CompnTemp

Compensating Developing Timer

Version 1.11

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Probe clamp and drawings - Copyright Alan Ross

```
00:31

Temp: 70.59 F

Target Temp: 72.00 F

Elapsed Real time: 02:06
Elapsed Comp time: 02:00

Stop
```
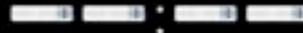
Introduction

The CompnTemp Timer, CT for short, is a compensating developing timer software application. CompnTemp reads the developer temperature using a USB temperature probe and compares this to a target temperature. It compensates for fluctuations in developer temperature by slowing down or speeding up the timer to maintain constant development. The CT timer has both a count-up and a countdown mode. It needs three basic parts to function, the CT software, the Go!Temp temperature probe and a computer. CT can monitor temperature in tray development (Figure 1) or tank development (Figure 2, with a small modification of the tank lid). CompnTemp will run on either Windows or OS X machines. CT is written in Java, so it will run on any computer platform, however CT also uses a JNI library that is platform specific. JNIs are provided for the Microsoft Windows and Apple Mac OS X platforms.

The Go!Temp temperature probe is an inexpensive USB temperature probe made by Vernier Software (http://www.vernier.com/). Vernier makes products targeted for the educational market. Read their disclaimer about the intended use of their products, before you decide if CT is right for your use.

CT can be used without the GoTemp probe as a normal darkroom timer. There are also controls that let the user manually set the current temperature, but these are mainly for demonstration purposes and not an efficient way of using the compensating timer.

CompnTemp Features

- Toggle between real and Comp Time
- Fahrenheit or Celsius
- User settable target temperature
- Keyboard or pull-down menu options to set time
- Optional remote USB 10-keypad start-stop & time input
- Programmable compensation curve
- User selected options (profiles) are savable
- Restorable default profiles
- Easily switch between profiles
- Count-down or Count-up timer modes
- Metronome sound, at user defined interval
- End of time alert sound in countdown mode, at user defined interval
- Multiple print processing option in count-down mode

What you need to use CompnTemp as a compensating developing timer:
See the Before you Begin section for more information.

	Where to find
Essential	
CompnTemp Software	http://curtpalm.com/Software.html
Go!Temp probe	http://www.vernier.com/
Computer with at least one USB port	
Recommended	
Remote 10-key keypad, mouse or 2nd keyboard	
USB footswitch	http://www.delcom-eng.com
Safelight cover for Computer Screen	
Red plexi	Art supply, plastic supply store
Rubylith	On-line auction, curtpalm.com
Kodak Safelight	On-line auction
Red theatrical/lighting Gel	Theatrical, film supply store
Clamp for Go!Temp	
Ross Clamp	Alan Ross (alan@alanrossphotography.com)
Heavy Duty Velcro	Plastic supply store – TAP plastics

Figure 1. CompnTemp timer in Alan Ross's darkroom. The filter on the screen is a sheet of red acrylic plastic from the local plastic store. With this plastic filter in place, the monitor was tested safe against paper fog for at least 7 min exposure with the paper lying on the keyboard. Note the keyboard Alan has mounted over trays. It is connected to the laptop computer by its USB cable and used to control the timer. Any key, other than the number keys, can be used to start/stop the timer.

Figure 2. Go!Temp probe in Patterson tank. Tank was modified by drilling a small hole in lid. (thanks to Alan Ross for tank modification idea and photo).

Main Window: The Timer

Figure 3. CompnTemp Main Window. The time is displayed at the top of the window. The current temperature, the target temperature and elapsed time and the real elapsed time are displayed below. A set of pull-down menus for setting the timer is on the right side of the window. The timer start time can also be set from the keyboard.

Before You Begin

Computer:

CompnTemp runs on Microsoft Windows and Apple Macintosh OSX computers. It has been tested on windows XP and Vista and OSX 10.4 and higher. The computer needs at least one USB port for the Go!Temp probe. A second USB port is useful for connecting a mouse or other input device for controlling the timer.

Testing and setting up your computer for the darkroom.

Light leaks: Most computers have light sources other than the monitor, such as indicator lights or on Apple laptops the glowing apple on the back of the screen. Make sure you can turn off or block any light sources that you think are a problem. Do NOT block or tape over anything that could be a cooling vent.

A good secure place for your computer: the computer will be on the wet side of the darkroom. Evaluate the chance of spills and the chance of the computer falling in liquids or off a shelf. Several companies sell plastic keyboard covers, which can be useful in protecting keyboards from wet fingers or splashes. In addition, a secondary input device, such as a mouse, keyboard or 10-keypad can be attached to your computer (Figure 1) and used to control the CT software. This eliminates the need to touch your laptop keyboard during processing (with potentially wet fingers) and also allows the computer to be put in a more out-of-the way location and have a more convenient location for the start/stop controls.

Computer Screen Safelight - Paper Fogging test

It is definitely recommended that you test your computer/timer setup for paper fogging using a good paper fog test. Paper left on my laptop keyboard does not fog for at least 7 minutes with the red acrylic or rubylith in front of my computer screen. However your darkroom setup and computer are likely to be different, so do a paper fog test.
Another alternative for a computer safelight is one of the larger Kodak safelight filters. There is at least on type that is transparent. The 12-inch version (and perhaps a smaller size with some sort of mask) should give enough space to see the timer. These are expensive new, but can be found used on auction sites. Another alternative for a safelight cover could be red theatrical/lighting gels. I have not tested these for paper fogging.

Go!Temp Probe

The plastic top of the probe is not waterproof and should not be submerged in liquid. The sensor for the probe is at the tip of the probe, so having 1/2 inch (and perhaps less) of the probe in the liquid is sufficient for an accurate reading.   When used in a tray, it is recommended that a clamp be used to secure the probe. Suggested options include; 1) Plastic clamp designed by Alan Ross. This is the best option I've seen. For ordering

email Alan Ross at: alan@alanrossphotography.com. The clamp can be seen if Figure 1 and Figure A2 (in appendix) See Appendix for drawings. 2) 3M™ Marine Reclosable Attachment (Five times stronger than conventional hook-and-loop fasteners (Velcro) and water-resistant). This option puts the top of the probe close the liquid in the tray, so care must be taken to keep the plastic top of the probe out of the liquid.

