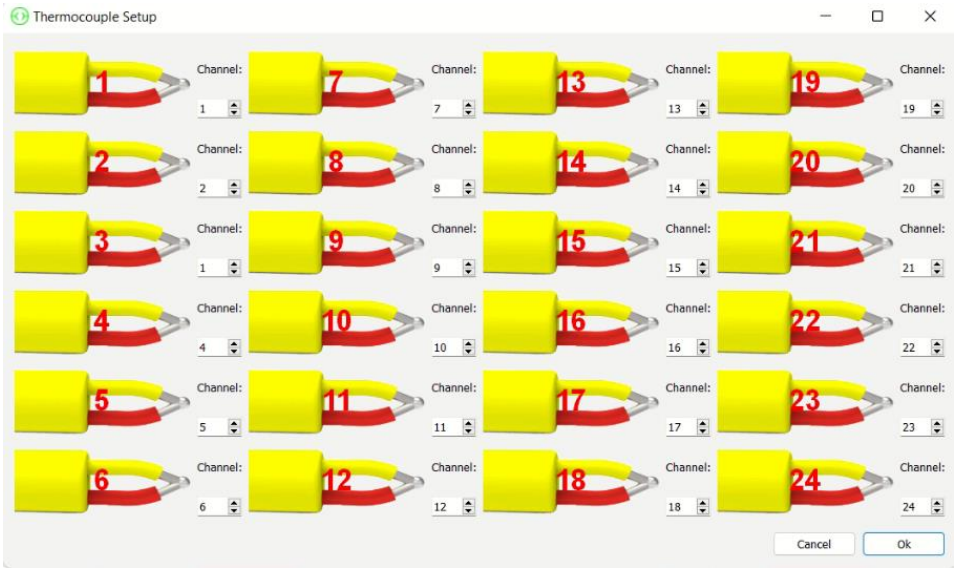


Figure 102: Multi-Thermocouple Control - Thermocouple Setup window

The number that appears in red text next to each pictographic of a thermocouple is the number of the actual channel itself. The modifiable 'Channel' field that appears to the right of each pictographic indicates which channel that thermocouple is currently assigned to as a control or 'Backup TC'. For normal operation of the system the two numbers should be the same for each channel.

To allocate a channel to another as a 'Backup TC' change the number in the modifiable 'Channel' field to match that of the primary channel you want to pair it with. In the image above, channel 3 has been allocated to channel 1 as a 'Backup TC'. Channel 1 would now show thermocouple readings from both channels, while channel 3 would appear blacked out on the 'Main Screen'.

6. In the modifiable 'Channel' field next to each channel you wish to allocate as a 'Backup TC', type the number of the primary channel it will be paired with.
7. Once all thermocouples have been allocated correctly, click the 'Ok' button to apply the change. This will close the 'Thermocouple Setup' window and temporarily cause the 'Main Screen' to show no process or channel data while it refreshes the program to reflect the allocations you have made.

To return the channels to their normal thermocouple control functionality, return to the 'Thermocouple Setup' window and change the number in the modifiable 'Channel' field back to match the red channel number to the left. Make sure you click 'Ok' to apply your settings and close the window. Clicking 'Cancel' will close the 'Thermocouple Setup' window without applying any changes you made.

Each time you make and apply a change in the 'Thermocouple Setup' window, the 'Main Screen' will take a few seconds to refresh with the new configurations shown.

14 The Error List Window & Audible Alarms

To ensure that heat cycles run efficiently and as intuitively as possible, HEAT VIEW Controllers constantly monitor, check, and verify received input data against programmed process variables, as well as their own hardware and processes, to assist operators by alerting them of any abnormality or deviation from the set parameters that occurs while the system is running. An error or 'Fault' occurs when the system detects one of these abnormalities or deviations.

The following sections will detail how the system alerts operators to a new fault, both visually and audibly, mute the audible alarm that accompanies new faults, dismiss faults that have been resolved, and even change the sound of the alarm if they desire.

14.1 The Error List/Fault Window

The 'Error List' or 'Fault' window serves multiple purposes. First, it is where an operator can view a list of active faults currently affecting the controller in a single consolidated environment, enabling them to track and troubleshoot multiple issues simultaneously. Second, it allows the operator to the 'Mute' the 'Audible Alarm' while they troubleshoot. Lastly, this is where operators must come to 'Dismiss' faults once they have been resolved, enabling them to 'Resume' channels that were 'Paused' or start channels that were 'Stopped' but also faulted.

When a new fault is detected by the controller and computer software, the computer application will immediately notify the operator of the new fault in multiple ways. For all faults, the 'View Errors'/ 'Fault Indicator' button  will appear in the 'Title Bar' (if not already present due to a previous, unresolved fault) and an 'Audible Alarm' will sound to alert the operator to the problem.

If the fault is specific to a channel or group of channels, the affected channel(s) will also turn from blue, green or yellow depending on their current run state, to red; indicating they are currently experiencing a fault. For more in formation on colors of channels and their meanings please refer to Section 8.7 ' Channel States and Colors' on page 58.

Should you ever experience a fault you cannot resolve, and require technical support from a HEAT VIEW technician, please record the fault exactly as you see it in the 'Error List' and relay it to your authorized HEAT VIEW distributor when contacting them.

Figure 103 on the next page highlights the features of the 'Error List/Fault' window.

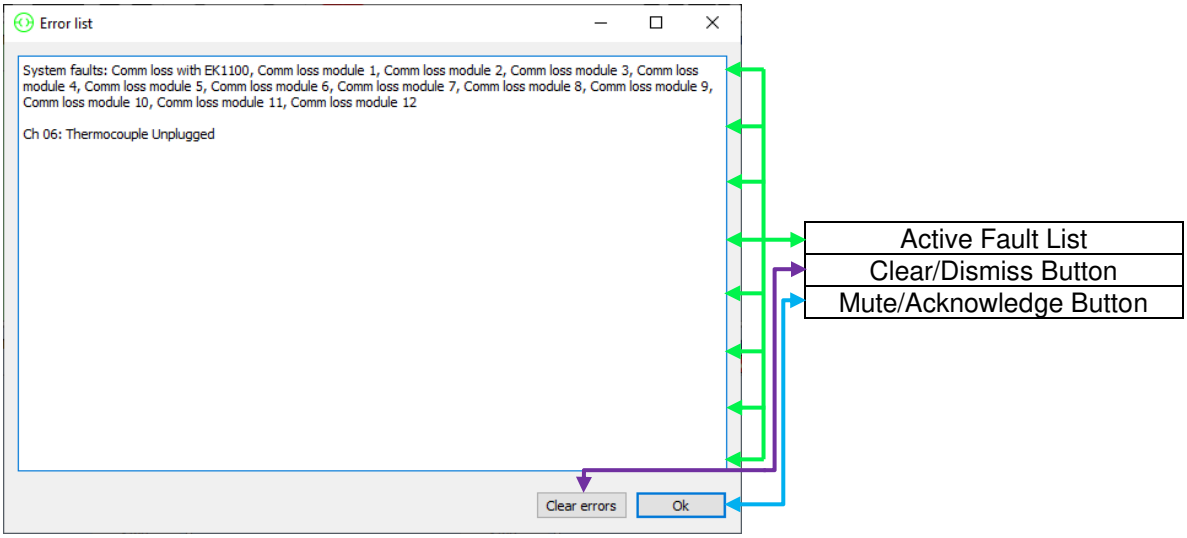


Figure 103: The Error List/Fault Window

Error/Fault List: All faults that are currently affecting either specific channels or the entirety of the system, will appear in this list and stay until the cause of the fault is resolved and then the error cleared from this list. 'Channel' and 'System' faults are explored in detail in Section 15.1 'Fault Types' on page 109.

'Clear Errors' Button: Once the cause of a fault has been corrected by the operator, they can then use this button to attempt to clear the fault and return the channel to the whichever state they require it to be in.

'Ok' Button: this button is dual purpose in nature. It acts to both 'acknowledge' the faults and close the 'Error List' window, while simultaneously 'Muting' the audible alarm.

14.2 Clearing Faults

When a fault occurs, it will either require an operator to address and clear it, or automatically clear itself, depending on the fault and just how the system has been affected. Clearing faults from the system that require operator intervention can be accomplished in a few simple steps.

