

# LSSC boat race timer – Quick start Guide v5

## Pursuit race

Plug the horn cable into the USB socket in the dog-house, then the mains13 Amp plug – wait 30 seconds

When the race type, start time and length is displayed, use mouse to click on the “Select if OK” button

Select button to run a Std Pursuit race. Click on the “HORN” button to test it is working

Click on all the boat types racing and “Yes” will appear next to them. When they start this will turn to “Started”

The horn will do all the start signals as indicated by the Next Start entry on the screen

## Crew Pursuit race

Plug the horn cable into the USB socket in the dog-house, then the mains13 Amp plug – wait 30 seconds

When the race type, start time and length is displayed, use mouse to click on the “Select if OK” button

Select button to run a Crew Pursuit race. Click on the “HORN” button to test it is working

Click on all the helm name of each person who is racing followed by clicking on the boat and sail number displayed at the top of the screen.

Once a boat has started the Yes will turn to a lap number. Log laps as they occur for each sailor by clicking on the helm name. The lap will increase by 1 and the positions recalculated. After lap 2 the last lap time in seconds will be shown next to the lap number

At race end the horn will sound to indicate race finishing. Check if boats have changed positions in the last lap then click on the Log results button and enter the finishing positions. When all have been entered click on the Save results button and the results will be written to a file against the race date and start time.

Click on Close button then shutdown to close it down

## Handicap race

Plug the horn cable into the USB socket in the dog-house, then the mains13 Amp plug – wait 30 seconds

When the race type, start time and length is displayed, use mouse to click on the “Select if OK” button

Click on the “HORN” button to test it is working

Click on all the helm name of each person who is racing followed by clicking on the boat and sail number displayed at the top of the screen. Check that the fast or slow text is displayed against the helm name

Log laps completed independently of the system

At race end sound horn to indicate race finishing

Click on the Log Finishes button

As each boat completes the required number of laps, click on the helm name to record the finish time

Copy finish times and corrected timed off the screen before closing it down

## Delay Start

If you click on the Delay Start Button it will move the start back by 5 minutes for each click on it.

# LSSC boat race timer – User Manual. Full Guide and configuration

Software v38 – July 13<sup>th</sup> 2021

## 1. Connect and switch on

Lift the timer out of its bag by the sides of the screen – not by the blue box or the top of the screen.

Check that the mouse is plugged into the left hand USB socket on the top of the blue box

Plug the horn cable into the Horn USB socket on the blue box and into the horn relay in the dog house

Plug the white lead into the 13 Amp socket in the dog house and switch the power on

Wait about 30 seconds as several boot screens are shown, finishing with the Boatstart one

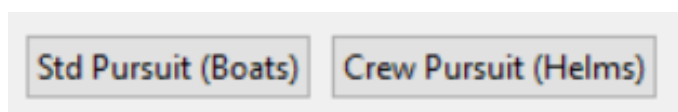
Mouse should be lit up blue and fan on back of blue box should be spinning – nudge it if not.

## 2. Race selection

The top line of screen will show the expected race type, length and time derived from the race calendar

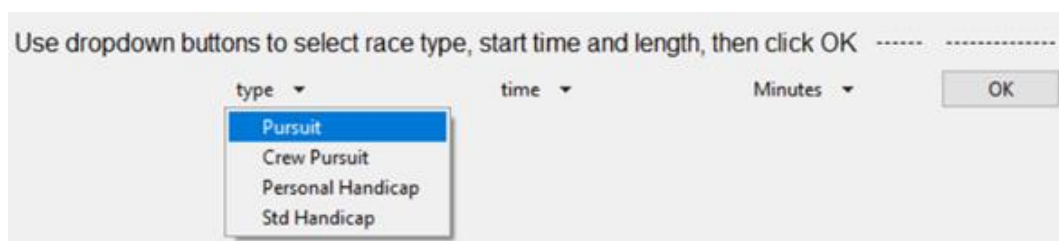
If this is the race you want to run, use the mouse to click on the “Select if OK” button

If the expected race type is Pursuit you will then get two buttons to choose from, as to whether you want to run a Std Pursuit (just based on boat classes) or a Crew Pursuit (where all the helms are shown and you can record laps completed and automatically show the positions during the race for each boat).

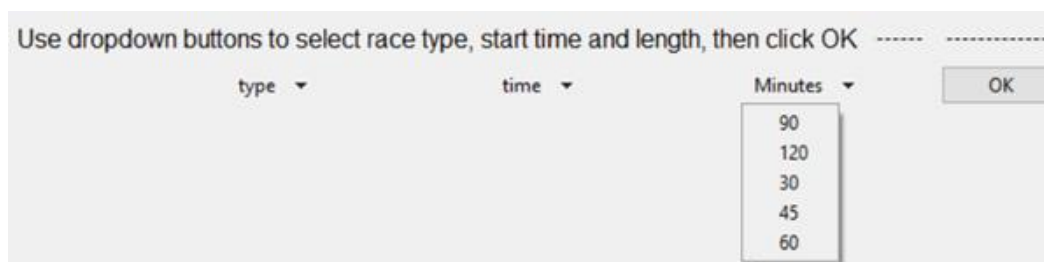


If you want any other race type, or different start time or race length, click on the “Other race” button and a screen will appear with options for Type, First gun start time, and duration in minutes.