Options for Starting and Stopping the Timer

The timer can be started and stopped by tapping any key except the numbers on the keyboard or by clicking the mouse button on the start/stop button on the timer. However in the darkroom this may not be the best option. The computer may be set up too far away to reach easily and or one's fingers may be wet from chemicals. Attaching a second input device to the computer is a good option in these cases. Some of the options for second input devices are: 1. Second keyboard – (see figure 1.), 2. a mouse, 3. 10-keypad, 4. USB footswitch. Many people may have a spare one of these devices lying around their house. See the Remote Start/Stop or Foot Switch section in Operation section for details.

Tank Development

Some daylight film developing tanks have holes in the center for filling and/or a thermometer. The Go!Temp probe can be immersed in the developer by setting it in this hole. Other tanks have a solid lid and can be modified by drilling a small hole in the lid. Depending on the material of the lid, once the probe is inserted into the lid you may have a light and liquid proof seal, so you can invert the tank when mixing. If not, a rubber gasket can be fit into the hole first, and then the probe inserted. This will give a watertight and light-tight seal.
Tanks can also be set in a large tub filled with water and the temperature of the water in the tub monitored by the probe.
See appendix 2 for details and photos.

Operation

Setup:

1. It is recommended that you turn off screen savers and sleep functions of your computer. At least some of the operating systems will still start their screen savers or go to sleep even though CT is running.
2. plug Go!Temp probe into USB port. This needs to be done before starting software. CT will not recognize Go!Temp probe if probe is plugged in after CT software is started.
3. Start the CT software. The software will find the Go!Temp probe and turn of the LED light on the probe. The current temperature will be displayed in the main timer display window.
4. Resize Main Window, if needed. CT tries to fill your computer screen completely, to keep light coming from your screen to a minimum. On some systems it may be necessary to click the maximize window button, to expand the CT window to fill the screen.
4. Place probe in developer. See before you begin section for suggestions on how to clamp your probe to the tray.
5. If needed, select a profile and/or start time. If using countdown mode, set time by either the pull-down menus or the numbers on the keyboard. For using the keyboard, enter the numbers sequentially. For example, for 9 minutes, type "9", "0", "0". Note that the display responds after each number typed and converts to minutes and seconds in the display. So after entering "9", "0", the display will show 01:30, not 00:90. When the second "0" is entered the display will show 9:00.

Running the timer:

There are three ways to start and stop the timer:

1. Clicking with the mouse on the Start/Stop button on the lower left part of the timer.
2. Pressing any key on the keyboard other than the number keys.
3. Pressing the "enter" key on the remote 10-keypad in countdown mode or any key on the 10-key in countup mode. (See 10keypad info below).

In countdown mode, the timer beeps (makes the system alert sound, so it may not be a beep) when there is 5 seconds left on the countdown. When the timer reaches 0, it resets to the start time and the real elapsed time is displayed in a small font on the timer face, unless the print number is set to greater than 1. In that case, the counter will continue counting down in five-second intervals for each additional print and then reset to the start time.

In count-up mode, the timer runs continuously until stopped and resets to 00:00 when stopped. The timer can count up to 99:59, after which it resets to 0:00 and keeps counting.

Remote Start/Stop or Foot Switch

A USB mouse or 10-key or secondary keyboard can be used as a remote start/stop switch. USB wireless mice are a nice alternative in that they remove having to deal with the cables. When using a mouse solely as an on/off switch, one can disable the tracking capability of the mouse (by taping over the light source or removing the trackball) so the mouse will not move the curser when bumped. The curser has to be over the start/stop button to start or stop the timer using the mouse. This way the curser is more likely to remain over the on/off switch since in will not move due to accidentally bumping of the on/off switch mouse.   When using a keyboard to start or stop the timer, the location of the mouse is not relevant. A 10-key pad is useful in that it can also be used to enter the time for the countdown mode. Delcom makes a reasonably priced ($36.00 in 06/2008) USB footswitch (http://www.delcom-eng.com/productdetails.asp?productnum=803661) that sends a left mouse click. It comes with a 6-foot USB cable, so you may need to have a USB extension cable to use in the darkroom.

Selecting CompnTemp Profiles

A CT profile is the set of preferences that control the behavior of the timer. Selecting a profile sets all of the preferences to the values defined by that profile. Profiles are selected from the pulldown 'Profiles' menu in the main menubar.   CT comes with preset profiles, which can be user modified. The user can also create and save new profiles.
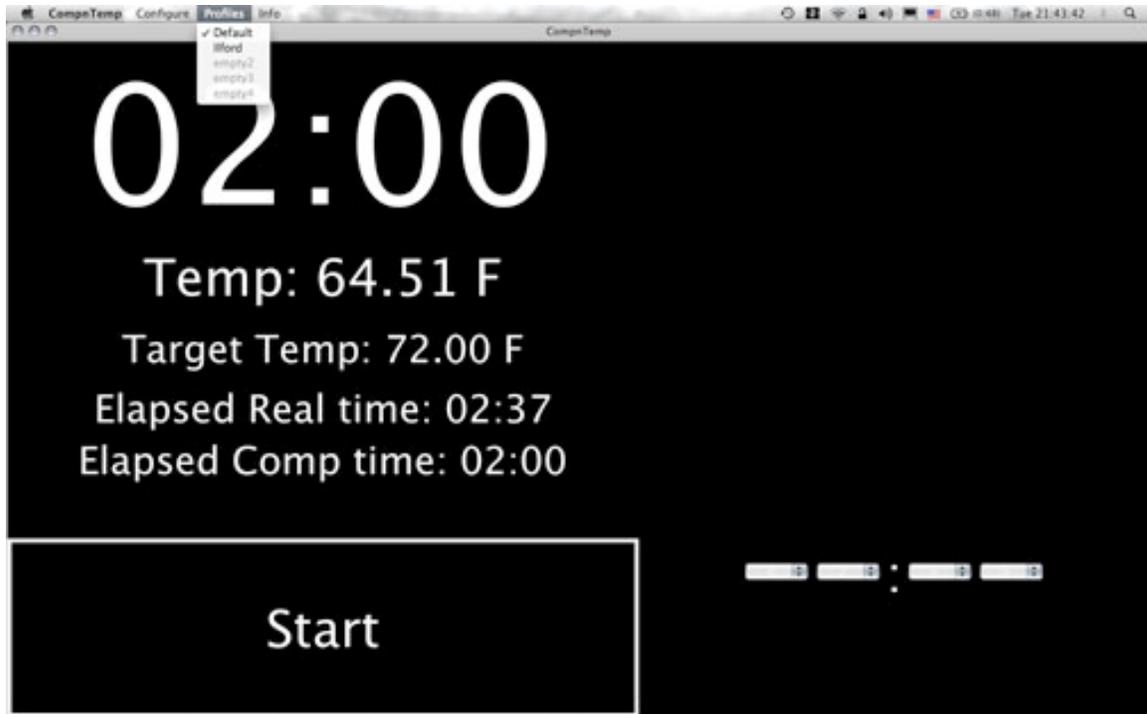
Figure 4. The pull-down Profile menu in the main menu bar