1. Click on the 'View Errors'/ 'Fault Indicator' button to open the 'Error List/Fault' window.
2. Observe the 'Error List' to determine what fault has occurred, and once you are ready to address the issue, press the 'Ok' button to acknowledge the fault, muting the 'Audible Alarm'.

PLEASE NOTE: The 'Audible Alarm' will remain on until the 'Ok' button in the 'Error List/Fault' window is pressed, muting it. If a new fault occurs at any time, for any reason, the 'Audible Alarm' will sound again, to alert the operator to the new issue. The operator will then have to press the 'Ok' button again, to acknowledge and mute the new fault.

3. Perform repairs, adjust settings, or address the channel configuration issues, as indicated by the fault.
4. Once you are confident the issue has been resolved, and if the fault is not of the 'Auto-Clearing' variety, click on the 'View Errors'/ 'Fault Indicator' button  to re-enter the 'Error List/Faults' window.
5. Next, click the 'Clear errors' button at the bottom of the window to clear the active fault and dismiss/close the 'Error List/Faults' window.

If you were successful in resolving the fault, the 'View Errors'/ 'Fault Indicator' button  should disappear from the 'Title Bar' (if there are no other active faults affecting the system) and your channels should now either back to the state/color they were prior to the fault occurring. If they entered a 'Paused' state due to a fault, the channel (s) affected will now be yellow and awaiting operator input to 'Resume' their cycles.

If you were unsuccessful in resolving the fault, the 'View Errors'/ 'Fault Indicator' button  will remain in the 'Title Bar' and the 'Audible Alarm' will sound once more, alerting the operator to the unresolved issue. Attempt your repairs/changes once more and try to clear the fault again.

14.3 Changing The Audible Alarm

Should you ever desire to change the sound of the audible alarm to something of your preference, this can be accomplished by following the few steps outlined below.

1. Ensure the HEAT VIEW computer application is not running.
2. Choose a sound you would prefer to hear when the 'Audible Alarm' is activated. This sound file must be in .MP3 format.
3. Rename your MP3 sound file to "Alarm.mp3"
4. Navigate to the install directory for the HEAT VIEW computer application. By default, it should be in C:\HeatView.
5. Replace the "Alarm.mp3" file in this location as well as in the SRC subfolder (C:\HeatView\SRC) with your new "Alarm.mp3"
6. Restart your computer.
7. Launch the HEAT VIEW computer application.
8. Pressing 'Start' on a channel that does not have a temperature reading will be the quickest way to generate a fault and test that your new alarm audio was installed correctly.
9. Enjoy you new 'Audible Alarm'.

15 Faults – A Detailed Guide

This section is a comprehensive guide to understanding all the faults that currently exist within the computer application and controller code, for a standard configuration HEAT VIEW controller and will be universal to almost all configurations of the HEAT VIEW Control System.

If you possess a custom configuration of the controller, with faults unique to your application or are using a SAFE version of this controller, refer to the documentation provided to you with your system to find information about faults specific to your configuration. If you are unsure of which documentation you need to refer to, please contact your authorized HEAT VIEW distributor and provide them with the Serial Number of your controller so they effectively facilitate your request and forward you the proper documentation.

15.1 Fault Types

HEAT VIEW Controllers have two core 'Fault' types:

System Faults: are faults that are affecting the controller's physical hardware components or communication to the controller. System faults generally are critical in nature and not usually something an operator can resolve on their own. Always reference the list of faults in found further in Section 15 for information on how to proceed if you encounter a 'System Fault'. In the 'Error List' these faults are always proceeded by the text "System Faults" followed by the name of the fault.

Channel Faults: are faults that are related to the function, status, and programmed process variables of individual channels. These faults exist specifically to inform an operator of a channel specific issue, that with the right knowledge, they can resolve and dismiss, themselves. Depending on the cause of the fault, channel faults can occur while a channel is in a 'Running', 'Paused', or even, 'Stopped' state. In the 'Error List' these faults are always proceeded by the text "Channel XX:" (where XX is the channel number)

The tables in the following sections will detail the fault name as it appears in the computer application, differentiate between whether it is a channel or system fault, types of channels affected, which run states the fault can occur during as well as the effect is has on that run state, general information about how the how the controller detected the fault, known factors that cause the fault to occur, and the most common solutions to resolve it.

Most faults are broken down in their own individual table and, in most cases, its own subsection of this manual, for operator convenience. The last subsection of this guide will be a collection of faults that are near singular in both cause, and solution, so if you do not see your fault listed in the Table of Figures, please refer to Section X to find the fault you're looking for.

Please check the HEAT VIEW website regularly for updates to both the software and this manual, as this section will be updated each time a new, universal, fault scenario is added to the HEAT VIEW Control System.

TAKE NOTE: HEAT VIEW Controllers have been equipped with thermocouple boards that filter and eliminate welding noise and signal interference, that would otherwise cause erratic fluctuations in a thermocouple's temperature reading. To this end, these thermocouple boards are fitted with isolation modules to electrically isolate all channels from one another. Meaning, in the event of a thermocouple related issue, you cannot use a 'Jumper' plug/wire to force a channel to use the temperature reading of a separate, properly functioning channel, to avoid a less desirable looking chart and continue running.

The use of a 'Jumper' compromises this electrical isolation, forcing the channels to split and share the temperature reading, effectively invalidating the Channel Control Temperature for both. As a result, both channels temperature reading will drop to anywhere from 30-50% lower than the current, actual temperature of the channel the reading was jumped from and cause the system to enter a faulted state. This WILL negatively affect your heat cycle, both in terms of control accuracy and data recorded to the chart.

15.2 Thermocouple Unplugged

‘Thermocouple Unplugged’ – Channel Fault		
Channels Affected	**States Affected**	
Master/Slave Backup TC Monitor	Running Paused Stopped	
Information	**Common Cause(s)**	**Solution(s)**
No valid temperature reading present. The system is not registering any signal input from a thermocouple. This fault is the only fault that will always cause channels to switch from ‘Running’ to ‘Paused’ and cannot be dismissed until either a valid, stable thermocouple reading is present, or the channel is ‘Stopped.’ A channel cannot be started without having a valid, stable thermocouple reading. Master-slave configurations cannot ‘Resume’ from their ‘Paused’ state, following this fault occurring somewhere in the configuration, until all instances of this fault affecting channels in the configuration have been addressed and dismissed. Trying to start a channel without a thermocouple reading will cause this fault to immediately appear.	The thermocouple is physically unplugged or not connected to the workpiece, console, or controller. A lead has come free of a thermocouple plug. The thermocouple cable is damaged or burnt. The thermocouple is plugged into the wrong channel. The thermocouple attached to the workpiece has failed.	Inspect all thermocouple leads and connection points, starting at the workpiece and working back towards the controller until you find the disconnect. Fix broken or loose leads on thermocouple plug. If damaged beyond repair, replace the ‘Triple Cable Set’ running to the workpiece or run a separate thermocouple wire to the controller. Plug the thermocouple into the correct channel. Attach a new thermocouple to the workpiece.

15.3 Thermocouple Loose

‘Thermocouple Loose’ – Channel Fault		
Channels Affected	**States Affected**	
Master Slave Backup TC Monitor	Running Paused	
Information	**Common Cause(s)**	**Solution(s)**
Once a channel reaches its ‘Soak’ step in ‘Post-Weld’ mode or its ‘Final Temperature’ in ‘Pre-Heat’ mode, the system monitors the temperature over a set period of time. If during this period, the system detects that the channel has a significant increase in how much power it is calling for it will throw this fault. This is usually due to a loose thermocouple connection, a poor wrap/insulation job on the workpiece and/or environmental factor. Seeing this fault is not a major cause for alarm. Only proceed with troubleshooting this fault if it occurs repeatedly and you notice an actual affect on your heat cycle. This fault will clear itself and does not need to be dismissed by the user.	The thermocouple connected at the workpiece has broken off but is still making partial contact, resulting in a lower than actual temperature reading. The lead in one of the thermocouple plugs is loose or floating in the plug, resulting in a lower than actual temperature reading. There is a break in the thermocouple extension wire that is still making partial contact, resulting in a lower than actual temperature reading. The workpiece has not been properly wrapped and/or insulated and is losing a small but manageable amount of heat due to environmental factors such as wind, rain, or snow.	Inspect all thermocouple leads and connection points, starting at the workpiece and working back towards the controller until you find the loose connection. Fix or replace any loose thermocouple connections found. Inspect how the workpiece has been wrapped, fix any issues with the wrap and add additional insulation if there are environmental conditions that appear to be having a measurable affect on the workpiece. If no loose connections are found in obvious locations, and the workpiece appears to be wrapped properly and free of environmental impact, there may be a break in the thermocouple extension wire. Try another ‘Triple Cable Set’ or run a dedicated thermocouple wire directly to the controller to see if this resolves the issue.