Click on the down arrow next to “type” then click on required option to select race type from the dropdown list



Do the same for “time” and “Minutes” to set the start time and length. (If you don’t select them, they will default to 11am and 90 minutes)



Then click on OK. You will now be taken to the main screen for the race type selected

### 3. Pursuit race type selected

This is the simplest form of pursuit race as only boat classes are selected not crews or individual boats. You will see this screen showing boat classes, their start time after first gun, the current time and the time to the next sounding of the horn (Next start) and what it is for. Boat types normally crewed by 2 persons but being raced with just one are shown in the second column (Helm only) with a (1) against them.

Boatstart

Selected: Pursuit race at 11:00 for 90 minutes -----

Boat Class	Racing?	Start Time	Click on boat if racing		
Topper		10:00			
Comet		19:00			
Comet Duo		21:00			
Lightning 368		22:00			
British Moth		22:00			
Laser Radial		22:45			
Solo		23:00			
GP14		23:45			
Streaker		24:00			
Enterprise		24:15			
Laser		25:30			
Solution		26:00			
National 12		26:15			
Supernova		27:00			
RS Aero 7		27:30			
K1		27:45			
Albacore		29:00			
RS Aero 9		30:30			
Phantom		31:15			

Current Time

Hours	Mins	Secs
10	18	8

Next start

First Gun

In:      Mins      Secs

41	52
----	----

Helm only

Boat Class	Racing?	Start Time
Comet Duo (1)		24:30
GP14 (1)		27:00
Enterprise (1)		27:30
National (1)		29:15
Albacore (1)		32:00
Race End	Yes	90

#### 3.1 Test Horn

Click on the "HORN" button to test the horn is working correctly

A message will appear on the screen if the horn cable is not connected correctly

#### 3.2 Select boat classes in race

For each class of boat racing, click on the boat name and "Yes" will appear in the Racing? column next to that boat class. Clicking again on the same boat will remove it from the racing list and delete the "Yes"

Once a boat class has started the "Yes" will change to "Started"

Boat Class	Racing?	Start Time
Topper	Started	10:00
Comet	Started	19:00
Comet Duo	Yes	21:00
Lightning 368	Yes	22:00

### 3.3 Start signals

The system is now ready. It will sound the horn for **First Gun** (e.g. often at 11am), then at **Five Minute**, then at **First Start** or for Topper if that is racing as they are both at the same time. It will then sound the horn for the start time of each boat class racing and finally for **Race End**.

For 10 seconds before the horn is sounded a small beep will be sounded from the timer itself

There will also be 5 small beeps one minute before First Gun to let you know crews to get ready to set their watches

Here is a screen shot with 10 boat types selected

Boatstart

Selected: Pursuit race at 20:45 for 90 minutes

Boat Class	Racing?	Start Time	Click on boat if racing		
Topper		10:00			
Comet	Yes	19:00			
Comet Duo		21:00			
Lightning 368	Yes	22:00			
British Moth	Yes	22:00			
Laser Radial		22:45			
Solo		23:00			
GP14		23:45			
Streaker		24:00			
Enterprise	Yes	24:15			
Laser	Yes	25:30			
Solution		26:00			
National 12	Yes	26:15			
Supernova	Yes	27:00			
RS Aero 7		27:30			
K1	Yes	27:45			
Albacore		29:00			
RS Aero 9		30:30			
Phantom		31:15			

Current Time

Hours	Mins	Secs
20	45	1

Next start

Five Minute

In:	Mins	Secs
	4	59

Helm only

Boat Class	Racing?	Start Time
Comet Duo (1)		24:30
GP14 (1)		27:00
Enterprise (1)	Yes	27:30
National (1)		29:15
Albacore (1)		32:00
Race End	Yes	90

And here is one with the Lightning 386 and British Moth ready to start in 11 mins 27secs

Note: If two or more boat types have the same handicap, the last one in the list will be shown as Next Start

Boatstart

Selected: Pursuit race at 20:45 for 90 minutes

Boat Class	Racing?	Start Time
Topper		10:00
Comet		19:00
Comet Duo		21:00
Lightning 368	Yes	22:00
British Moth	Yes	22:00
Laser Radial		22:45
Solo		23:00
GP14		23:45
Streaker		24:00
Enterprise	Yes	24:15
Laser	Yes	25:30
Solution		26:00
National 12	Yes	26:15
Supernova	Yes	27:00
RS Aero 7		27:30
K1	Yes	27:45
Albacore		29:00
RS Aero 9		30:30
Phantom		31:15

Click on boat if racing

Current Time  
 Hours: 20 Mins: 55 Secs: 33

Next start  
**British Moth**  
 In: Mins: 11 Secs: 27

Helm only

Boat Class	Racing?	Start Time
Comet Duo (1)		24:30
GP14 (1)		27:00
Enterprise (1)	Yes	27:30
National (1)		29:15
Albacore (1)		32:00
Race End	Yes	90

There is no scope for logging laps or race positions with this race type mode as individual boats and their crews are not recorded.

## 4. Crew Pursuit race type selected

This is still a standard pursuit race with start times determined by handicaps, but we display and select helm names instead of boat classes. There is therefore an entry available for each person who is likely to helm a boat in a race. Once we select the helm name, we are prompted with the expected boat class and sail number and we can select this or an alternative boat class. By having an entry for each boat in the race we can record the progress of each boat in the race by capturing each time a boat completes a lap of the course.