Changing CompnTemp Preferences

The pull-down menu (see fig. 3) is the way to access the CT change preference options. This menu gives you three options: to switch between Fahrenheit and Celsius for the temperature units; to switch between comp time and real time for the timer; to open the Preferences window. The preferences window gives all the options available with the CT timer and the option to save preferences as a profile. The preferences are described below.
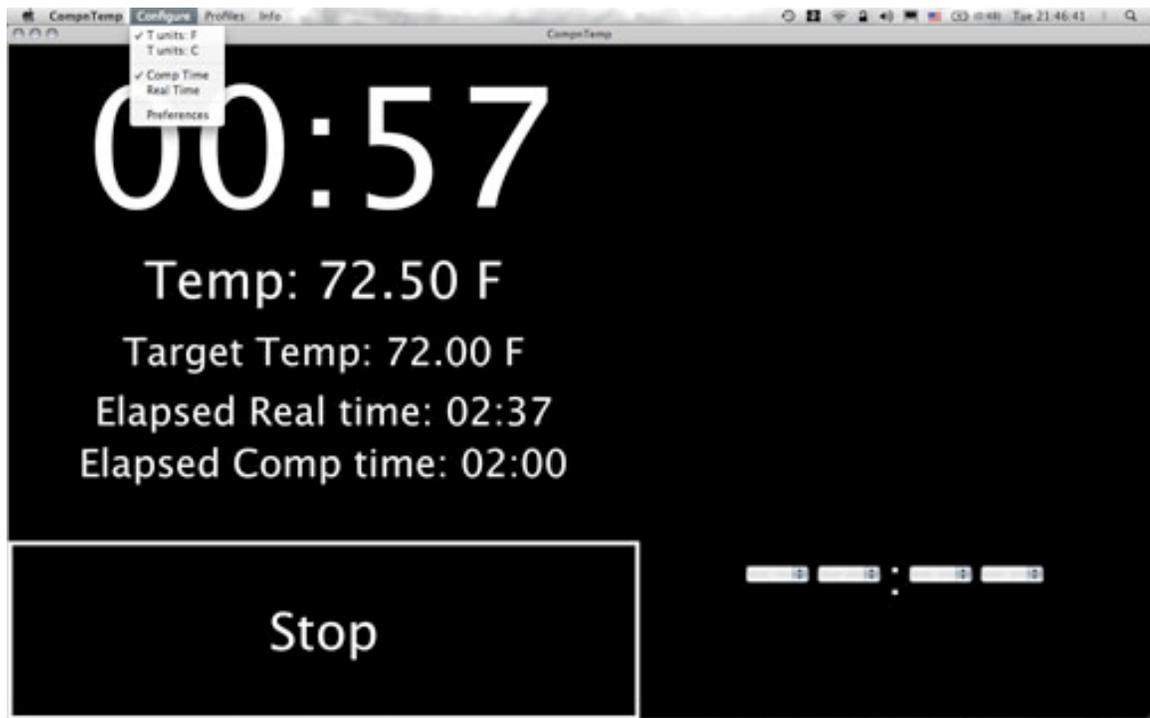

Figure 5. The pull-down configuration menu in the main menu bar

The Preferences Window

Selecting the preferences option in the pull-down menu from the main menu bar brings up the preferences window shown in figure 5. The different options are identified by red letters in the figure and described below figure 5.
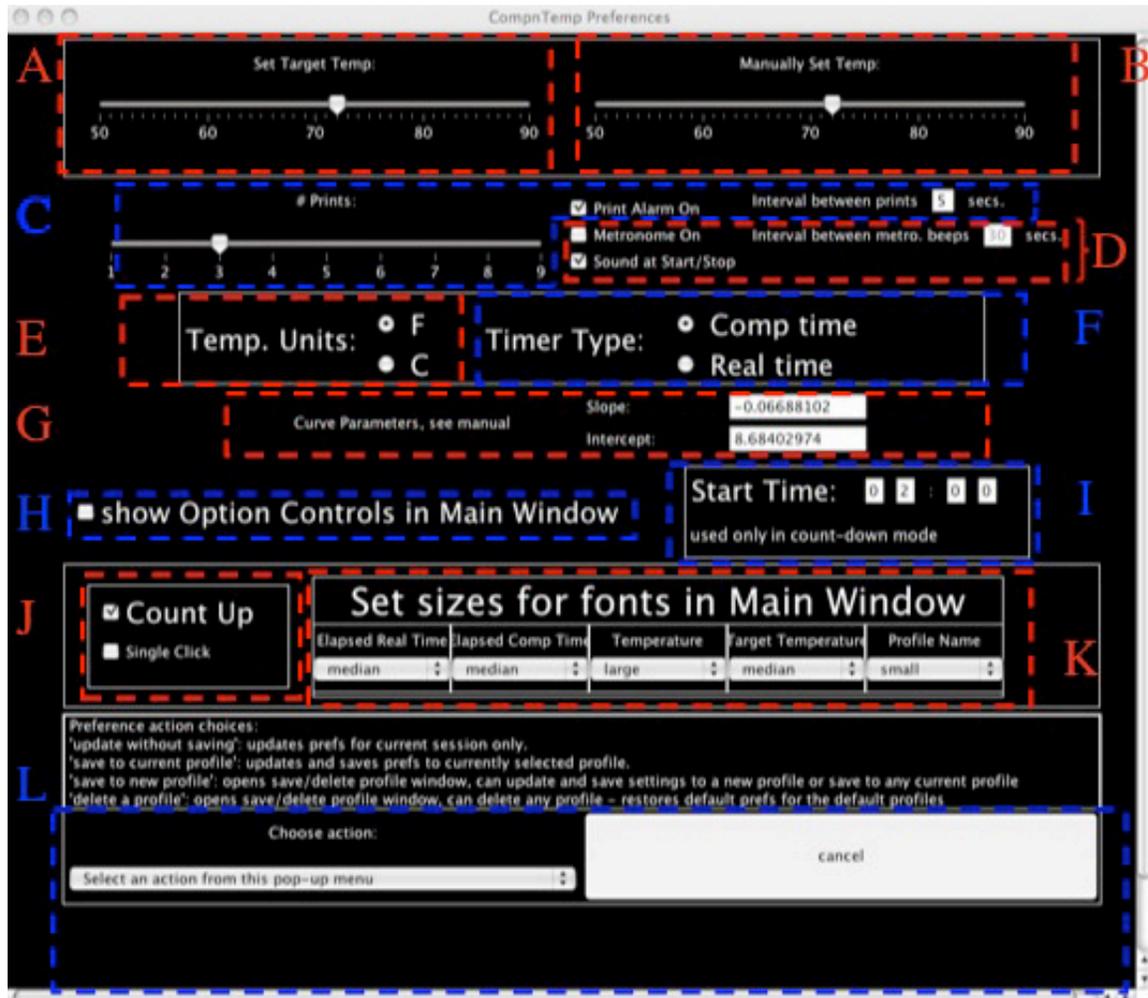
Figure 6. Preference window. The different preferences are labeled with red or blue letters. See text below for descriptions of preferences.