15.4 Thermocouple Erratic

‘Thermocouple Erratic’ – Channel Fault		
Channels Affected	**States Affected**	
Master Slave Backup TC Monitor	Running Paused	
Information	**Common Cause(s)**	**Solution(s)**
This fault appears when the system registers a rapidly fluctuating temperature reading on a channel in both positive and negative directions. This is easily visible on the ‘Snapshot Graph’ and will appear as a jagged line with both large and small rapidly changing spikes. This can result from a thermocouple issue or signal interference. The thermocouple boards in the HEAT VIEW Controller have been designed to be isolate each channel from each other and filter out noise and voltage spikes from welders such as high frequency start and pulse start welders. This almost always indicates a thermocouple issue. This fault will clear itself once the issue causing it is not longer causing the rapidly fluctuating temperature reading.	A thermocouple connection that is broken or loose and vibrating, rapidly connecting, and disconnecting. Commonly found when the thermocouple wire is burnt, exposing the individual leads of the thermocouple. Something as simple as wind rushing past a cable can cause exposed wires to rapidly short out. Signal interference or induced voltage that is greater than what the thermocouple board is capable of filtering. A channel on the thermocouple board that has been damaged due to repeatedly inducing excessive voltage into the thermocouple wire. Such as repeatedly flash welding thermocouple wire to the workpiece while it is connected to the controller.	Inspect all thermocouple leads and connection points, starting at the workpiece and working back towards the controller until you find the disconnect. Fix broken or loose leads on thermocouple plug. Replace the ‘Triple Cable Set’ running to the workpiece or run a separate thermocouple wire to the controller if a burnt cable is found. If none of the above resolve your issue, please contact your authorised HEAT VIEW distributor, and have them inspect and test your thermocouple board for excess voltage damage.

15.5 Sudden Temperature Drop

‘Sudden Temperature Drop’ – Channel Fault		
Channels Affected	**States Affected**	
Master Slave Backup TC Monitor	Running Paused	
Information	**Common Cause(s)**	**Solution(s)**
Occurs when a channel is ‘Running’ or ‘Paused’, and the system registers a sudden, large change in temperature in excess of 25°C/45°F. This fault will not affect the running state of the channel affected by the sudden temperature change, unless that change exceeds 100°C/180°F. At this point the system will force the channel, and any configured slaves, into a ‘Paused’ state. The fault cannot be dismissed, and the channel(s) ‘Resumed’ until the cause of the fault has been corrected and the temperature returns to within acceptable cycle parameters. If the sudden temperature change was not large enough to force the channel into a ‘Paused’ state, the fault will clear itself once temperatures stabilize and it is back within cycle parameters.	Extreme environmental factors such as: 1. Heavy rain, that effectively ‘quenches’ the workpiece, rapidly drawing heat out of the metal. 2. Strong wind blowing though the center of an uncapped pipe. The insulation or pads, sagging or falling off a workpiece because it was poorly wrapped. The insulation and/or pad was removed to inspect a thermocouple or replaced a burnt-out heating pad. Someone stripping the wrap off the wrong workpiece thinking it was finished. Using a thermocouple ‘Jumper’ plug to try to jump a fake, accurate, reading from a properly running channel, to a problematic channel to prevent problems with a cycle from appearing on a chart.	Inspect the workpiece for any obvious environmental factors affecting it. Protect the workpiece from the elements by isolating it in a hoarding or by plugging open ends of a pipe with insulation. Inspect workpiece and correctly re-wrap pipe if it was poorly done. Replace the burnt-out pad, re-wrap the workpiece, and wait for temperatures to stabilize before resuming cycle (if applicable). Remove the ‘Jumper’ plug and correct whatever is the root cause of your problems with this channel. Then resume the cycle. If the problem cannot be resolved quickly or will jeopardize the entire cycle. Stop the cycle, properly repair the issues, the run the cycle again to avoid major issues and less desirable charts.

15.6 Temperature Tolerance Upper/Lower Ramp/Soak

‘Temperature Tolerance ->Upper/Lower Ramp/Soak’ – Channel Fault		
Channels Affected	**States Affected**	
Master Slave Backup TC	Running	
Information	**Common Cause(s)**	**Solution(s)**
PLEASE NOTE: These faults only occur if the tolerance settings in the ‘Channel Settings’ window are set. Leaving these fields set to 0° disables these faults. By industry standards, every material has specific tolerances for its heat treatment process. These tolerances can be set in the ‘Channel Settings’ window before you start your cycle. If you do not set a ‘Upper Ramp Tolerance’ in the ‘Channel Settings’ window, the system will not notify you in the event of a shorted thermocouple at the start of a cycle. This will result in the system continuously calling for power and likely result in a channel being far over the ‘Setpoint’ temperature. Temperature tolerance faults all occur as a direct result of the corresponding variable, set in the ‘Channel Settings’ window, being out of tolerance during the heat cycle. Temperature tolerance faults often accompany other faults, enabling operators to determine what has caused this fault to occur. These faults do not cause the system to change its state from ‘Running’ and simply inform an operator of a problem with the cycle. Temperature tolerance faults will clear themselves once the temperature comes back within established parameters.	A shorted thermocouple causing the channels ‘Control’ temperature to not increase with the set point. ‘Sudden Temperature Drop’ fault – If this sudden change in temperature pushes the temperature out of tolerance. ‘No Current Output’ fault – If power is not flowing to the pad and goes unnoticed, you will likely receive a ‘Under Ramp’ or ‘Under Soak’ tolerance fault. Contactor Stuck On’ – A contactor stuck in the closed position, causing uncontrolled heating, resulting in an overheat and likely ‘Upper Ramp’ or ‘Upper Soak’ tolerance faults. Setting your ramp rate too high on thin material may cause the ‘Ramp’ step to greatly exceed the ‘Upper Ramp Tolerance’ at any time and/or the ‘Upper Soak Tolerance’ when transitioning from ‘’Ramp’ to ‘Soak’. Similarly, an unrealistic rate on thick material will quickly lead to the ‘Setpoint’ far exceeding the actual temperature resulting in a ‘Lower Ramp’ tolerance fault. Environmental or pad/insulation issues affecting the temperature reading. During a Pre-Heat cycle, if using the temperature tolerance settings to notify an operator of inter-pass temperature you will see the ‘Temperature Tolerance -> Upper Soak’ once the channel temp passes inter-pass.	Find and fix the short in the thermocouple wiring circuit. Correcting the cause of the fault that has likely appeared alongside this fault may automatically resolve this fault by extension. Ensure you are using realistic ramp rates when programming your cycles. Remember, each type of metal has a definite rate at which it can absorb heat. Setting your rate higher will not make your workpiece absorb heat faster. It will only cause overshoots, leading to ugly charts and prematurely wearing out pads. Eliminate or control any environmental or operator related issues affecting your workpiece. If using the ‘Upper Soak Tolerance’ for inter-pass welding procedures, wait for the temperature to fall below inter-pass temperature and the fault to clear, before starting your next pass.

