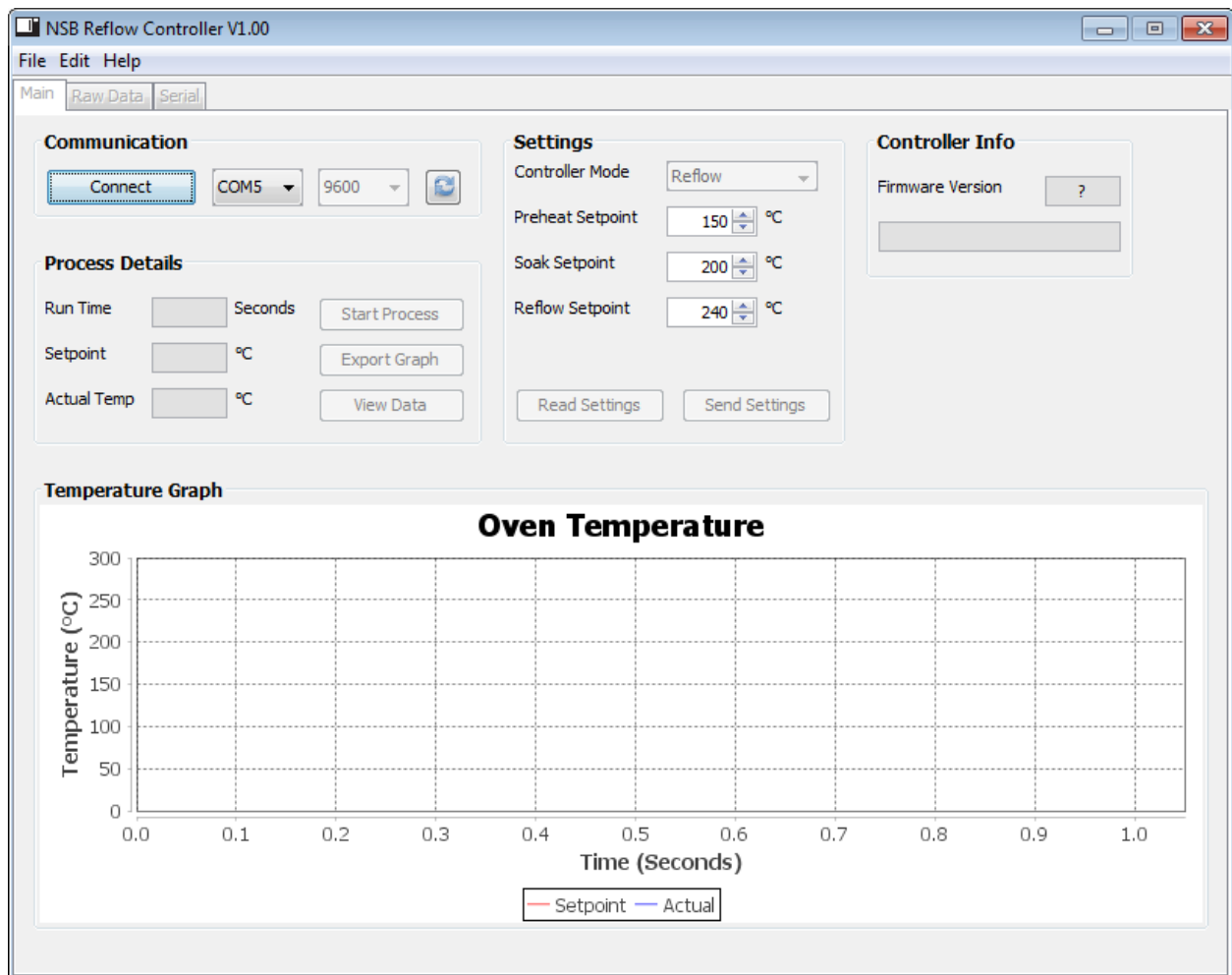


Reflow Controller

NSB006

GUI User Manual

Version 1.00



Document History

Version	Modified By	Date	Comments
1.00	N Barnes	2017-01-14	Initial release

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1 INTRODUCTION

The Reflow Controller is specifically designed to control the soldering of surface mount technology (SMT) components onto pc-boards using a small batch compact oven. The controller follows the correct temperature profile for SMT soldering. This allows for production quality prototyping or small batch manufacturing to be completed effortlessly.

The Reflow Controller is intended to be used by hobbyist, technicians, engineers and the like for prototype or low volume assembly of pc-boards with SMT components. The Reflow Controller constantly monitors the temperature inside the oven and using a PID control algorithm, tracks the reflow soldering profile ensuring components are not over heated or over stressed.

1.1 Purpose of the Document

This document describes the installation and use of the Reflow Controller Graphical User Interface (GUI). It should be read before proceeding to use the GUI and the Reflow Controller.

NOTE: Install the software before connecting the Reflow Controller to your computer. The drivers need to be installed first to avoid issues with it not being detected correctly.