A. Manually Set Temp

This slider allows the user to manually set the developer temperature. It is designed mainly for use in demo mode, The GoTemp probe will override this setting.

B. Set Target Temp

This slider sets the target temperature, the temperature for which comp time equals real time.

C. Number of Print controls: In count-down mode, sounds a warning at intervals for each print. First warning is always sounded with the interval time remaining on the timer. If multiple prints are being processed, the timer continues to count past 0, making the warning sound at every interval. For example if three prints was selected and the interval was 5 seconds, the timer would make the warning sound at 00:05, 00:00 and –0:05 seconds and the timer would continue counting until – 0:10 and the reset to the start time. The sound used is the system alert sound, so if you want to change the sound you need to change the system alert sound. The

"Print Alarm on" checkbox turns the sound off or on. The default value is for the interval is 5 seconds and for number of prints is 1.

D. Metronome On and metronome interval. Turns metronome beep on/off and sets interval for beep, minimum one second, no fractional seconds (value must be an integer).

Sound at Start/Stop – sounds beep at start and stop of timer.

E. Temp. Units: Toggles temperature display on timer between Fahrenheit and Celsius. Currently does not change the units on the sliders. Default is Fahrenheit.

F. Timer Type: Toggles timer from counting in real time or comp time. Default is comp time.

G. Change Comp Curve. Boxes for entering slope and intercept to define a compensation curve. (See Compensation Curve section for details).

H. Show option controls in main window. Checking this box displays most of the controls in the main window (see figure 6). This makes changing the options faster, you don't have to go through the pull-down menus each time to change an option. Useful when exploring the features of the CT timer.

I. Start Time. Sets start time for countdown mode.

J. Count up. Toggles between countup and countdown mode, selecting Count up button also activates single-click button. If single-click button is selected, timer resets and restarts counting with a single click, otherwise one click stops timer and resets to zero and a second click starts timer.

K. Change font sizes or hide. Can change font size or hide the different timer information shown in the main window.

L. Update, Save/delete menu bar, and cancel buttons. Menu bar choices are:

       'update without saving': updates prefs for current session only.

       'save to current profile': updates and saves prefs to currently selected profile.

       'save to new profile': opens save/delete profile window, can update and save settings to a new profile or save to any current profile .

       'delete a profile': opens save/delete profile window, can delete any profile also restores default prefs for the default profiles.

Cancel cancels any changes made in the preference window.
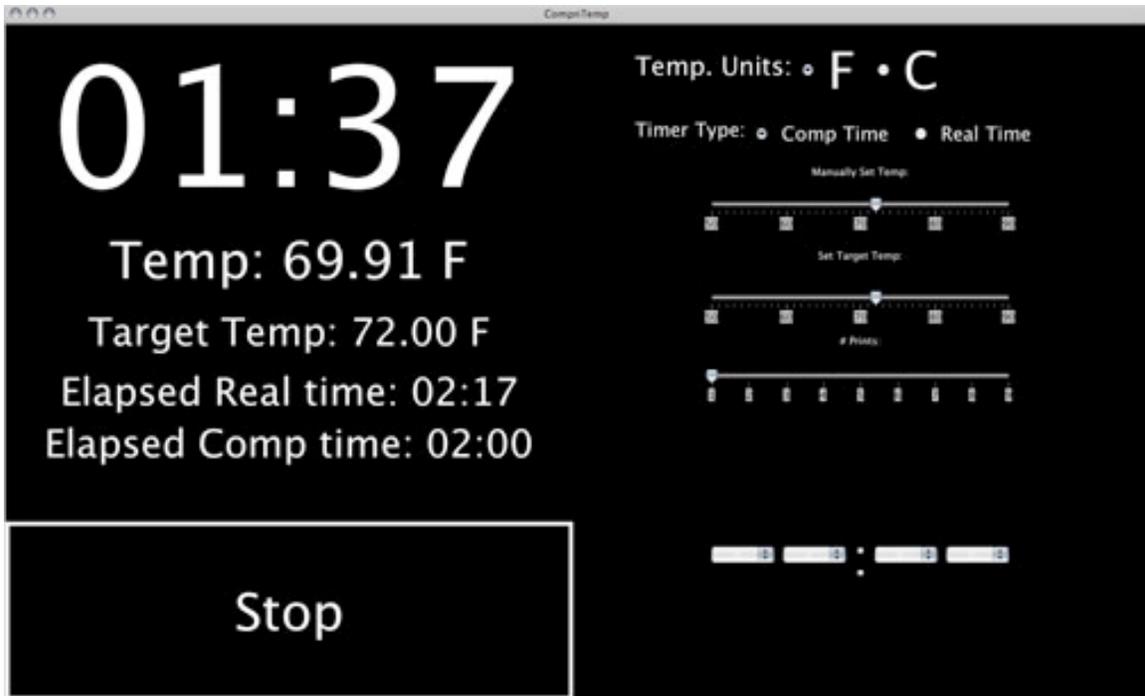
Figure 7.   CompnTemp main window with preference controls displayed

Saving and Deleting CompnTemp Profiles

To Save a Profile:
1. Type a profile name in the box labeled "New Profile Name".
2. Select profile position from pulldown menu "Select Profile Position".
3. Click "Save Profile".