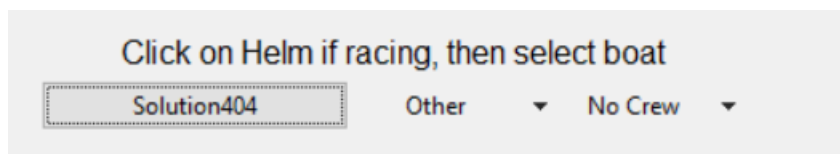
### 4.1 Test Horn

Click on the “HORN” button to test the horn is working correctly

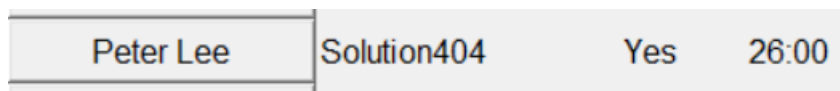
A message will appear on the screen if the horn cable is not connected correctly

### 4.2 Select Helm names and Boat classes in race

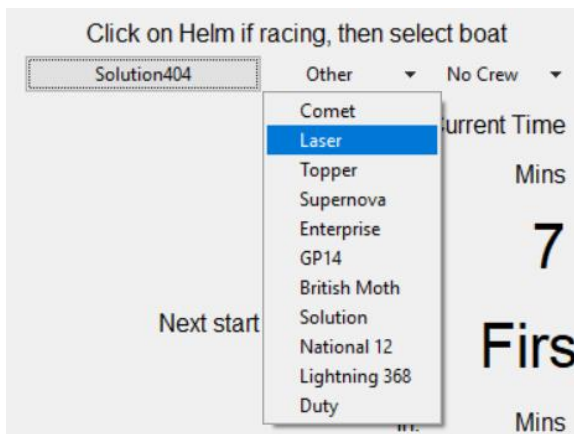
For each person racing as helm of a boat, click on the helm name and “Yes” will appear in the Racing? column next to that boat class. Now click on the boat being raced. The normal boat raced by that person will appear as default – in this example below “Solution404”.



If they are racing in their normal boat click on it. The boat class and optional sail number and handicap will appear next to the helm name like this:

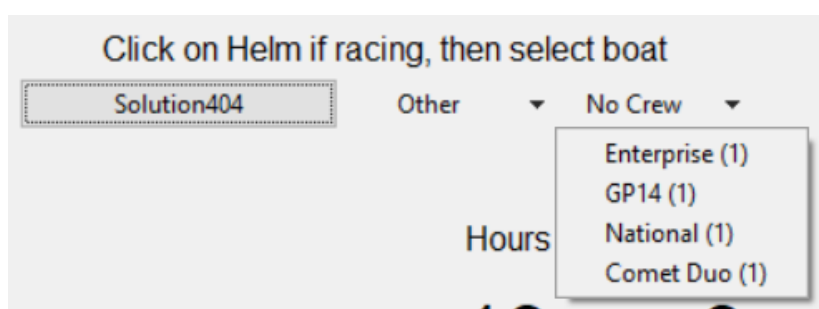


If they are racing in a different boat, click on the “Other” button and a menu list of other boats will appear.



Click on the required boat class and it will appear with its handicap next to the helm name

If they are sailing single handed in a normally 2 crewed boat click on the “No Crew” button and a menu list of possible boat types will appear for selection



Click on the required single crewed boat class and it will appear with its handicap next to the helm name. Note : All single crewed boats that normally have 2 crew have “(1)” after their name. They will have a different handicap to dual crewed boats of the same class

Having selected several helm names and their boats you should see something like this:

Selected: Crew Pursuit race at 19:00 for 90 minutes software v 31

Helm Name	Boat & Sail no.	Racing?/Lap	Start/Posn
Alan Mattocks	Comet0	Yes	19:00
Barry Marsh	British Moth885	Yes	22:00
David Hannaford			
David Murray	Comet435	Yes	19:00
Don Clark			
Duncan Lavery	British Moth860	Yes	22:00
Elaine Lavery	British Moth886	Yes	22:00
Geoff Coop			
Jayne Whigham	Comet538	Yes	19:00
Laurie Walker	Supernova585	Yes	27:00
Mark Ellard	Solution450	Yes	26:00
Martin Seaton	Enterprise22658	Yes	24:15
Pam Coop			
Paul Maddock	K1109	Yes	27:45
Peter Lee			
Phil Muddeman			
Ray Meredith			

Click on Helm if racing, then select boat  
British Moth885 Other No Crew

Current Time  
Hours Mins Secs  
18 59 18

Next start  
First Gun  
In: Mins Secs  
0 42

Undo last item Log results Delay start Close HORN

Helm	Boat & Sail no	Racing?/Lap	Start/Posn
Richard Colwell			
Robin Williams			
Stella Ellard	British Moth0	Yes	22:00
Steve Baker			
Stuart Watts			
Tom Billyard			
Wills D-Baker			

## 4.3 Correcting mistakes

**4.3.1 wrong person added** If you click on the wrong person racing while setting up the people sailing, as long as they haven't been shown as started, another click on them will remove the "Yes" and they will not be included in the start signals. Their boat and handicap will still continue to show if you selected a boat for them, but nothing else will be done for them as long as there is no "Yes" or "Lap 0" shown.

**4.3.2 Person missed out** If you miss someone out, you can add them at any time but if it is after their start time, they will not get a start sound on the hooter and their "Yes" will turn almost immediately to "Lap 0" so that you can record lap completions for them.