15.6.1 Temperature Over Maximum

‘Temperature Over Maximum’ – Channel Fault		
Channels Affected	**States Affected**	
Master Slave Backup TC Monitor	Running Paused	
Information	**Common Cause(s)**	**Solution(s)**
Occurs when a channel is ‘Running’ or ‘Paused’, and the system registers that the temperature for the channel has exceeded the ‘Maximum Temperature’ setting for the channel as defined by the operator. This setting is used as a failsafe measure when it is absolutely critical that the material being heat treated not exceed a specific temperature, or in electric furnaces to prevent damage to both the workpiece and furnace itself. Because of the failsafe nature of this setting, it will trip the shunt of the associated heat treatment console, meaning this fault will always occur in unison with the ‘Shunt Tripped’ fault. The shunt must be reset and the temperature reading below the maximum temperature setting before the operator can reattempt the cycle.	Setting unrealistic or aggressive ramp rates when programming the heat cycle parameters in either ‘Pre-Heat’ or ‘Post-Weld’ mode. Changes to the cycle parameters mid cycle. Changes to the way the workpiece is wrapped mid cycle. Such as adding additional pads or insulation near the final temperature. A contactor getting stuck in the closed position.	Properly programming the heat cycle parameters with realistic/achievable ramp rates. Use the ‘Ramp Control’ feature to allow the system to automatically decrease the ramp rate to something more accurate for the cycle. Use the ‘Temperature Tolerance’ settings to visualize and anticipate such an overheat scenario before it occurs. Use the ‘Corner Rounding’ feature when programming your cycle parameters to decrease the rate at which your cycle enters its ‘Soak’ step. Avoid changes to the parameters and wrap mid cycle whenever possible. Depending on just how tight the tolerance of the heat cycle are, the ‘Contactor Stuck On’ fault of the system should trip the shunt long before the ‘Maximum Temperature’ setting is exceeded.

15.6.2 No Temperature Change

‘No Temperature Change’ – Channel Fault		
Channels Affected	**States Affected**	
Master Slave Backup TC	Running	
Information	**Common Cause(s)**	**Solution(s)**
Occurs when a channel is ‘Running’ and the system detects that the channel has a valid power output, however, the temperature is not increasing. This fault will affect the run state of the channel(s) affected and transition them from a ‘Running’ state to a ‘Paused’ state. This fault can be dismissed at any time, and the channel(s) ‘Resumed’. However, the fault will continue to reoccur until the cause of the fault has been corrected and the channel sees both, valid power, and valid temperature readings.	Incorrect power lead/thermocouple hookup. A shorted thermocouple lead, resulting in a continuously ambient temperature reading.	First inspect the connections to the workpiece and ensure that the thermocouple plugged into the channel matches with the thermocouple under/beside the pads that will be heating it. Inspect all thermocouple connections for a short in the thermocouple lead, most commonly occurring at the thermocouple plugs. Repair as needed. If no obvious connection errors have been made and no short can be found, run a dedicated thermocouple extension lead or replace the ‘Triple Cable Set’ to resolve the issue.

15.7 Power Related Faults

The following faults are all related to an issue with the power output of the console in some way.

15.7.1 No Current Output

'No Current Output' – Channel Fault		
Channels Affected	**States Affected**	
Master Slave Backup TC	Running Paused	
Information	**Common Cause(s)**	**Solution(s)**
Occurs when a channel is 'Running' or 'Paused', and the system is calling for power but the measured output in Amps is 0. This fault will not change the running state of the channel. This fault can be dismissed at any time by the operator, however, if the cause of the fault has not been resolved, the system will register this fault repeatedly until it is fixed.	The connection cable between the controller and console is not connected or is connected to the wrong port. Channel is connected to the wrong workpiece. The splitter(s) leads are disconnected. Cables connected incorrectly to the heat treatment console. A burnt pad, if using only single heater circuits. Heat treatment console is not energized or is energized but is 'down a phase'. Contactor has failed in the open position. Wiring between the controller and the contactor has become disconnected. Wiring for the CT coils has come loose.	Ensure the connection between the console and the controller is present and connected to the correct port. Inspect the workpiece for any obvious setup mistakes or disconnected splitter leads. Ensure 'Triple Cable Set' is connected to the heat treatment console correctly. Replace the burnt-out pad, re-wrap the workpiece, and wait for temperatures to stabilize before resuming cycle (if applicable). Energize the heat treatment console. Have a certified electrician or HEAT VIEW technician inspect the wiring between the console and controller for any loose wiring in the contactor control or current measurement circuits.

15.7.2 Heating Pad Burnt

'Heating Pad Burnt' – Channel Fault		
Channels Affected	**States Affected**	
Master Slave Backup TC	Running Paused	
Information	**Common Cause(s)**	**Solution(s)**
Occurs when a channel is 'Running' or 'Paused', and the system registers a change in the average measured power output of the console. This fault will not affect the running state of the channel affected. The fault can be dismissed at any time, however, once dismissed the amount of power currently being output by the system becomes the new average. This means that if there were 3 pads connected and one burnt out or got disconnected, clearing the fault will now accept the power output of 2 pads as being the norm and the fault will not register again until another drop in the average power output is detected.	One of the female camlocks on a splitter has become disconnected from one or more pads. A heating pad has reached the end of its life cycle and burnt out. A decrease in power being output directly from the console resulting from losing a phase.	Inspect the splitter leads to ensure they are all connected correctly. Replace the burnt-out pad. If your heat cycle/workpiece allows for it, disconnect the burnt-out pad, clear the fault, and continue to run the heat cycle if it appears the remaining pads in the configuration can complete the heat cycle. Have a certified electrician inspect the main feed electrical connections for a disconnected phase connection.

15.7.3 Contactor Stuck On

‘Contactor Stuck On’ – Channel Fault		
Channels Affected	**States Affected**	
Master Slave Backup TC Monitor	Running Paused Stopped	
Information	**Common Cause(s)**	**Solution(s)**
Occurs when a channel is ‘Running’ or ‘Paused’ or ‘Stopped’ and the system registers power output when no power is currently being called for on that channel. This fault will affect the processes of all channels associated with the console of the problematic channel. As a failsafe measure, this fault will cause the system to automatically trip the main breaker of the associated heat treatment console via the shunt (if installed) to prevent damage to the workpiece and equipment. This fault can be dismissed only once the system stops registering output on a channel that is not calling for power.	A contactor failing in the ‘Closed’ position. Connecting the wrong power leads to the wrong channels. Connecting the connector between the controller and console to the wrong port. Power measurement circuit wiring issues.	Have a certified electrician or HEAT VIEW technician inspect your console and replace any failed contactors. Connect the ‘Triple Cable Sets’ to the correct outputs on the heat treatment console. PLEASE NOTE: The use of the ‘Test Channel’ function in the channel settings window prevents this from occurring, as the operator can identify any such connection issues prior to starting the cycle. Have a HEAT VIEW technician inspect the power measurement circuit wiring of the controller.

15.7.4 Strange Power Usage

‘Strange Power Usage’ – Channel Fault		
Channels Affected	**States Affected**	
Master Slave Backup TC Monitor	Running Paused	
Information	**Common Cause(s)**	**Solution(s)**
Occurs when a channel is ‘Running’ or ‘Paused’ and the system registers a sudden increase in the average power output for a channel. This fault will not affect the running state of the channel affected. This fault can be dismissed at any time; however, it may reoccur after some time if there is another fluctuation in the power output.	Connecting an additional pad mid cycle or after clearing a ‘Heating Pad Burnt’ fault prematurely. Console main feed power supply issue.	Clear the fault if it occurred after connecting or reconnecting a pad. Have a certified electrician inspect and verify the integrity of the power supply for the heat treatment console.

15.8 Configuration Related Faults

The faults in this section all occur as a result of an operator error while programming the heat cycle/configuring 'Master-Slave' scenarios.

15.8.1 Shunt Tripped

'Master Can't Be Slave' – Channel Fault		
Channels Affected	**States Affected**	
Master Slave Monitor	Running Paused Stopped	
Information	**Common Cause(s)**	**Solution(s)**
Occurs when the shunt is tripped either by the system or the manually by the operator.	A Channel fault that also trips the shunt Clicking the 'Shunt Trip X' buttons.	Clear the cause of the system generated shunt trip.

15.8.2 No Recipe Present

'No Recipe Present' – Channel Fault		
Channels Affected	**States Affected**	
Master Slave	Stopped	
Information	**Common Cause(s)**	**Solution(s)**
Occurs when a channel is 'Stopped' and an operator attempts to start the channel(s) in 'Post-Weld' mode without uploading a 'Recipe' to the channel. This fault will appear and prevent an operator for starting a channel until a recipe has been uploaded or the operator chooses another run mode. This fault must be cleared before attempting to start a channel again.	No 'Recipe' written to the channel via the 'Recipe Editor' or the 'Load file' button.	Create a new 'Recipe' or load an existing one from your computer, write it to the channel in question, clear the fault, and attempt to start the channel once more.