1.2 Prerequisites

The Reflow Controller GUI software has been tested on Windows XP and Windows 7 but should work on later versions as well. Below are the minimum requirements to run the Reflow Controller GUI software:

Table 1. System Prerequisites

Description	Requirement
Operating System	Windows XP or above
CPU	1 GHz
Memory	2 GB
Disk Space	200 MB

2 SOFTWARE INSTALLATION

2.1 Main Graphical User Interface

To install the GUI double click on the “NSB Reflow Controller-1_00.exe” file. Follow the GUI instructions and click on “Install” for the process to begin. Wait for it to finish, this can take a few seconds.

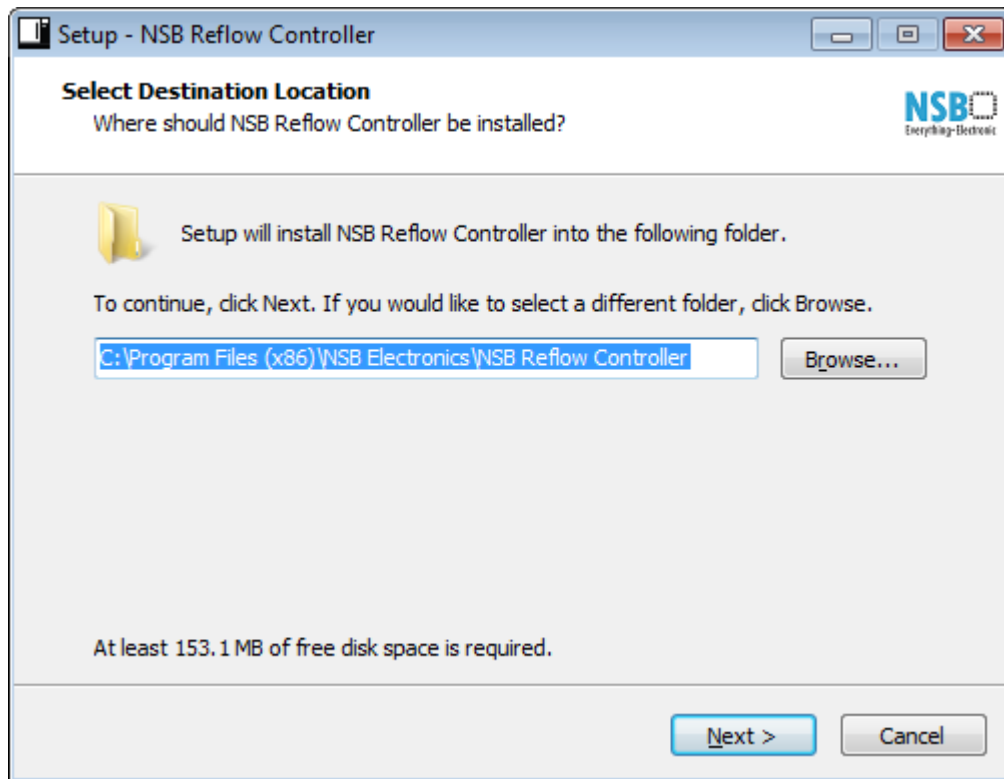


Figure 1. Reflow Controller GUI installer

A driver installer will come up, click on “Install” and wait for it to complete.



Figure 2. Driver installer

When a Windows Security window comes up, click on “Install” to continue.

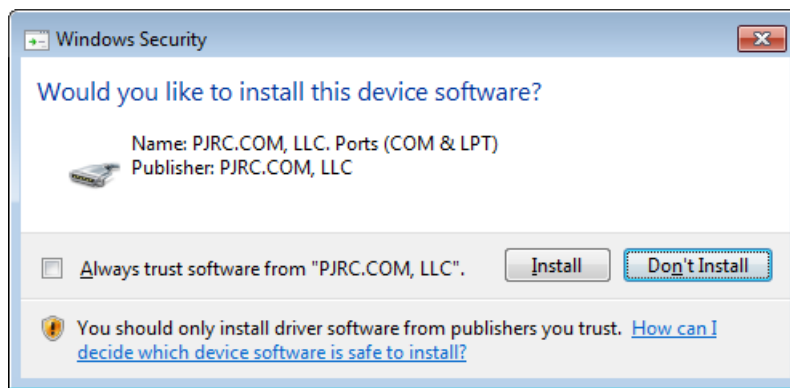


Figure 3. Windows Security window

If prompted that “Windows can’t verify the publisher of this driver software”, click “Install this driver software anyway” to proceed.

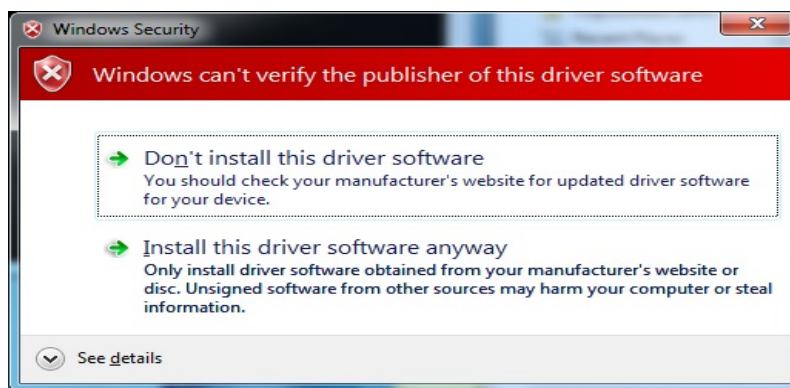


Figure 4. Driver verification warning

If an error occurs when running the NSB Reflow Controller-1_00.exe, install Microsoft Visual C++ 2010 Redistribution Package (x86). This will solve the missing file issue. The package is available to download from the NSB website and is named vcredist_x86.exe.