**4.3.3 Selected wrong boat** If you have selected the wrong boat for a person, as long as they haven't started, click twice on their name then reselect the correct boat for them. It should now appear with the "Yes" and the updated start time.

**4.3.4 lap added incorrectly** If after a boat has started and is showing a lap number, you incorrectly add a lap to a boat or to the wrong boat, click on the "Undo last item" button. This will reduce the lap number by 1 for the last clicked on helm name. Each click will reduce the lap number by 1 down to a minimum of 0. If you reduce too many laps, click on the helm name to increase the lap number again. Note that reducing or increasing the lap number at other than a correctly completed lap will invalidate the last lap time shown, until the next 2 correct lap updates for that helm.



## 4.4 Start signals

The system is now ready. It will sound the horn for **First Gun** (e.g. often at 11am), then at **Five Minute**, then at **First Start** or for Topper if that is racing as they are both at the same time. It will then sound the horn for the start time of each boat class racing and finally for **Race End**.

For 10 seconds before the horn is sounded a small beep will be sounded from the timer itself.

There will also be 5 small beeps one minute before First Gun to let you know crews to get ready to set their watches

The horn will sound for each class of boats starting and the helm name for the next boat to start will be shown with the time to its start as shown here:

Next start	<b>Peter Lee</b>		
In:	Mins	Secs	
	11	4	

Note: If two or more helm names have the same handicap, the last one in the list will be shown as Next Start

## 4.5 Lap recording and position display

As each boat starts the "Yes" in column 3 will change to say "Lap 0" like this:

Peter Lee	Solution404	Lap 0	26:00
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Until you start recording laps, the start time will continue to appear in column 4.

When a boat that has started completes a lap, click on the helm name, and the start time will be replaced by a position

Peter Lee	Solution404	Lap 1	1
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As each boat completes its first lap, click on the helm name and its position will be recorded. For all subsequent laps click on the helm name as they complete the lap and their lap count will increase by one and the positions will be recalculated. Note that boats that have not competed one lap may not have a position shown yet.

At lap 2 and following laps, the latest lap time for the boat (in seconds) will be shown next to the lap number.

Peter Lee	Solution404	Lap 3-782	7
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Once all boats have completed several laps, the screen will look something like this (as shown on next page), with all boats showing their current number of laps and positions at the last time any boat completed a lap. Boats that have completed 2 or more laps are also showing their last lap time in seconds next to the lap number.

Selected: Crew Pursuit race at 18:45 for 90 minutes

Helm	Boat & Sail no.	Racing?/Lap	Start/Posn
Alan Mattocks			
Barry Marsh	British Moth885	Lap 4-804	1
David Hannaford	Laser108967	Lap 3-866	4
David Murray	Comet435	Lap 4-1074	2
Don Clark	Comet881	Lap 1	16
Duncan Lavery	British Moth860	Lap 3-776	3
Elaine Lavery			
Geoff Coop	Comet Duo65	Lap 3-844	5
Jayne Whigham			
Laurie Walker	Supernova585	Lap 2-781	11
Mark Ellard	Solution450	Lap 1	14
Martin Seaton	Enterprise22658	Lap 3-780	6
Pam Coop	British Moth432	Lap 2-743	10
Paul Maddock			
Peter Lee	Solution404	Lap 3-782	7
Phil Muddeman	National 123461	Lap 3-847	9
Ray Meredith			
Richard Colwell	GP1410208	Lap 3-817	8

Click on Helm if racing, then select boat

Normal Boat raced Other No Crew

Current Time  
Hours Mins Secs  
19 46 19

Next start  
Race end  
In: Mins Secs  
28 41

Undo last item Log results Delay start Close HORN

Helm	Boat & Sail no	Racing?/Lap	Start/Posn
Robin Williams	RS Aero 71814	Lap 2-753	12
Stella Ellard	British Moth0	Lap 2-758	13
Steve Baker			
Stuart Watts			
Tom Billyard	Lightning 368167	Lap 1	15
Wills D-Baker			
Visitor			

## 4.5 Position and lap time calculation

**4.5.1 Positions shown** Boats that have completed the largest number of laps will be ahead of those that have done less laps. For boats that have done the same number of laps, the ones that completed them at the earliest time will be ahead of those that completed them at a later time. The system uses these 2 facts to recalculate and display the positions every time any boat completes a lap. If two boats complete a similar number of laps with less than a second difference between them, the system cannot establish which is first so will assign the 2 positions arbitrarily. Therefore, if 2 boats are approaching the lap marker buoy together, the race officer should leave a second between clicking on the helm names to be certain to get the relative positions recorded accurately.

**4.5.2 Lap times** The lap time shown is the difference in time in seconds between the last 2 clicks on the helm name after a boat has started. This will normally be the time between recording two successive laps for that helm name. However, if the "Undo last item" button is used to reduce a previously added lap this will invalidate the lap time for the last clicked on helm name, until a further 2 correct lap updates have been made.

## 4.6 Race end

At the end of the race the horn will sound.