15.8.3 No Manual Values

'No Manual Values' – Channel Fault		
Channels Affected	**States Affected**	
Master Slave	Stopped	
Information	**Common Cause(s)**	**Solution(s)**
Occurs when a channel is 'Stopped' and an operator attempts to start the channel(s) in 'Pre-Heat' mode without changing the cycle parameters from their default value of '0'. This fault will appear and prevent an operator for starting a channel until the cycle parameters have been defined or they choose a different run mode. This fault must be cleared before attempting to start a channel again.	No ramp rate or final temperature values entered into the channel settings window.	Input your 'Pre-Heat' cycle parameters and attempt to start the cycle one more.

15.8.4 Master Can't Be Slave

'Master Can't Be Slave' – Channel Fault		
Channels Affected	**States Affected**	
Master	Running Paused Stopped	
Information	**Common Cause(s)**	**Solution(s)**
Occurs when an operator attempts to add a channel as a slave that is already the master of its own 'Master-Slave' Configuration	Channel is already programmed in a separate 'Master-Slave' configuration.	Deconstruct existing 'Master-Slave' configuration and re-add channel. Choose a different channel to add as a slave channel.

15.9 Contactor Usage Tracking Faults

HEAT VIEW controllers track the number of times a channels contactor has opened and closed or 'Cycled'. The manufacturer of these contactors generally indicates the maximum recommended number of cycles before they should be replaced.

15.9.1 Contactor Usage Warning

'Contactor Usage Warning' – Channel Fault		
Channels Affected	**States Affected**	
Master Slave	Running Paused Stopped	
Information	**Common Cause(s)**	**Solution(s)**
Occurs when the contactor for a channel has reached 90% of its maximum number of cycles. This fault will occur each time the controller is powered on and can be dismissed by the operator.	Contactor nearing the end of its manufacturer stated life span.	Replace contactor affected in the near future.

15.9.2 Contactor Over Used

'CONTACTOR OVER USED' – Channel Fault		
Channels Affected	**States Affected**	
Master Slave	Running Paused Stopped	
Information	**Common Cause(s)**	**Solution(s)**
Occurs when the contactor for a channel has exceeded its maximum number of cycles. This fault is constant and cannot be dismissed until the contactor is replaced and the cycle count reset to 0.	Contactor cycle count has exceeded the manufacturers stated lifespan and the probability of failure has drastically increased.	Replace the contactor at the most immediate convenience and reset the cycle count to 0 using Supervisor Level privileges.

15.10 System Faults

The following list of faults are system specific and have to do with either the physical hardware of the controller or the controllers source code/operations. These faults affect the entire controller and not just a specific channel type or state. It's possible that these may be resolved by an operator but generally 'System' faults require the assistance and intervention of a HEAT VIEW technician to resolve.

15.10.1 HMI Stopped!

'HMI Stopped!' – System Fault		
Information	**Common Cause(s)**	**Solution(s)**
This fault indicates that part of the essential code that runs directly on the controller has either crashed for failed to initialize properly.	Startup process did not initialize correctly. The controller was power cycled too quickly. Unstable power supply to the controller causing 'Brown Outs' resulted in the controller deactivating itself as a failsafe protection measurer. Improperly matched versions of the code installed on the controller. The controller code was not properly disengaged prior to uploading new source code.	If the startup process did not initialize correctly, power the controller down for 30 seconds and then power it back on. The controllers are internally equipped with a small uninterruptible power supply that enables them to properly write data to their file systems when being powered down. If an operator turns the power switch off and quickly back to on, the system will have stopped the code as part of its shutdown procedure and this fault will appear. Ensure you are using the latest version of all code in conjunction with the latest version of the computer application.

15.10.2 USB Storage Fault

'USB Storage Fault' – System Fault		
Information	**Common Cause(s)**	**Solution(s)**
This fault indicates that the system is experiencing an issue reading or writing the heat cycle data to the internal file system.	The use of special character such as: !@$%\^/?. Etc. when entering channel, recipe, and cycle names.	Remove any special characters from the channel, recipe, or cycle names you may have used and clear the fault. This should resolve the issue. If it does not, contact your authorized HEAT VIEW distributor for assistance.

15.10.3 Comm Loss EK1100

'Comm Loss EK1100' – System Fault		
Information	**Common Cause(s)**	**Solution(s)**
This fault indicates that the controller has lost communication to the main component bus.	Component failure. Operator error while servicing equipment.	Contact your authorized HEAT VIEW distributor for assistance.

15.10.4 Comm Loss Module 'X'

'Comm Loss Module X' – System Fault		
Information	**Common Cause(s)**	**Solution(s)**
This fault indicates that the controller has lost communication to the specific module on the main component bus. Where X denotes the number of the module in question.	Component Failure. Improperly applied update code.	Contact your authorized HEAT VIEW distributor for assistance.

16 Databases & Reports

HEAT VIEW Controllers, having been designed to be an all-in-one solution for both control and data logging, can generate detailed reports about the heat cycles that are run on them. These reports can be generated both while a heat cycle is running if necessary, or more commonly, once a cycle has ended.

Whenever the computer application is connected to a controller and it sees that a channel has been successfully 'Started' and is 'Running' a heat cycle, it will generate a record of the cycle and store it locally on the connected computer in a 'Database' specific to the controller. Into this 'Database' the computer application will record multiple pieces of information about the cycle, with primary focus being on the temperature data.

This temperature data is captured and recorded to the database at an interval specified by an operator in the 'System Settings' window under the 'Chart Sample Interval' option discussed in Section 9.1. In addition to the temperature data, the 'Database' entry for a heat cycle will also include information about: Time and date, 'Run Modes' and their process variables (such as a 'Recipe and its steps), Channel and Cycle Names, Temperature Tolerances, 'Slave' state data and any 'Chart Notes' added by the operator.

All of this data captured and stored by the computer can then be viewed, enhanced with any additional information and details the operator may feel is relevant to how the heat cycle progressed and finally converted into a PDF file that can then be stored for quality control purposes and/or provided to your clients as proof that the heat cycle was completed successfully.

The following sections will show you where to find your locally stored 'Databases' as well as detail the features of, as well as instruct you in the use of, the 'Report' window.

16.1 The Report Window

When it is time to create a 'Report' for a heat cycle, the 'Report' window can be opened by clicking the 'Report' button on any channel in all 3 views available for the 'Main Screen'. This button is also the only button available on the 'Main Screen' when not connected to a controller so that an operator can generate reports about cycles they've run using their computer at any time.

Figure 104 below highlights the 6 functional zones of the 'Report' window. The sections that follow will break these zones down further and detail their functions.