To Delete a Profile:
1. Select profile position from pulldown menu "Select Profile Position".
2. Click "Delete Selected Profile".
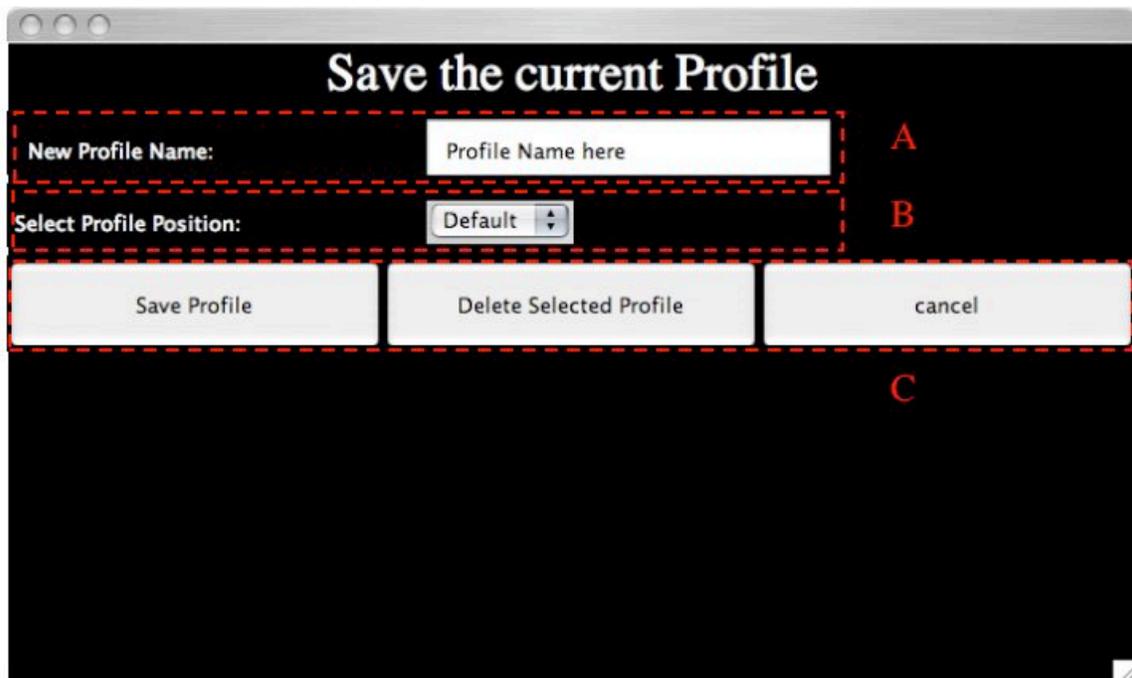
Figure 8. The save profile window.

Profiles can be saved in any of the five profile positions. If there is a profile in the selected position when "Save Profile" is clicked, that profile will be replaced. If a profile is deleted from a position that originally contained a default profile, the default profile will be restored when the current profile is deleted. If no default profile was stored, the position will return to being labeled "empty". The user definable parameters and their default values are in table 2.

Table 2. Parameters and their default values.

Profile name	Paper_VI	Ilford	Film_VI
Current Temp.	72	72	72
Target Temp.	72	72	72
Compensating or real time	Compensating	Compensating	Compensating
F or C	F	F	F
Show Prefs. in main window	No	No	No
Slope	-0.06688102	-0.05187782	-0.04979394
Intercept	8.68402974	7.61662578	7.47238868
# Prints	1	1	1
Print interval	5 sec.	5 sec.	5 sec.
Print alarm on	Yes	No	
Count up or down	Down	Up	Down
Start time	2:00	0:00	2:00
Metronome on	No	Yes	No
Metronome Interval	30	30	30