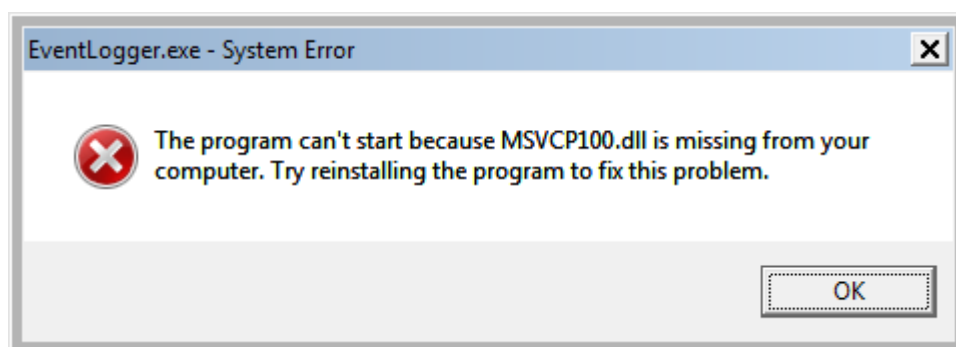


Figure 5. Missing file error

Now that the GUI and drivers are installed, it is time to connect the controller to the computer using a USB A to USB B cable, also typically referred to as a printer cable.

Windows will detect the Reflow Controller and install the drivers, please wait a while as this can take some time.

3 GUI OPERATION

3.1 Connection

The main window of the GUI looks as in Figure 6 below. The Reflow Controller GUI will automatically detect Reflow Controllers on the com port list.