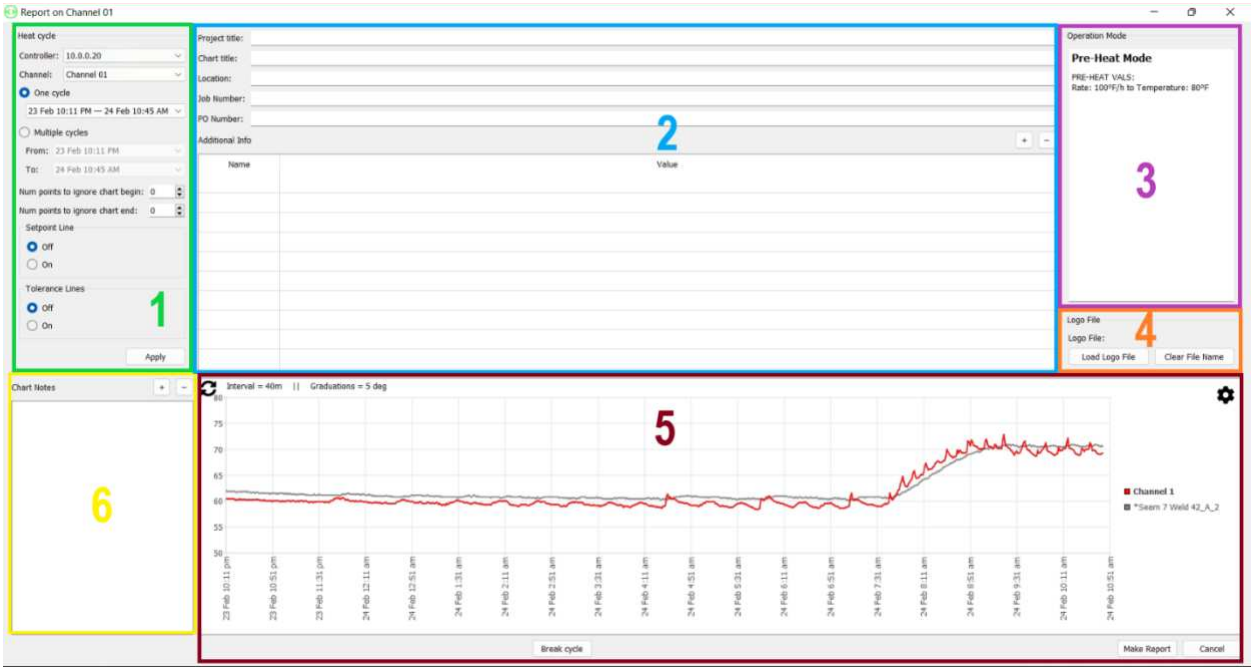


Figure 104: The Report Window - Zones

16.1.1 Heat Cycle Selection Options

Zone 1 of the 'Report' window – Figure 105 on the next page – is where an operator selects the controller – and by extension 'Database' where the cycle information is stored – that was used to run the heat cycle they are generating a report for. Selecting a specific channel from the drop-down menu will make the 'Report' window load all cycles associated with that channel into a list of available options to choose from.

This zone also offers the option to stitch 2 or more charts together into a cohesive whole if the operator accidentally used the 'Stop' and 'Start' buttons repeatedly during a cycle. As well as options to show/hide the 'Setpoint/Temperature Tolerance lines from a final report chart.

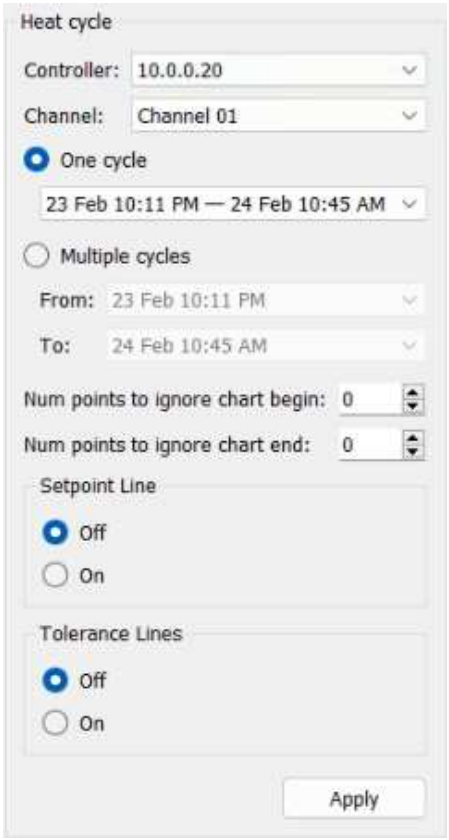


Figure 105: The Report Window - Heat Cycle Selection Options

Controller: Any HEAT VIEW Controller that has been connected to your computer will have generated an associated and identically named 'Database' for ease of navigating and searching for cycle data in the 'Report' Window. Picking a controller/database from the drop-down list of available databases will give the operator access to any heat cycle data stored in the database.

Channel: Once a controller has been selected, the operator must pick a channel from the drop-down list that they wish to find an associated heat cycle for. If looking to make a report on an entire 'Master-Slave' configuration of channels, the operator needs only select the channel that was the 'Master' channel in the configuration to populate all data relevant to the cycle.

One Cycle: This is the default selected option for searching through cycles associated to both the controller/database and channel selected above. It allows the operator to select a single, complete entry from the database via the drop-down list to generate a report on. If the operator did not set a 'Cycle Name' heat cycle is stored according to it's recorded start and stop date and time.

Multiple Cycles: If for some reason a cycle has been split into 2 or more sections, the operator can stitch these sections together via the 'Multiple Cycles' option and drop-down lists. In this instance the system will show cycles that could theoretically be logically stitched together due to being sequentially listed in the database.

Num Points To Ignore Chart Begin/End: These two fields allow an operator to precisely hide a few points of temperature data at either the beginning or the end of the heat cycle if there are data spikes at either end of the chart due to interference or early cycle/end of cycle thermocouple reading issues, such as an overzealous technician unplugging a thermocouple (This intentionally creates a straight vertical spike in the chart to signify that a thermocouple unplugged fault occurred) before the operator clicked 'Stop' on the channel. These options are more accurate than trying to accurately use the click-and-drag zoom function.

Setpoint Line On/Off: This allows an operator to show/hide the dotted-blue, system generated, Setpoint line on the final report chart if they so desire.

Tolerance Lines On/Off: This allows an operator to show/hide the dotted-black, user defined, Temperature Tolerance lines on the final report chart if they so desire.

Apply Button: Once options in the above zone have been selected, clicking the 'Apply' button will populate the requested data into the 'Report' window. Any changes made to this zone after the initial import of data must also be applied using this button.

16.1.2 Report Information

Zone 2 of the 'Report' window is where an operator can enter and record specific data relevant to the heat cycle but not captured by the temperature controller for obvious reasons. All data entered in the fields shown in Figure 106 on the next page become persistent data.

This means that if the operator closes the 'Report' window or even the HEAT VIEW application entirely, the next time they open the application and/or the 'Report' window, the data they entered previously will still be populated in these fields. This prevents operators from constantly having to re-enter the same information repeatedly when generating reports for multiple cycles all containing data from the same job/location/po number etc.

The upper section of this zone are the most requested fields from customers. Thus, they were made permanent, and each given a dedicated position on the final report main page. The lower half of this zone is where an operator can add as many additional data fields as they may require and customize them to their needs.

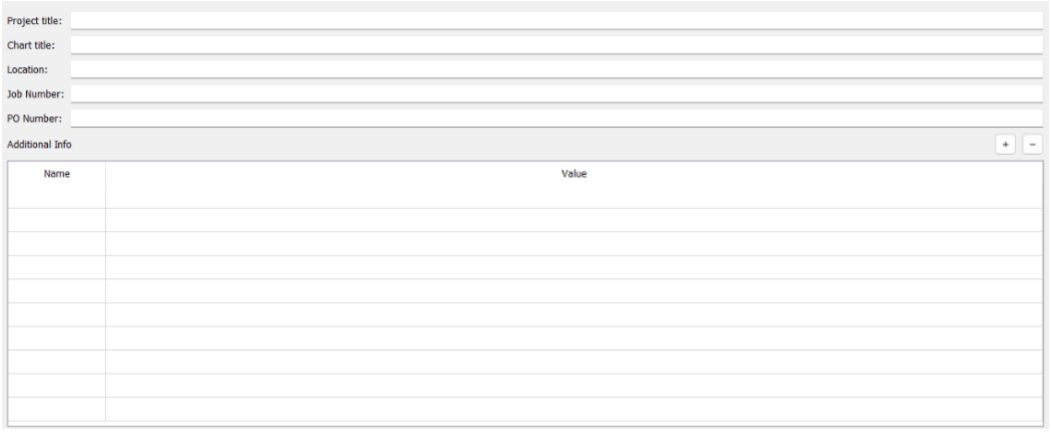


Figure 106: The Report Window - Report Information

Project Title/Chart Title/Location/Job Number/PO Number: Based on customer feedback early on, these fields were the ones operators were entering into the 'Additional Info' section most frequently. When the final report underwent a redesign, these fields were added permanently and given a dedicated position within the main page of the PDF created when generating a report.

Additional Info: The data fields in this section do not appear on the main page of the PDF report generated, but instead appear on the second page of the report as a list of nay supplemental data the operator felt compelled to include.

[+] Button: This button allows an operator to add additional fields to the bottom of the list.

[-] Button: This button allows an operator to remove an entire row from the list of additional information. To do this, first click the row you wish to remove to highlight it in blue, then click the **[-]** button to remove it from the list.

Name/Value Fields: this is where an operator can designate additional data fields of their choosing. For example, they could enter 'Operator:' in the 'Name' field and then type the operators name into the 'Value' field. The options/combination are limitless.