Note: the Profile called paper_VI was called Default in version 1.0

The Compensation Curve

Plots of temperature versus development time are shown in figures 9 and 10. These data do not fit a simple linear curve, however a log of the time vs. temperature produces a linear plot. This makes curve fitting and calculating a compensation factor much simpler. A compensation factor is calculated using the current temperature and the target temperature and the compensation curve equation.
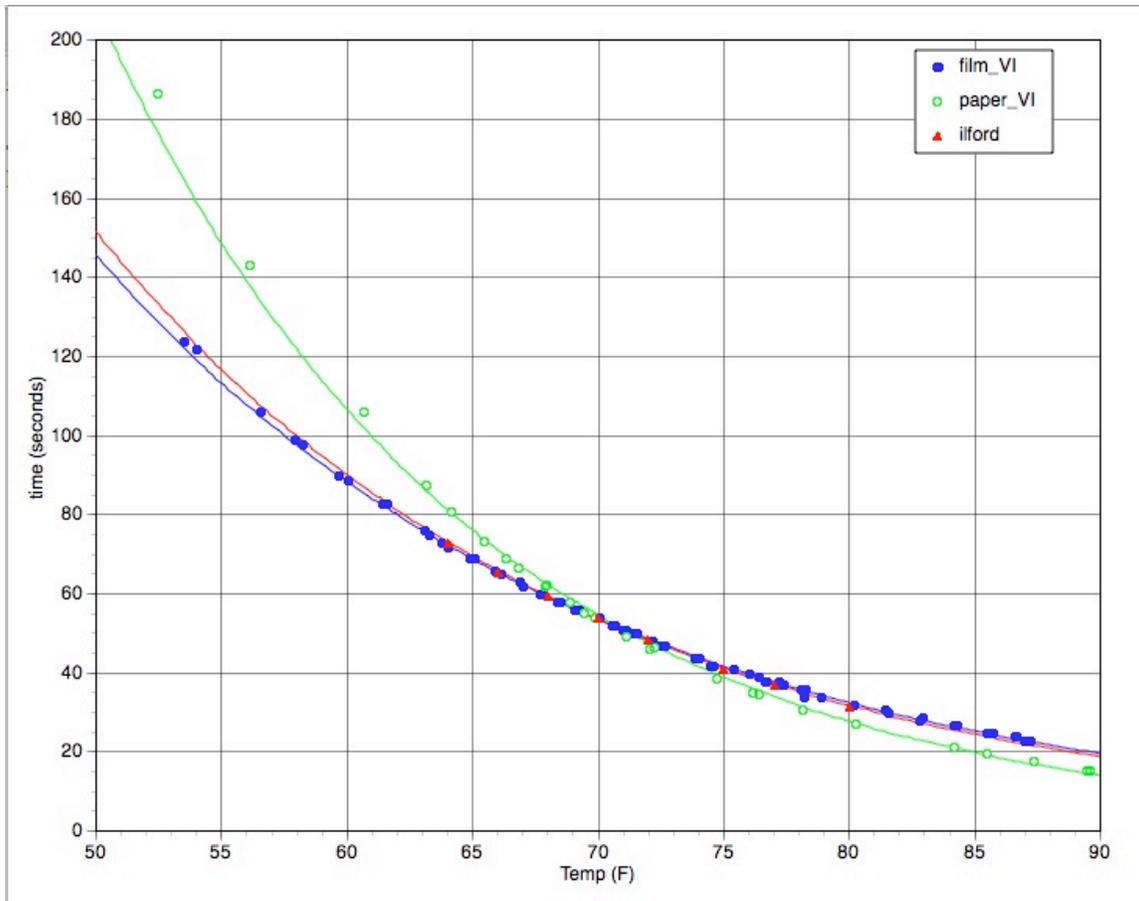

Figure 9. Plot of temperature vs. time of development for Zone VI paper, Zone VI film and a set Ilford recommended times for film developing. Temperature of developer is plotted on the x-axis and real time is plotted on the y-axis.
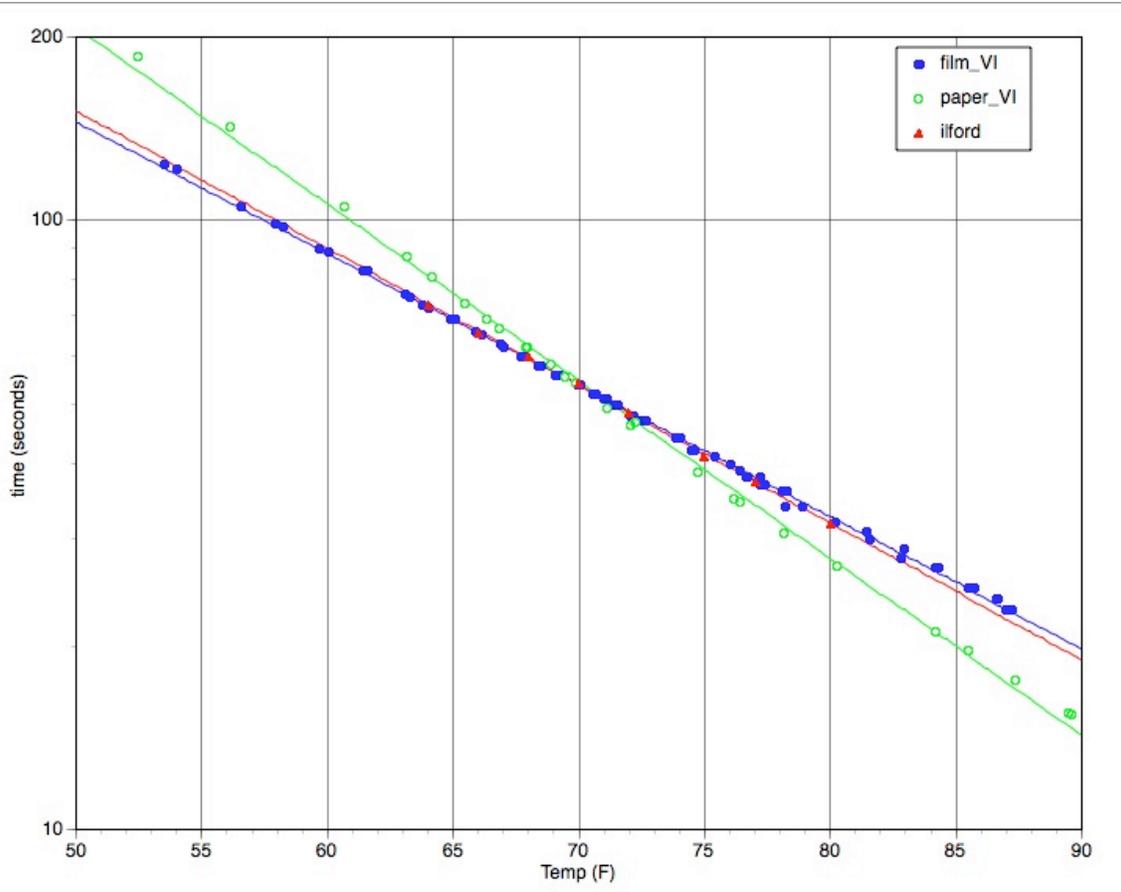
Figure 10. Temperature vs. log time for the Zone VI film, Zone VI film and Ilford film data. The lines are the least squares fit of the data from which the slope and intercept are derived.

Table 1. Slope and Intercept for different data sets

	Slope	Intercept
Zone VI paper (paper_VI)	-0.06688102	8.68402974
Ilford	-0.05187782	7.61662578
Zone VI film (film_VI)	-0.04979394	7.47238868

These numbers are the defaults for the CompnTemp timer.

If you have your own data for your compensation curve, here is what you need to do. You need to determine the best-fit straight line for your data and find the slope and intercept for that line. You enter the slope and intercept into the change comp curve preferences window and the CT timer will be using your custom compensation data.