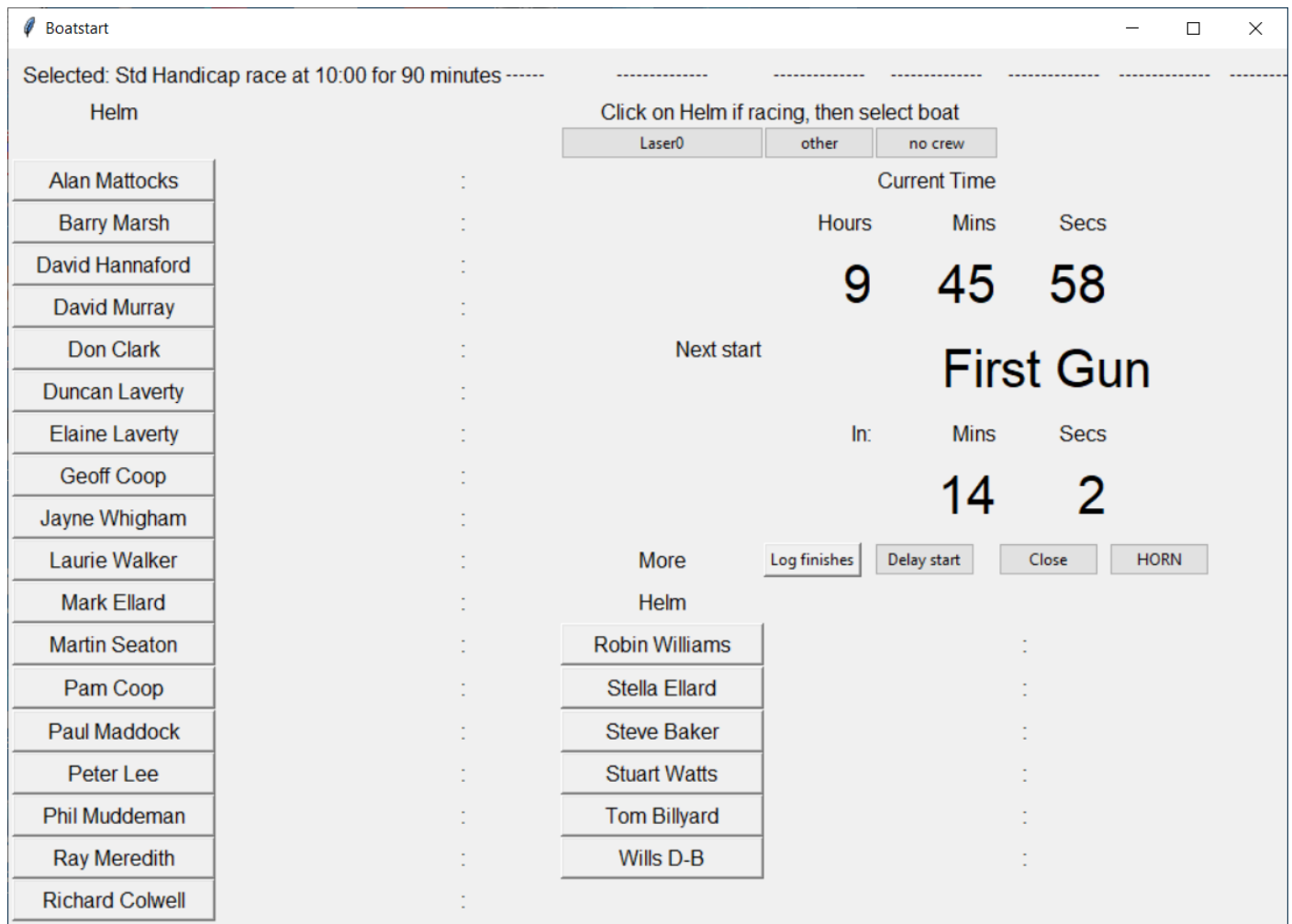
Using the shown race positions as a starting guide, check whether any boats have passed others during their last lap – in which case you can manually amend the race positions. If you click on the "Log Results" button it will prompt you to select the helm names in order of position and will show these in the column before the one with the calculated positions. When all of the results have been entered click on the Save results button and a file of the results will be written with filename of the date and start time of the race. It is suggested that you also record the results on the race form or take a screen shot with a phone.

When the results have been saved, click on the "Close" button and follow the instructions in section 7.

## 5. Std Handicap race type selected

For a standard handicap race the boat classes are divided into two groups - slow and fast start boats, depending on their PY yardsticks. Slow class boats will start at 10 minutes after first gun, and fast class boats will start at 15 minutes after first gun. Rather than boat classes being listed, helm names are listed and selected to be racing.

The initial screen will look like this:



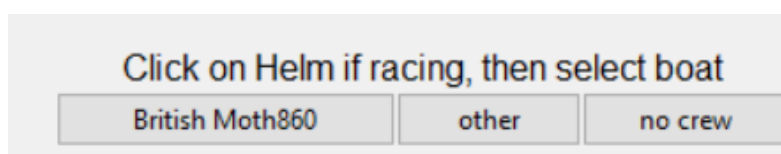
### 5.1 Test Horn

Click on the "HORN" button to test the horn is working correctly

A message will appear on the screen if the horn cable is not connected correctly

### 5.2 Select persons taking part in the race

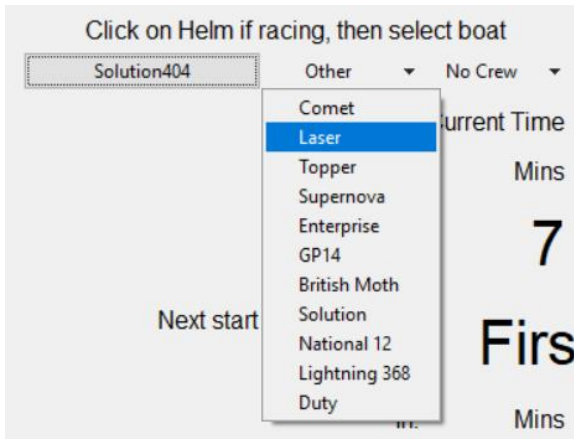
For each helm who is racing, click on the person name and "Yes" will appear in the Racing column and the expected boat class and sail number will appear near the top of the screen like this:



If that is the boat that they are sailing today click on it and it will copy the details next to the helm name and also put up whether it is a fast or slow start boat. The button at the

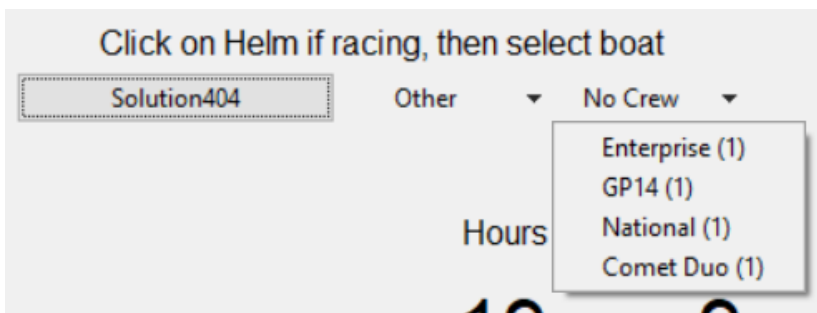
top of the screen will reset to the text "Normal boat raced".

If they are racing in a different boat, click on the “Other” button and a menu list of other boats will appear.



Click on the required boat class and it will appear with its handicap next to the helm name

If they are sailing single handed in a normally 2 crewed boat click on the “No Crew” button and a menu list of possible boat types will appear for selection



Click on the required single crewed boat class and it will appear with its handicap next to the helm name. Note : All single crewed boats that normally have 2 crew have “(1)” after their name. They will have a different handicap to dual crewed boats of the same class

Having selected a few helm names and their boats, the screen should now look like this:

Boatstart

Selected: Std Handicap race at 10:00 for 90 minutes

Helm

Click on Helm if racing, then select boat

Normal boat raced | other | no crew

Helm	Boat	Yes	Slow	Fast	Current Time
					Hours   Mins   Secs
Alan Mattocks					
Barry Marsh	British Moth885	Yes	Slow		
David Hannaford	Laser108967	Yes	Fast		10   2   20
David Murray					
Don Clark					
Duncan Lavery	British Moth860	Yes	Slow		
Elaine Lavery	British Moth886	Yes	Slow		
Geoff Coop					
Jayne Whigham	Comet538	Yes	Slow		
Laurie Walker					
Mark Ellard	Solution450	Yes	Fast		
Martin Seaton	Enterprise22658	Yes	Fast		
Pam Coop					
Paul Maddock	K1109	Yes	Fast		
Peter Lee	Solution404	Yes	Fast		
Phil Muddeman					
Ray Meredith					
Richard Colwell					

Next start: Five Minute

More | Log finishes | Delay start | Close | HORN

Helm

Robin Williams			
Stella Ellard	British Moth0	Yes	Slow
Steve Baker	Enterprise22888	Yes	Fast
Stuart Watts			
Tom Billyard			
Wills D-B			

## 5.3 Start signals

The system is now fully ready for the race to start and the horn will automatically sound for **First Gun, Five Minute, Slow Hcap Start** (at 10 minutes) and **Fast Hcap Start** (at 15 minutes), with the times to these events being shown below the current time

There will also be 10 short beeps on the machine before the horn is sounded and 5 short beeps one minute before First Gun to let you know crews to get ready to set their watches.

Once the Fast Hcap Start has occurred the Next start will default to the last helm name in the list and put up a time to go of 0. Ignore this as it is meaningless at this time. As a std handicap race does not have a fixed duration, only a specified number of laps, we cannot put up a time to the end of the race

## 5.4 Race progress and finishing

During the race, the race officer will be logging the number of laps performed by each boat independently of the system (further developments to be made here shortly) and will decide at some stage that they wish to start the finishing process. This is indicated to the sailors by a blast on the horn using the **HORN** button.

At this time the race officer should also click on the **Log finishes** button. The "Racing?" Heading will change to say "Finish Time"

As each boat completes the required number of laps, the race officer should click on the helm name and the system will replace the Yes on the screen with the current time, the corrected time (taking into account the start time and handicap) and sound the horn. The corrected time, will determine the position in the race, with the lowest corrected time being first place and the rest in ascending order of corrected time.

The system does not currently store the results, so make sure to copy down the finish times before closing the system using the **Close** button. See section 7 for the closedown process.

## 6. Personal Handicap race type selected

Details to be added here

## 7. Configuration files

The following files are stored on a memory card, and are used to control the operation of the system:

**boatpynumbers.csv** – This holds the Portsmouth Yardstick (PY) numbers against each class of boat, and the normal number of crew for that boat. The PY numbers are used to calculate the handicaps to apply to each boat in each type and length of race. The system can hold and display up to 20 different classes of boats plus up to 8 classes that are normally crewed with 2 persons but are racing helm only (i.e. no second crew). The current file has 18 boat classes and 4 helm only.