16.1.3 Run Mode Parameters

Zone 3 of the 'Report' window is where the parameters that were used to complete the cycle will appear. For example, if the cycle in question was run in 'Post-Weld' mode, the 'Recipe' and all of its details (steps, rates, timers, name) will appear here. This zone will a record of any changes made to the parameters while the cycle was running.

Take a 'Pre-Heat' cycle for example, once the cycle is complete, the operator can see if there were any insulation or pad issues with a workpiece if they had to continuously modify the 'Ramp' rate or 'Final Temperature' setting. This would enable them to inspect the workpiece and identify the cause of the repeated adjustments, reducing the likelihood of the issue reoccurring.

This section is also a valuable troubleshooting tool for HEAT VIEW technicians while assisting a customer. The HEAT VIEW Control system is largely self regulating in regards to how it proceeds through the heat cycle while following the operator defined parameters.

Should an operator constantly change these parameters too quickly, the HEAT VIEW system cannot properly respond to and regulate the cycle as it (and most other controllers) are designed to. Best practice to make logical small changes to the parameters if need be, and allow the system to respond accordingly before determining if another change needs to be made. Figure 107 below shows a very simple example of the kind of data one can expect to see here.

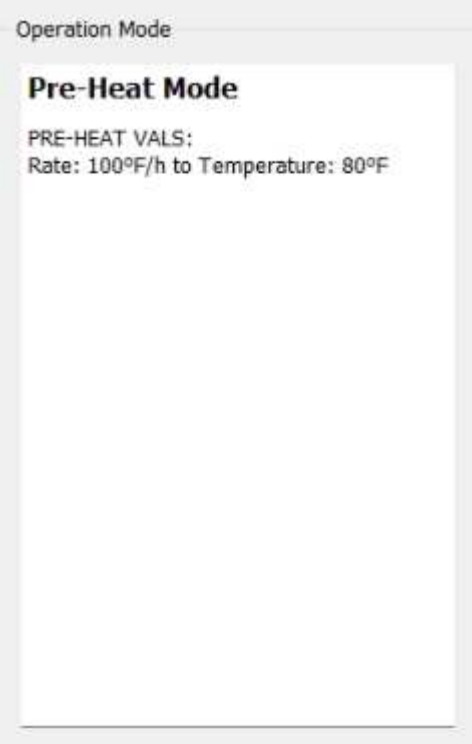


Figure 107: The Report Window - Run Mode Parameters

16.1.4 Report Logo Customization

Zone 4 of the 'Report' window allows a customer or operator to upload their own company logo into the HEAT VIEW computer applications report generator. This logo then replaces the 'HEAT VIEW' logo that appears in the top right corner of the PDF report. Figure 108 below shows this zone in a little clearer detail.

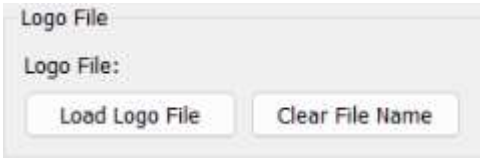


Figure 108: The Report Window - Report Logo Customization

'Logo File:' : This is a text field that will list the name of the logo file uploaded once and operator or customer has done so, enabling them to quickly verify that their logo has been applied to the program before generating their PDF file.

Load Logo File Button: This button will open the File Explorer, Navigate to the folder where you Logo file is located and click 'Open' to upload it to the HEAT VIEW Computer application.

Clear File Name Button: In the event that you want to change or remove the logo that appears on the final report, clicking this button will delete the currently uploaded logo and defaulting the system back to the standard HEAT VIEW logo.

16.1.5 Chart Data & Additional Controls

Zone 5 of the 'Report' window – Figure 109 below – is where the visual representation or 'Chart' data from a heat cycle will appear once a heat cycle has been selected via the options outlined in Section 16.1.1 on page 128. The key elements of this chart are the same as discussed in Section 8.6.3 starting on page 56.

One key difference being, if an operator uses the click-and-drag zoom function on this version of the chart data, the now zoomed section of data will be the chart that appears in the PDF report.

This feature was added so that operators could run cycles that potentially lasted days at a time, have them get stored in one single continuous database entry, but still have the option of zooming in to break the large, minimally detailed chart, into shorter, much high detail charts without having to use the 'Break Cycle' function detailed further down.

This section of the manual only discusses the features specific to this zone, for information specifically about the chart, and the features universal to both the one available on the 'Main Screen' as well as the 'Report' window, please refer to Section 8.6.3 starting on page 56.

Figure 109: The Report Window - Chart Data & Additional Controls

Break Cycle Button: This button allows an operator to physically separate a larger chart down into smaller 'Database' entries in the event a cycle was run for a long period of time, resulting in a lower than desirable resolution of data being observable due to the scale being stretch over such a long period of time. This feature has been largely replaced by the click-and-drag to zoom functionality of the chart. Which allows an operator to zoom in, create a report on a section of data, reset the view, and repeat this process without out having to switch to a separate database entry.

Make Report Button: Once an operator is satisfied that they have all the relevant data input into the 'Report' window and are ready to create the PDF version of the report, clicking this button will open the 'File Explorer' window and ask the operator to name the file and choose a location to save this report. Clicking 'Save' in the 'File Explorer' window will finalize this process, closing the 'Report' window and automatically opening the PDF file for the operator to view. This button is greyed out if no heat cycle data has been loaded from a database.

Cancel Button: This button can be used to close the 'Report' window at any time. It does not however delete in the Information fields. That data is persistent and must be cleared by the operator.

16.1.6 Chart Notes

Zone 6 of the 'Report' window shown in Figure 110 below is where any chart notes the operator entered during the heat cycle will appear. The operator can use this section of the 'Report' window to add, modify, or delete notes for a heat cycle before generating the PDF report. This zone functions identically to how it does in the 'Main Screens' chart which was covered in detail in Section 8.6.1 on page 54.

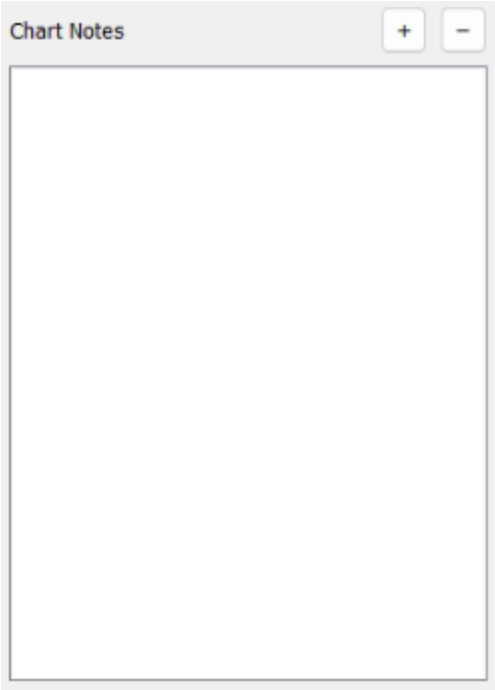


Figure 110: The Report Window – Chart Notes

16.2 The Report Window – Supervisor Level

Channel names are stored and locked in the 'Database' once a cycle transitions from 'Running' to 'Stopped'. Because of this it is important that operators verify the 'Channel Name' field is set correctly before a cycle stops running.

In the event an operator forgets to change the name of 1 or more channels before stopping a heat cycle, someone who has been granted 'Supervisor' level credentials for the system can login and correct this issue.

Logging in to the 'Advanced Settings' in the 'System Settings' window with 'Supervisor' level credentials or higher will enable the 'Change Channel Name' button – highlighted in Figure 111 on the next page – in the 'Report' window.

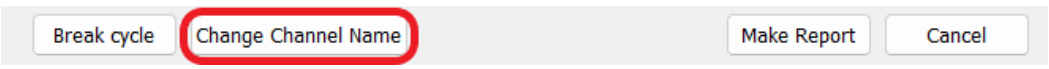


Figure 111: The Report Window – Supervisor Level – Change Channel Name Button

Clicking the ‘Change Channel Name’ button once you have loaded the affected cycle into the ‘Report’ window will open the ‘Channel Name Editor’ window shown in Figure 112 below. Here you will see a list of all channels associated with the heat cycle and be able to rename them accordingly. Notice in Figure 109 in Section 16.1.5 above, the red plotted temperature line has been left as the default ‘Channel 1’.