The Details:

    1. The data: a set of temperatures and corresponding development times that give equivalent development.

    2. Log transform the development times.

    3. Plot the data; log time on the y-axis, temperature on the x-axis.

    4. Find the slope and y-intercept using a curve fitting method, such as least squares.

    5. Enter the slope and y-intercept in the curve preferences boxes.

Known Issues and Planned Features

1. Resizing the main window: resizing the main window to a smaller size, past a certain size causes the individual components to rearrange on the screen or some disappear from the screen. – A partial fix of this has been implemented – scrolling main window.
2. Windows version sometimes has problems with vertical scrolling. The window can be reset by minimizing and then maximizing the window.
3. Add set timer start to config window - completed
4. Increase number of savable profiles
5. Implement Temperature scrollbars switching from F to C when Temp units toggled. – done version 1.1

Revision History

Nov. 2007 release
>Turning off the beep: added an option to let user turn off the beep.
>Added user selectable comp. Curves -add more curves and interface to easily
>>select them
>Added more options for print intervals interval is user definable
>made info data, elapsed times, target temp, larger font (24 pt)

Jan. 2008 (version 0.3)
>Added font size options for displays
>Graying of start button, look and feel options

Feb. 2008 (version 0.4)
>Removed look and feel options
>White border around black start button

March 2008 (version 0.5)
>New menubar for Preference window choices
>Made main window vertical fit on 760 and up screens

March 2008 (version 1.0)
>Updated GoIO library to 2.20
>Fixed Windows bug introduced in 0.5
>Name changed to CompnTemp to avoid name collisions in the real world

August 2008 (version 1.1)
>Added metronome feature
>Made Celsius slidebars fully functional
>Added Zone VI film compensation parameters as a new default setting.

April 2009 (version 1.11)
>Added profile label to main window
>Added single click option to count up mode
>Added start/stop beep option