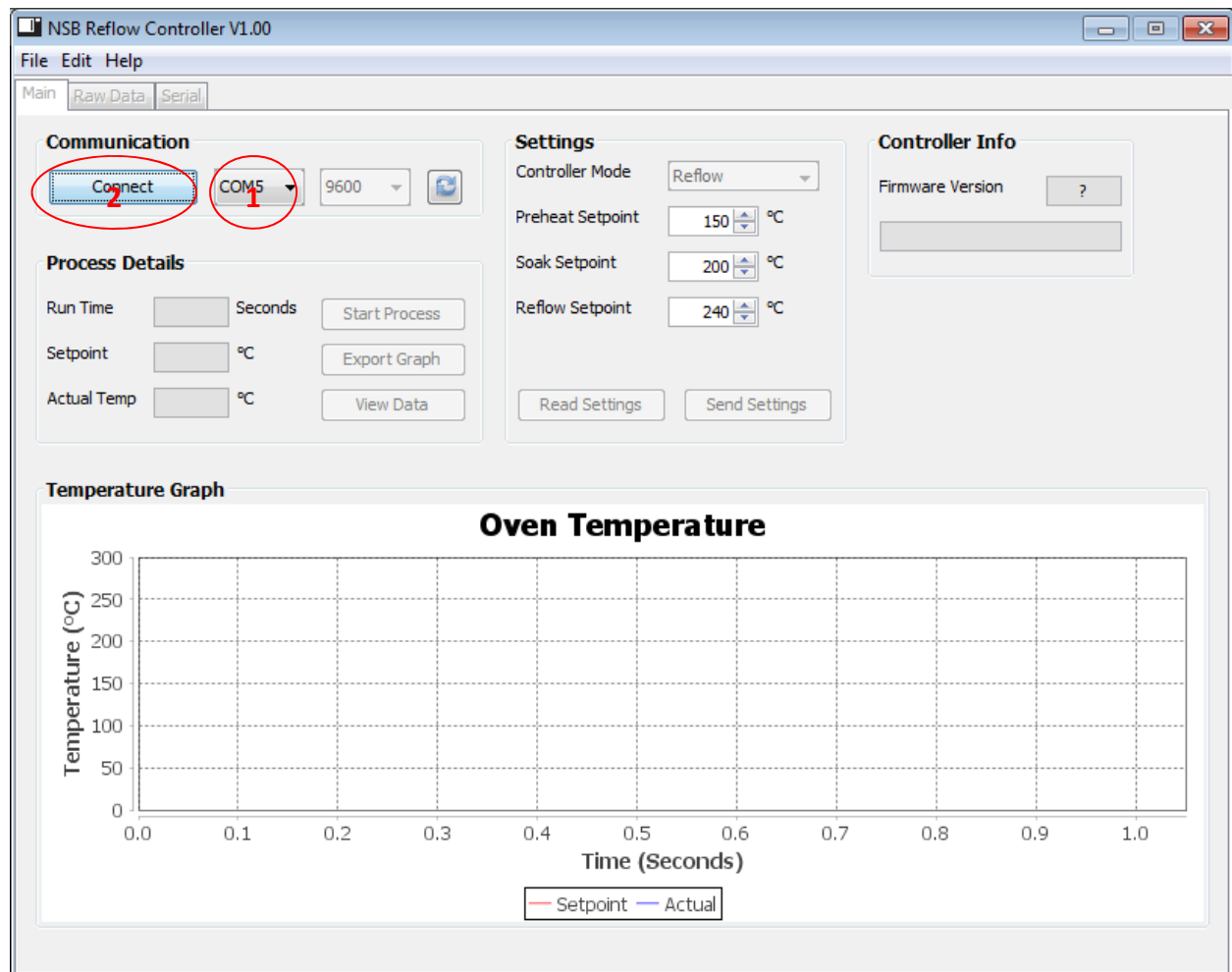


Figure 6. GUI Main window

Connecting to the controller:

1. Using the dropdown list marked 1 above, select the correct COM port for the Reflow Controller.
2. Click on the Connect button marked 2 to establish the connection.
3. The COM port list is automatically updated when a new port is detected.

3.2 Main Window Description