The first line of the file holds the PY number which is the dividing line between fast and slow start boats.

**racecalendar.csv** – This holds an entry for each race, giving its date, type, length, start time and name. It is normally held in date sequence with the earliest dates at the start of the file but if you want to put in all the Sunday races followed by all the Wednesday ones that is OK. If there are multiple races on one date however, they need to be in ascending time sequence. It is used at system start-up to identify the default race type, start time and length that will be run on that date.

**helmnames.csv** – This holds the names of sailors who helm boats, plus the sail number and type of their boat. Note that boat type names must match exactly with the names used in the boatpynumbers.csv file. The file can hold and display up to 26 helm names – They are normally held in alphabetical order for ease of finding a name, but this is not essential and if we wanted to group the most frequent sailors at the top of the list we could do so. We currently use the last 2 helm names for visitors.

**personalhandicaps.csv** – This holds the names of sailors taking part in the personal handicap races plus details of their sail no, boat type and current handicap. A new copy with a numeric suffix is created for each personal handicap race that is held, with the latest one holding the handicaps for the next race. A file called filenumber.csv is used to show the latest handicap file.

### 7.1 Updating the configuration files

All of these files are saved in the Comma Separated Values (CSV) file format so that they can be easily updated on any computer system. They are all held in a folder named pi which is within the home folder. They can be updated on the race machine directly by plugging in a keyboard and opening the file in Libre Office (a Linux based free spreadsheet program), or by copying them across to a memory stick inserted in any blue box USB socket, then updated on a PC or other machine and then copied back.

The boatpynumbers.csv file will be updated once a year when we wish to apply the new set of PY numbers issued by the RYA. We usually do this at the end of the Spring series of races. PY numbers for helm only sailed boats that normally have a second crew member are calculated by reducing the normally crewed PY number by 5%. Boat classes must be kept in the file in PY sequence from high to low. If boat classes are added or removed and the number of boat classes held in the file changes, it is necessary to update the “end” and “helmentd” fields at the start of the main program. The file should finish with an entry for Duty with a PY number of 1 and number of crew = 1.

The racecalendar.csv file is updated once a year to add the race dates for the following year, or if the racing programme is amended. New dates can be added to the existing file at any time as long as they are kept in date sequence. Dates that have passed can be deleted at any time.

The helmnames.csv file is updated when a sailing member starts helming who is not on the list, or when a helm sailor changes their normally sailed boat, or if a sailor on the list leaves the club or stops sailing.

## 8. System Closedown

- At the end of the race click on the “Close” button just below the Next Start time fields. The screen will now show the “Leamington Spa Sailing Club lake with birds” background page.
- Click on the raspberry logo in the top left corner and select “Shutdown” from the bottom item in the list.
- On the Shutdown Options window click to select Shutdown. The screen will go black. Wait 5 seconds.

Disconnect the horn cable from the horn relay box – you can leave it connected to the blue box if you wish.  
Switch off the power and remove the 13 Amp plug  
Carefully put everything back in the bag.

## LSSC boat race timer – Technical Manual.

Software v31 - Sept 24<sup>th</sup> 2020

### 1. Hardware

The timer system consists of the following components:

- A Raspberry Pi 4b microprocessor board with 8gig RAM and a memory card with 4 USB ports, and 2 video HDMI outputs
- A ChronoPI real time clock module powered by a CR1220 battery which should keep it running for 3 to 4 years
- A 5 Volt, 4 Amp, mains power supply – for the Raspberry pi and to power the ChronoPI when the system is on, and provide power for the external horn relay
- A non-standard wired USB socket for connection to the external horn relay in the doghouse
- All the above items are mounted in a blue box fixed at the back of the monitor
- An HDMI to VGA video signal converter so that the system can use a VGA monitor as a display
- A letterbox format VGA computer monitor
- A 2-way power adaptor to plug in the Raspberry pi power supply and the monitor
- A USB wired mouse
- An optional USB keyboard for making changes on the machine

### 2. Software

The system uses the following items of software running on the Raspberry Pi:

- The Raspbian Linux operating system
- Python 3 code interpreter and runtime environment
- TK screen display libraries
- Boat timer software written in Python 3
- Libreoffice spreadsheet software for amending configuration files on the machine
- Linux File manager for displaying and copying files from the memory card to an externally plugged in memory stick or back the other way
- Utilities for starting programs automatically at boot up

### 3 Software Functions

**readboatpynos()** This function reads in the current PY numbers for each boat class except for crew pursuit races

**getboathandicaps()** This function reads in the current PY numbers for each boat class just for crew pursuit races

**readpershandicaps()** This function reads in the personal handicaps file

**readhelmnames()** This function reads in the list of helm names and their boats and sail numbers

**writepershandicaps()** This function writes out the personal handicaps file

**readfileno()** This function reads in the file number which sets the version number for the personal handicap file that is written out

**writefileno()** This function writes out the updated file number after a personal handicap race

**readracecalendar()** This function reads in the race calendar entry that sets the default race type, length and time for each date The file also contains the race series name

**calchcap(pynumber, rlen)** This function calculates the handicap for a given PY no and race length

**stdpursuit()** This function sets up the screen for a standard pursuit race based on boat classes

**crewpursuit()** This function sets up the screen for a crew pursuit race based on helm names

**closewindow()** This function shuts down the IO ports that are used to read in the current date and time, sound the beeps and the horn. Then it closes the main screen window

**setrun()** This function starts the timer function running which updates the time and the next start information

**horn(n)** This function switches the horn on (n=1) and off (n=0)

**horntest()** This function sounds the horn when the onscreen HORN button is pressed

**horncheck()** This function checks that the horn cable is connected by looking for a return back from the horn relay unit. It puts out a warning message if it is not connected

**beep()** This function puts out a half second beep on the piezo sounder

**undolast()** This function is called when the "Undo last item" onscreen button is pressed It calls boatstat with the number of the helm name to have a lap number reduced

**boatstat(x)** This function is called when a helm name or boat class button is clicked on. It switches helms or boat classes on or off for racing, plus captures and displays handicap race end times. For helms that have started it also updates lap numbers.