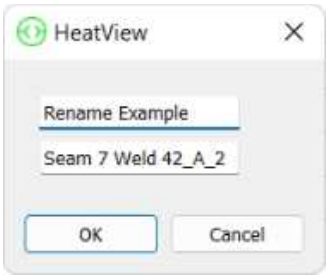


Figure 112: The Report Window - Supervisor Level - Channel Name Editor Window

Once you have entered your new ‘Channel Name’ click ‘OK’ to apply the changes to the database and by extension the visual chart as shown in Figure 113 below.

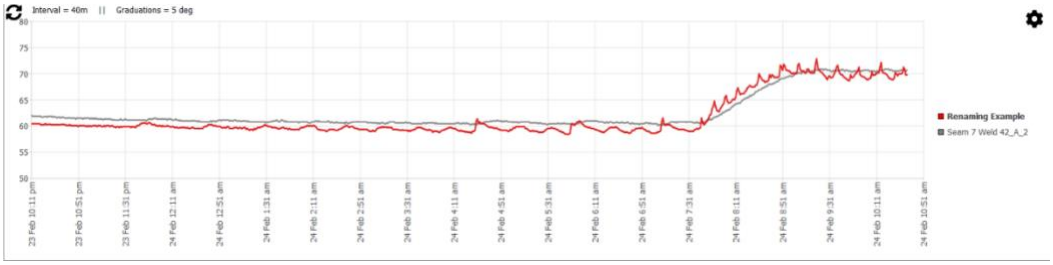


Figure 113: The Report Window - Supervisor Level - Channel Renamed

17 Recovering Chart Data

In the event that a heat cycle does not get properly recorded to the local database on a computer – such as an ethernet cable breaking, WiFi connection accidentally being disconnected/computer moved out of range of the network, or the computer itself dies – all HEAT VIEW Controllers store the 10 most recent heat cycles for each channel directly on the controller for recovery purposes.

These stored cycles are more raw visually than those generated by the computer program and lack certain details such as the parameters used in completing the cycle, channel names, and chart notes as just a few examples. They can also only be recovered 1 channel at a time while no channels on the controller are running, meaning each channel in a 'Master-Slave' configuration has be recovered individually and then pieced together in to a cohesive whole in the 'Report' window.

Therefore these cycles are stored for emergency recovery purposes only and should not be used to run a cycle with the controller disconnected from a computer, and then downloaded using the recovery function. This will lead to quality control issues and is an extremely poor practice.

To help combat data loss due to temporary network disconnects, the HEAT VIEW Computer application and controllers have been updated to include a 90 minute disconnect auto download grace period.

Meaning, should a computer become disconnected from the controller and the operator not notice, once the controller and computer have their conneciton re-estabished, the computer application will download relevant temperature data about the heat cycle from the controller from up to a maximum of 90 minutes in the past and merge it with the data in the locally stored 'Database'.

In the event an operator still needs to recover heat cycle data from a controller due to a failure not prevented/resolved by this auto download grace period, the HEAT VIEW Computer Application includes a built in Recovery Utility. Any data recovered from the controller will be entered into its own database so that it can be found easily. The steps to recover cycle data are detailed below.

17.1 Data Recovery Procedure

1. Click the 'Get backup report' button in the 'Title Bar'.
2. If there are channels currently running processes, you will see the pop-up window shown in Figure 114 below.

Figure 114: Recovering Chart Data - Stop All Channels Notification

3. Either click the ‘Stop all channels’ button to do as the pop-up window asks, or wait for your currently running cycles to complete, then reattempt the process.
4. If all channels are stopped, the system will open the ‘Select Channel’ window shown in Figure 115. Pick which channel you need to recover data from and click ‘OK’.

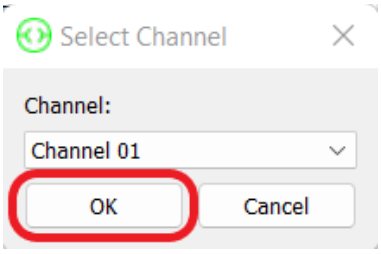


Figure 115: Recovering Chart Data - Select Channel Window

5. In the ‘Recall backup data’ window that appeared, choose the cycle you need to recover from the drop-down list and click the ‘Upload File’ button highlighted in Figure 116 below to start downloading the cycle data from the controller.

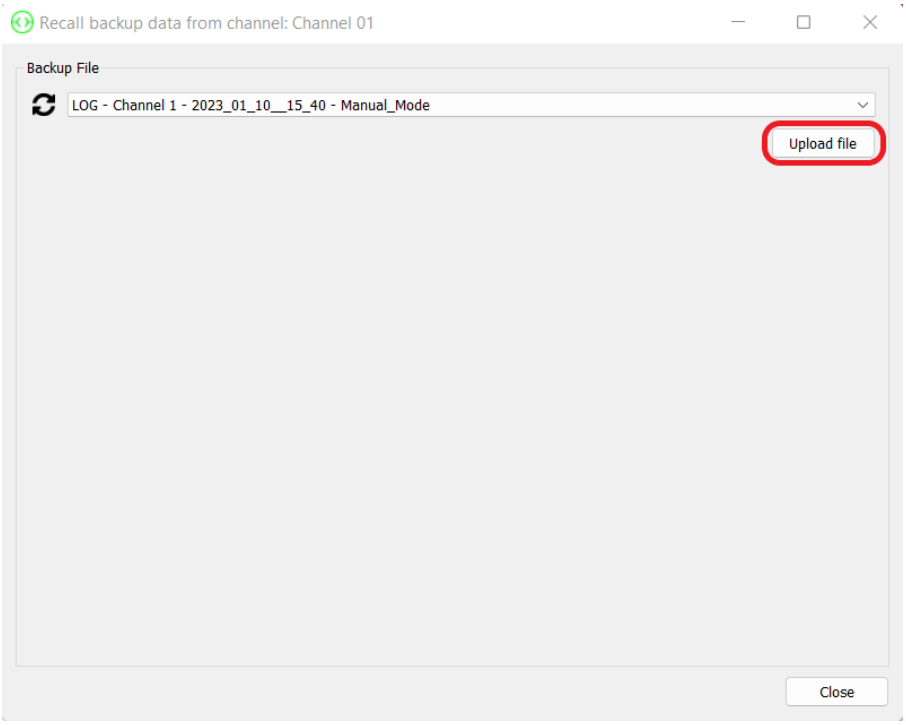


Figure 116: Recovering Chart Data - Recall backup data window & upload file button

6. This process should open the ‘Uploading file for channel X’ dialogue window shown in Figure 117 on the next page. It should calculate how many points of data it needs to recover and then visibly show progress of the download. If this window freezes, close it, and the HEAT VIEW computer application and power cycle the controller for at least 30 seconds and reattempt the recovery.

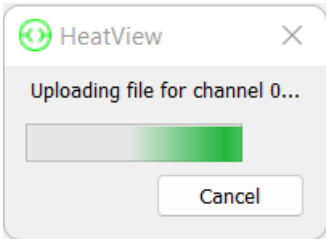


Figure 117: Recovering Chart Data - Uploading File Dialogue window

PLEASE NOTE: Because of the way the controller is programmed, when recovering data for a channel, this dialogue window will read one number off from the channel you selected. This is because in the controller code the channel sequence starts at 0 instead of 1. So, 0=1, 1=2, 2=3 and so forth.

7. If your recovery of the cycle data for the channel selected is successful, you will see the 'Upload Successful' window shown in Figure 118 below. Click 'OK' to dismiss this window. You will now find the uploaded data in the 'Report' window in its own database ending in **_BCKP. (The dialog text may be different based on the version of the computer application you have)**

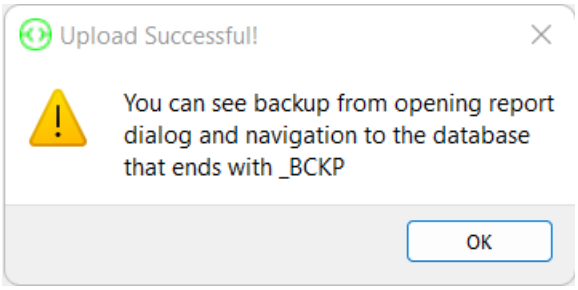


Figure 118: Recovering Chart Data - Upload Successful Dialogue Window

8. Either recover additional channels or proceed to the 'Report' to start building a report for the recovered data.