After connection is established, the fields in the GUI should be populated with the settings currently on the controller. If nothing updates, then either the incorrect port was selected or the controller is not connected correctly.

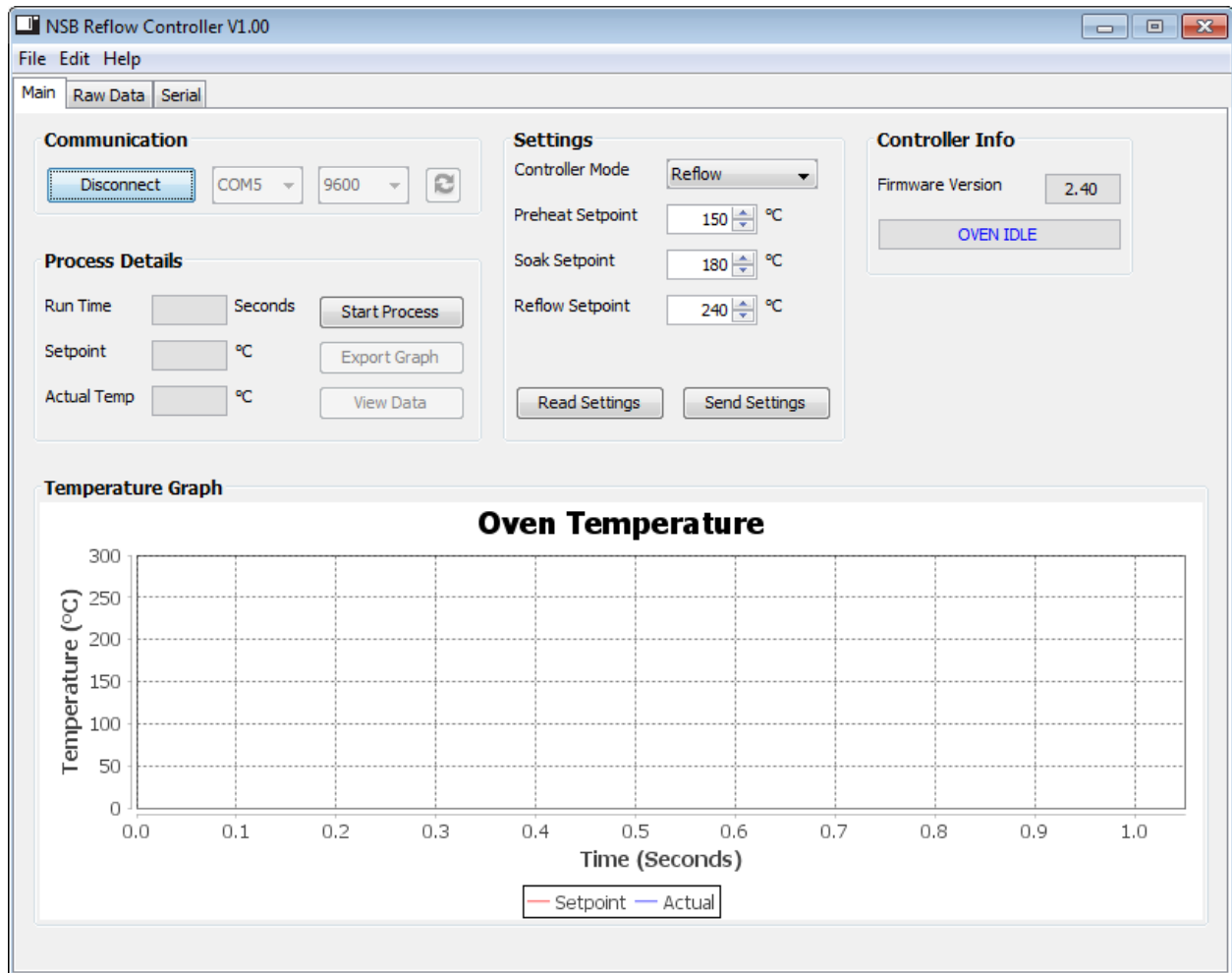


Figure 7. GUI Main window once connected

The sections below describes each panel of the main GUI in more detail.