**selectboat()** This function is called when the normal boat is being raced. It puts the boat being sailed next to the helm name

**selectother(boatselected)** This function is called when another boat from the normal one is selected from the dropdown menu. It puts the selected boat type next to the helm name



**gethandicap(x)** This function looks up the PY handicap for a boat class by searching through the PY table. It also identifies slow and fast handicap boats for the handicap race type

**calcposns()** This function calculates the positions in a crew pursuit race

Firstly, it identifies the boats that have started, and for each on it calculates a number that gives a value to each boat where the higher it is the higher in the position it should be. The calculated number is the (number of laps +1) x 10000 – the last lap end time since the start, in seconds. It saves the number of boats that have started in numstarted. This will be the number of positions to be assigned

Next, for each of the positions to be assigned – starting with no 1, it checks each started boat to find the calculated value that is the highest. Having checked all the boats it assigns the position to the highest one found. It records that one as processed then adds one to the position number to be assigned then goes round again until all the positions have been assigned.

**timesec()** This function is called every half second. It works out which boats or helms are racing and for each one that has not started it calculates how long until their start time. For the one with the lowest amount of time to the start time it displays this and the time to start on the screen. This also handles the start signal and race end signal in a similar way. It generates the calls to the beep function and the horn at the appropriate times and switches the horn off after a preset time

**gettime()** This function obtains the current date and time for display on the screen and to enable the start sequences to be determined. The date and time are maintained by the battery powered real time clock module when used on the Raspberry Pi. Otherwise they are provided by the operating system.

**timediff()** This function calculates the difference in time between the current time and the race start time

**showtime()** This function puts the current hours, minutes and seconds on the screen display

**pauserun()** This function delays the race start time by 5 minutes. It is called each time that the onscreen Delay Start button is pressed

**stdhcap()** This function sets up all the screen and parameters for a standard handicap race. It calls the people function to display the helm names and generates the onscreen fields to hold the handicap times

**logtimes()** This function is called when the Log finishes button is pressed. It updates headers and messages as to what to do next plus sets the logendtime flag that allows the boatset function to capture and display the standard handicap end times for each helm that is racing.

**pershcap()** This function sets up all the screen and parameters for a personal handicap race

**people()** This function creates the helm name buttons on screen in 2 columns

**boatclasses()** This function creates the boat class name buttons on screen in 2 columns for the standard pursuit race

**startsignals()** This function sets up the names and times for the start signals

**handicapstarts()** This function sets up the additional fast and slow names and times for the handicap racestart

**message(n)** This function displays the selected message at the top of the screen

**warning(n)** This function displays the selected warning at the top of the screen

**getresults()** This function establishes how many boats were racing and sets up boatstat so that the final race positions can be entered

**resetposns()** This function reduces the current position being assigned by 1 so that errors can be corrected

**saveresults()** This function saves the results for a personal handicap race so that the subsequent race can use them to calculate the new handicaps

**calcnew()** This function calculates the new handicaps for a personal handicap race, based upon their standard handicap and their position in the last race

**plannedrace()** This function is called when Ok is clicked on for selecting the default race as defined by the race calendar. For a pursuit race it also generates the option to run a standard (boat classes) or crew (helm names) pursuit race

**startim()** This function sets the timesec function running once the race type has been selected and the screen set up

**stdselected()** This function is called when the "Std Pursuit (Boats)" button is pressed. It calls the stdpursuit function

**crewselected()** This function is called when the "Crew Pursuit (Helms)" button is pressed. It calls the crewpursuit function

**setgrid()** This function sets out the basic grid pattern of the screen so that as the other fields are added they go in the right place

**othermenus()** This function is called when the "Other Race" button is pressed while selecting the race type to be run. It displays the drop down menus for selecting the race type, start time and race length.

**callback1(rtyp)** This function is called when the race type is selected from the menu

**callback2(rtim)** This function is called when the race time is selected from the menu

**callback3(rlen)** This function is called when the race length is selected from the menu

**done()** This function is called when the "OK" button is clicked during race selection. It saves the race type and calls the function required to set it up

**sethdrs1()** This function puts up onscreen headers for Racing and start time

**sethdrs2()** This function puts up onscreen fields for Current time, Hours Mins, Secs

**sethdrs3()** This function puts up onscreen buttons for Close, Horn and Delay start, and headers for Next Start in, Mins, Secs

**sethdrs4()** This function puts up onscreen headers for Boat, Racing, and Start Time

**sethdrs5()** This function puts up onscreen headers for Crew Pursuit races

**sethdrs6()** This function puts up onscreen headers for Std Handicap races