Appendix 1 – Clamp Drawing

Clamp design and drawing by Alan Ross

Go!Temp Probe-Clamp Assembly

Alan Ross

Hole #10 drill

saw kerf

1/4x20

30°

1-5/8

1-1/8

3/8

1

1-9/16

1-1/4

1-3/4
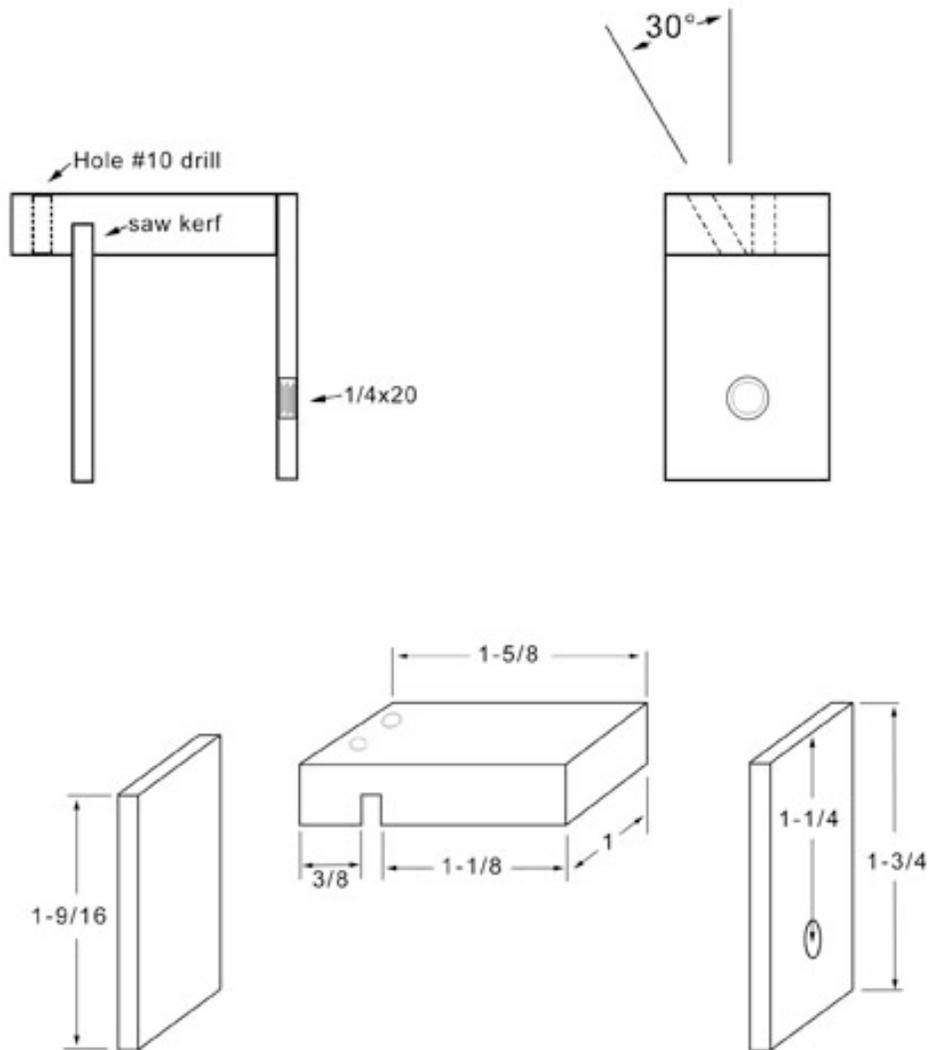
Materials: 1/8" and 3/8" plexi

Use plastic, stainless or brass screw to secure clamp

Scale: 1"=1"
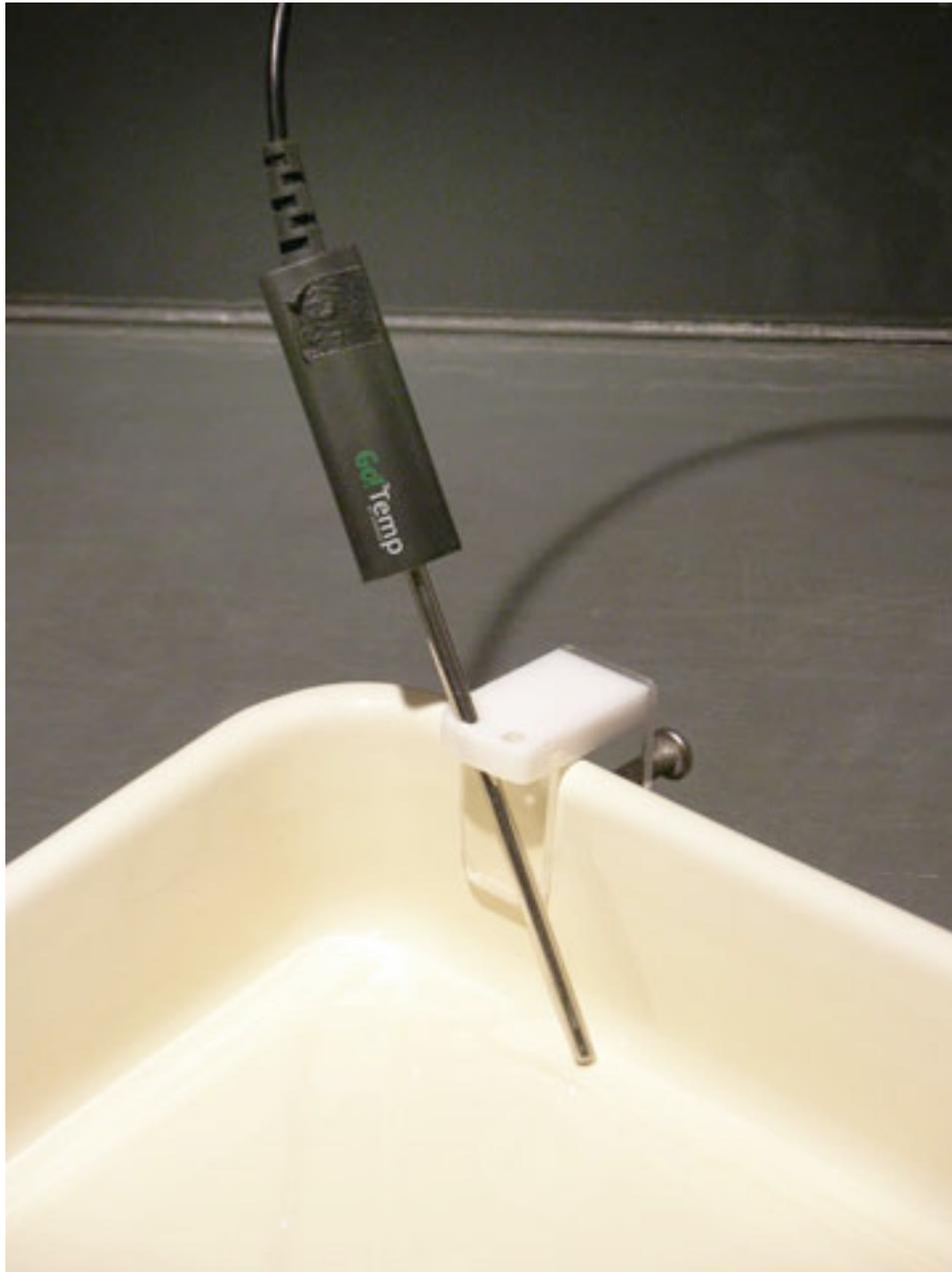
Figure A1-1. Ross clamp with Go!Temp probe attached to developing tray.

Appendix 2 – Film Tank Lid Modification

The photographs show the modifications to a hard plastic film tank lid that fits on a metal film tank. This lid consists of two parts, the larger lid that fits on the tank and a smaller lid in the center of the lid that comes off for filling and emptying the tank. Both lids were modified. An inexpensive plumbing washer was used as a gasket to make a water and light proof seal between the lids and the temperature probe.

Figure A2-2
The washer used to make a water and lightproof seal in the
tank lids. It is called a top-hat washer and can be found in
the plumbing department of hardware or home improvement
stores.

How-To:
-Using a drill bit slightly smaller than the smallest diameter of the washer, holes were
drilled in both lids with the smaller lid in place on the larger lid so that the hole align.
-The washer is then pulled half way through the hole in each lid so the lid sits in the slot
in the washer (Figure A2-2 and A2-3). A needle-nose pliers' works well for this task.
-A hole is then drilled in the center of each washer.

In Use:
-Push the smaller lid onto the probe first, then the larger, see figure A2-1 and A2-5.
-Filling and empting of the tank is done with the probe in place and the smaller lid slid up
to the top of the metal part of the probe. See figures A2-5 and A2-6
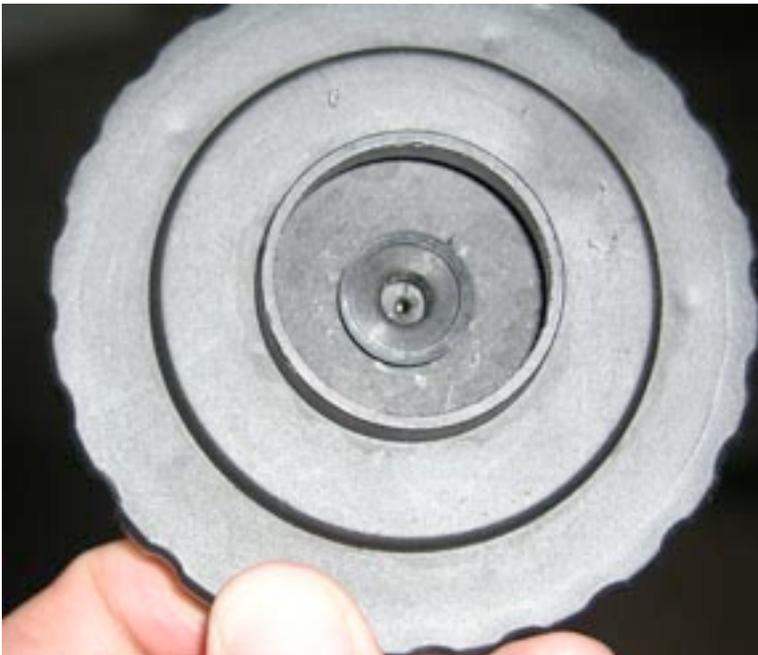
Figure A2-3 Lid top view

Figure A2-4. Lid bottom view

Figure A2-5. Filling the tank with the temperature probe lid modification

Figure A2-6 Empting the tank with the temperature probe lid modification

Figure A2-7. Tank Developing using water bath for temperature control