3.2.1 Process Details

The Process Details section indicates the current process information. It also allows control to start and stop the process.

- **Run Time**
Displays the total run time of the process
- **Setpoint**
Displays the controller setpoint temperature
- **Actual Temp**
Displays the actual controller temperature
- **Start Process**
Sends the start process command to the controller. When the controller is running, the button will change to Stop Process to send the stop command to the controller
- **Export Graph**
Allows the graph to be exported to jpeg or png format once the controller process has stopped
- **View Data**
Allows the raw data from the controller to be viewed. This will redirect to another tab in the GUI which also allows this data to be exported to csv

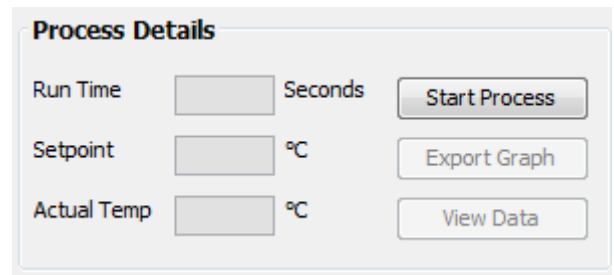
The screenshot shows a window titled "Process Details". It contains three input fields on the left: "Run Time" followed by "Seconds", "Setpoint" followed by "°C", and "Actual Temp" followed by "°C". To the right of these fields are three buttons: "Start Process", "Export Graph", and "View Data".

Figure 8. Process Details

3.2.2 Settings

The Settings window allows the Reflow Controller settings to be easily changed. The settings can be sent to the controller and retrieved back using the buttons.

- **Controller Mode**
Changes the controller between Reflow or Temperature controller. When the mode is changed, the GUI window updates to display the relevant settings for that mode. See figures below for info.

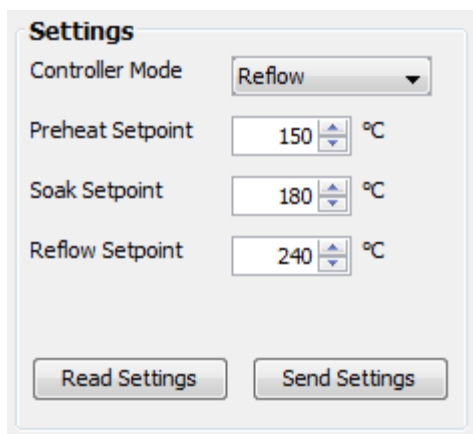
The screenshot shows a window titled "Settings" in "Reflow" mode. The "Controller Mode" dropdown is set to "Reflow". Below it are three input fields: "Preheat Setpoint" with a value of 150, "Soak Setpoint" with a value of 180, and "Reflow Setpoint" with a value of 240, all followed by "°C". At the bottom are two buttons: "Read Settings" and "Send Settings".

Figure 9. Reflow Mode

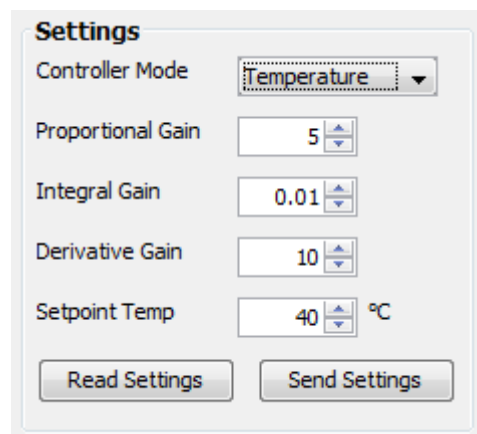
The screenshot shows a window titled "Settings" in "Temperature" mode. The "Controller Mode" dropdown is set to "Temperature". Below it are five input fields: "Proportional Gain" with a value of 5, "Integral Gain" with a value of 0.01, "Derivative Gain" with a value of 10, and "Setpoint Temp" with a value of 40, all followed by "°C". At the bottom are two buttons: "Read Settings" and "Send Settings".

Figure 10. Temperature Mode

In Temperature Mode, the Setpoint Temp value can be changed to change the setpoint on the controller

3.2.3 Controller Info

The Controller Info section will indicate the firmware version loaded on the Reflow Controller. This function is only available from firmware version 2.40 and upwards. If the version is not showing, it is possible to upgrade the firmware using the GUI, see section 3.4.1 below. The latest firmware is available on the NSB Electronics website.

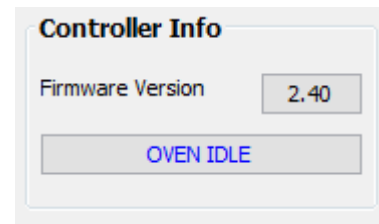


Figure 11. Controller Info

The text window shows the current controller status and updates as the controller goes through its process. Error messages are also displayed in this window in red.

3.2.4 Temperature Graph

The temperature graph plots the setpoint and actual temperature reported by the controller while the process is running. This graph can be exported using the Export Graph button.

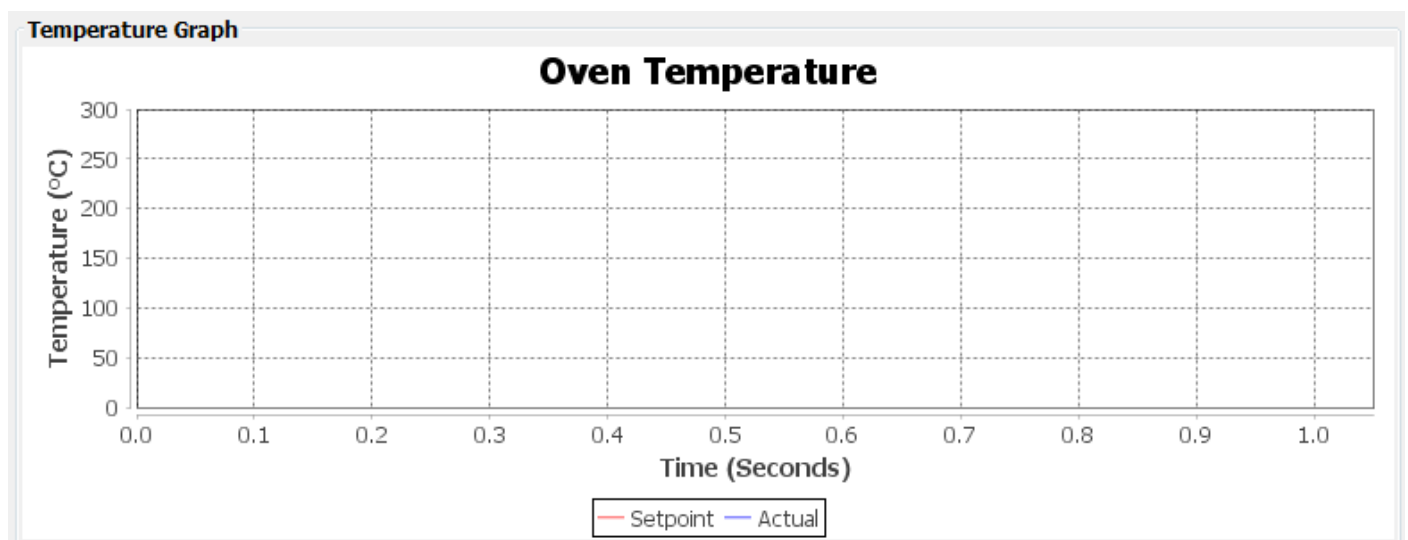


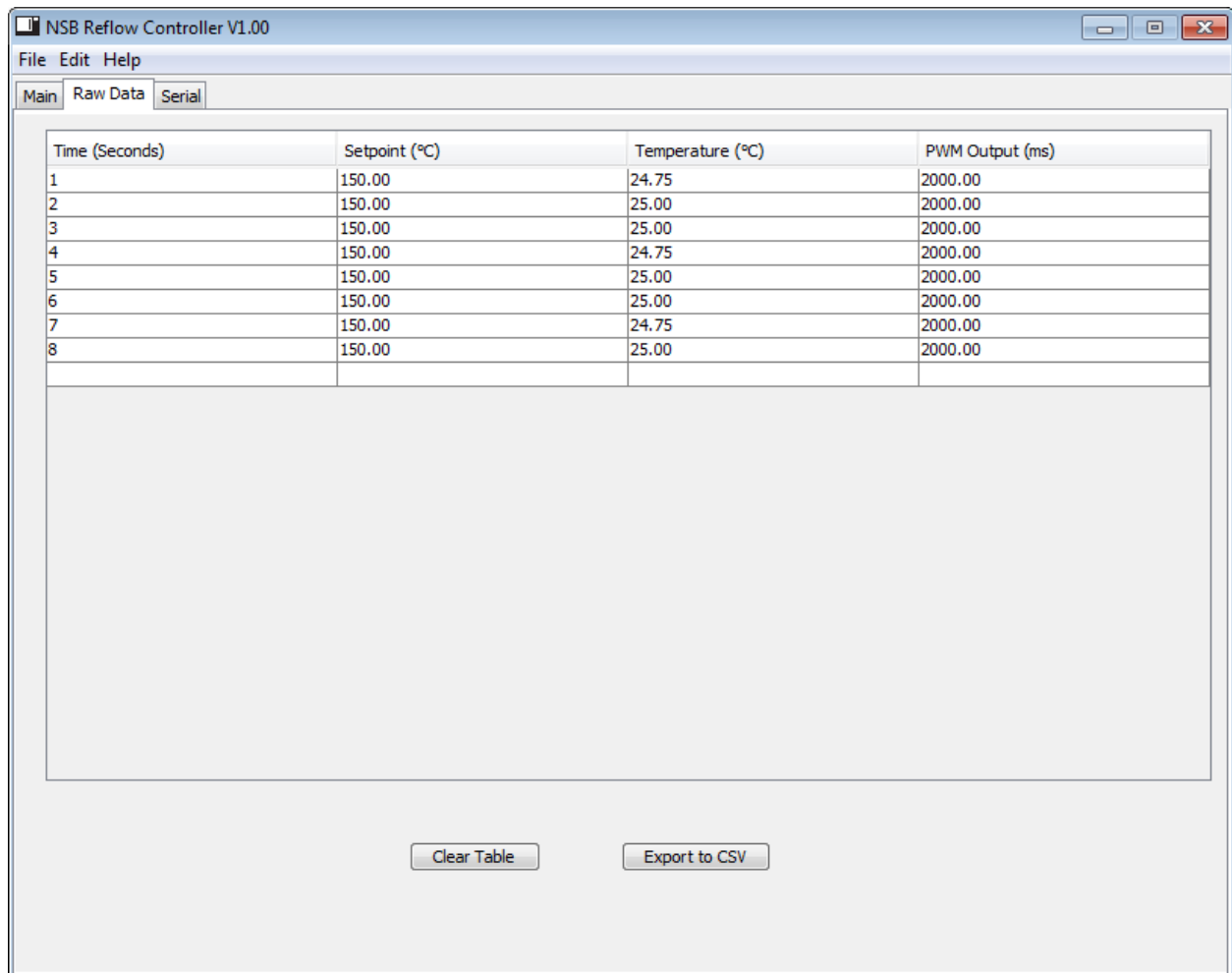
Figure 12. Temperature Graph

3.3 Raw Data Window Description

When the controller sends raw data, it is captured in the table on the Raw Data tab window. This data is also the data displayed by the graph on the main window.

Once the process is stopped, the Export to CSV button becomes available and allows the raw data to be saved to a Comma Separated Values (CSV) file. This file can then be processed further using a program like Excel.

The Clear Table button removes all data from the table. The same will happen if a new process is started, it will also first clear the table before inserting new data to it. Thus be sure to save the data of the completed process before starting another, or the data will be lost.



Time (Seconds)	Setpoint (°C)	Temperature (°C)	PWM Output (ms)
1	150.00	24.75	2000.00
2	150.00	25.00	2000.00
3	150.00	25.00	2000.00
4	150.00	24.75	2000.00
5	150.00	25.00	2000.00
6	150.00	25.00	2000.00
7	150.00	24.75	2000.00
8	150.00	25.00	2000.00

Figure 13. Raw Data tab

3.4 Serial Window Description

The Serial window is used to directly interact with the controller via the serial port.

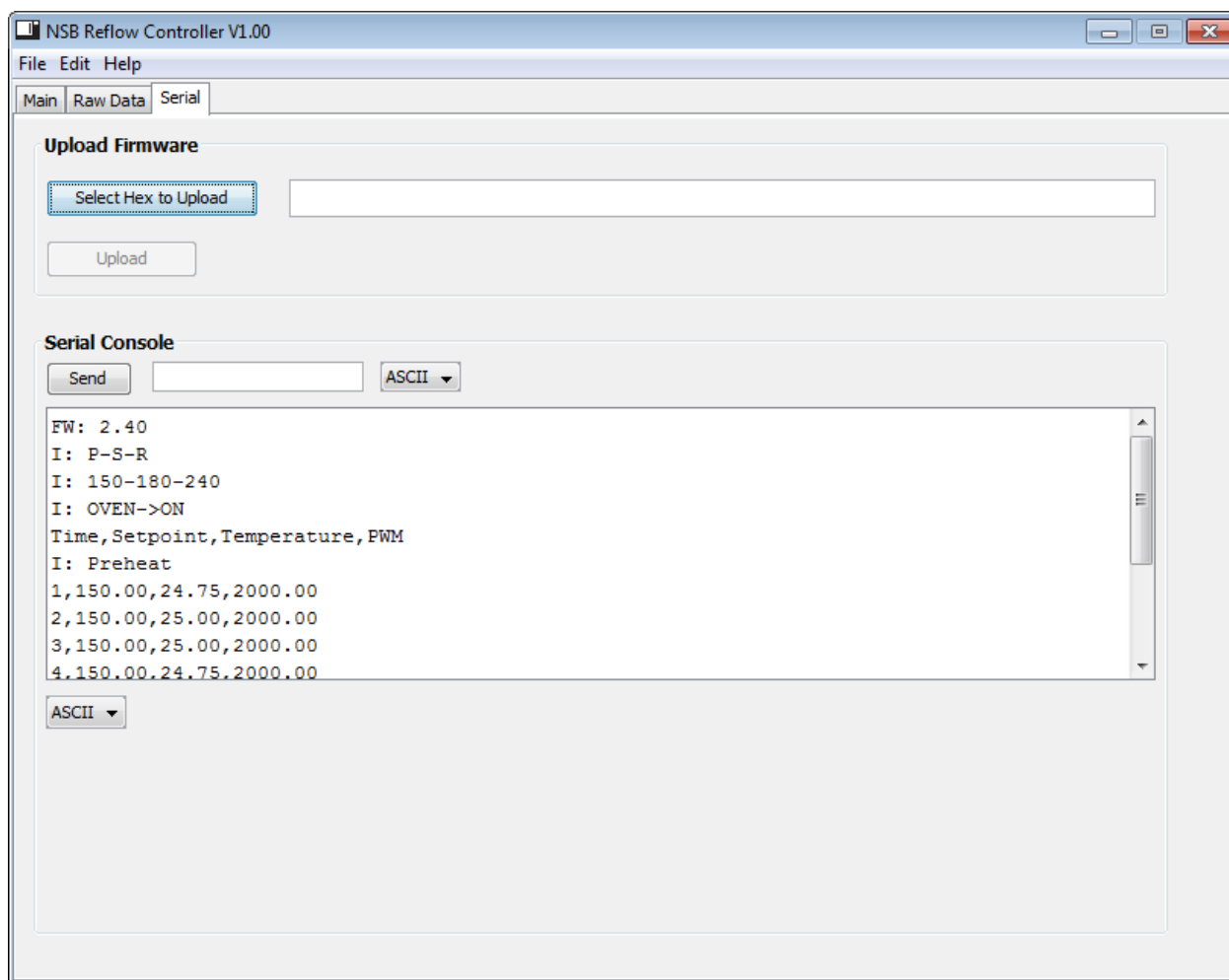


Figure 14. Serial tab

3.4.1 Upload Firmware

This section can be used to upload new firmware to the controller. This is handy when new features are added or bugs are fixed in the Reflow Controller firmware code.

The latest firmware is available on the NSB Electronics website for download. Once downloaded, click the Select HEX to Upload button and browse to where the .hex file is saved.

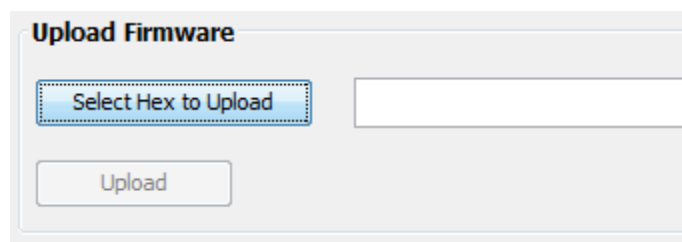


Figure 15. Upload Firmware

Once a file is selected, the Upload button can be used to send the new firmware to the controller.

Note: No settings on the controller will be lost. These are saved in a location that is not affected by the firmware upload. The settings are stored in the EEPROM and will remain as they were before the firmware upload. If new settings were added to the controller, these will be set to their default values and can be changed by the user to the desired value.

3.4.2 Serial Console

The Serial Console allows raw serial commands to be sent to the controller. This should not be needed as the GUI handles all the available commands. It is mostly used as a test interface if problems arise. The text area displays the raw serial data received by the GUI and can be used to trace problems or bugs.

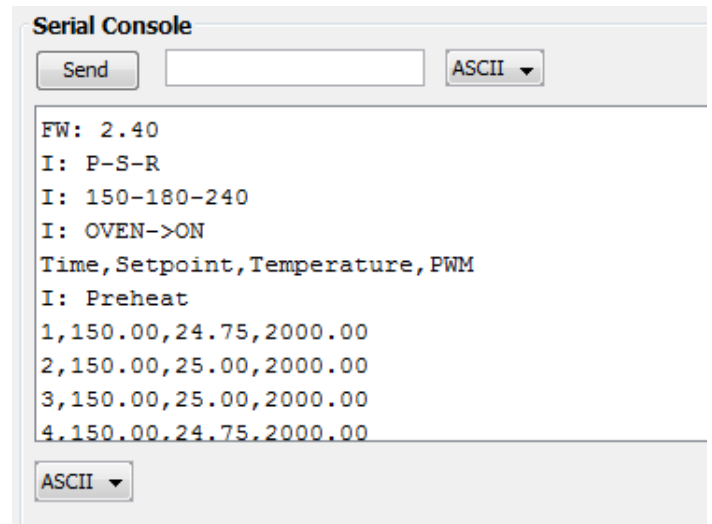


Figure 16. Serial Console

3.5 Error Codes

Below is a table with expected error codes and possible causes and solutions.

Table 2. Error Codes

Error	Description	Possible Solution
TC OPEN!	An open circuit has been detected on the thermocouple	<ul style="list-style-type: none">• Check that the thermocouple is plugged into the controller• Check that the wire of the thermocouple is not damaged, if so, replace the thermocouple
TC SHORT!	A short circuit has been detected on the thermocouple	<ul style="list-style-type: none">• Check that the thermocouple tip is not touching any metal or conductive surface connected to ground/earth• Check that the wire of the thermocouple is not damaged, if so, replace the thermocouple
TIMEOUT!	The reflow process timed out, took longer than 6 minutes to reach the reflow stage	<ul style="list-style-type: none">• Check that the oven door is closed• Check that the oven timer is still running• Check that the oven element is getting hot
UNKNOWN!	An unknown error occurred	<ul style="list-style-type: none">• Check the raw serial data for any clues or contact us to try and resolve

Appendix A: List of Abbreviations

The following table provides definitions for terms relevant to this document.

Term	Definition
API	Application Programming Interface
COM	COMmunications
CPU	Central Processing Unit
CSV	Comma Separated Value
EEPROM	Electrically Erasable Programmable Read Only Memory
GUI	Graphical User Interface
PC	Personal Computer
PID	Proportional–Integral–Derivative
SMT	Surface Mount Technology
USB	Universal Serial Bus