

Race Timer – User Manual

RT1-UML

Version 1.5

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1. General Information

Welcome to the user manual for the Race Timer. The timer consists of hardware that measures the race time and software running on a computer that controls the race and displays the results. For example the system can be used to time CO₂ model drag racing cars.

These instructions apply to:

- Hardware Version 1.0
- Dual Infrared (IR) transmitter option (separate IR transmitters are available is required)
- Infrared beams for both the start and end of the track, or, Solenoids at the start of the track and IR beams at the end.

Function Overview

- **Racing Accuracy:** 1ms, 1/1000 second timing for accurate timing. This is crystal oscillator based electronic hardware timing (the laptop computer is not involved in the measurement process). 0.5ms measurement granularity to ensure timing accuracy.
- **Racing Experience:** Drag racing “Christmas Tree” sequencing starting display for real racing experience.
- **Race Viewing:** Overhead screen projector (not supplied) display interface supported by the laptop for viewing by a large target audience.
- **Racing Display:** Screen shows dual lane information: reaction time, race time and racing speed. All software is included.

- **Race Sensors:** Supplied Infrared light beams provide non-contact race sensors. These employ modulation technology and automatic level control to operate reliably in a broad range of ambient lighting conditions with noise immunity for accurate timing.
- **Race Track:** Track (not supplied) can be any practical length and the racing time is essentially unlimited. Metric or imperial supported for track length and speed in **mph** and **km/h**.
- **Racing Drivers:** Racing driver names can be supplied as a text file and can be simply selected at racing time for an efficient racing experience.
- **Race Results:** The daily racing results can be viewed in a table and are continuously stored in a spreadsheet for record keeping and analysis.
- **Race Modes:** One or two lanes, winner can include reaction time as well as racing time, manual or automatic staging (with solenoid option).
- **Race Options:** Solenoid starting with manual switches or user supplied firing mechanisms are supported.

Contents: Standard Option

For the standard option, infrared detectors are placed at the start and end of the track. The user supplies the track and starting hardware along with the computer.



(Note: Lead and other component colours may vary)

- 1 x Controller module: placed at the start of the track for main timing control
- 1 x Remote module: placed at the end of the track for end of race detection
- 4 x IR receiver modules: placed across the track to pick up the racing cars
- 2 x IR dual transmitter modules (optionally single transmitter modules can be provided)
- 6 x 3.5mm connection leads: connects the IR modules to the control modules
- 1 x USB cable with A and B plugs: connects the computer to the race timer controller
- 1 x 20m (66') lead (RJ45): for connecting remote and controller units
- User Manual

Contents: Solenoid starting Option

For the solenoid starting, infrared detectors are placed at the end of the track and solenoids at the start together with the firing pins. The user supplies the track and mounting for the solenoids.



(Note: Lead and other component colours may vary)

- 1 x Controller module: placed at the start of the track for main timing control
- 1 x Remote module: placed at the end of the track for end of race detection
- 2 x IR receiver modules: placed across the track to pick up the racing cars
- 1 x IR dual transmitter modules (optionally single transmitter modules can be provided)
- 3 x 3.5mm connection leads: connects the IR modules to the Control module
- 1 x USB cable with A and B plugs: connects the computer to the race timer controller
- 1 x 20m (66') lead (RJ45): for connecting remote and controller units
- 2 x Start pushbutton switches: for manually starting the race
- 2 x 3.5mm/RCA connection leads: connects the starting switches to the control modules
- 1 x Starting module: provide power for firing the solenoids
- 2 x 3.5mm connection leads: connects the Starting module to the Control module
- 2 x Starting solenoids: used to drive a CO₂ cylinder puncture pin or otherwise start the race
- 1 x Power supply (12V 1A): provide power for the solenoid starting module
- User Manual

Other Equipment

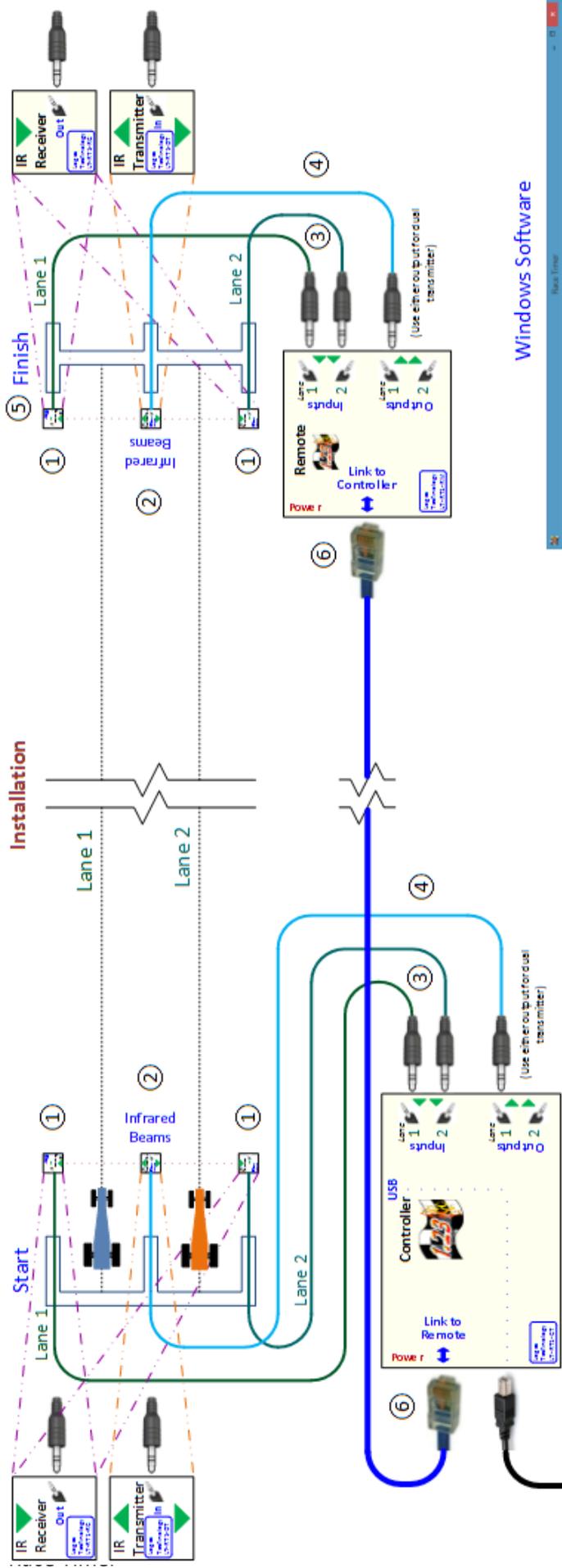
- Track with starting and finishing gates together with launching mechanism (not supplied).
- Laptop or desktop computer with USB connection (for management and display) running Windows XP SP3 or later – this is required (and not supplied).
- Optional projector and screen with PC monitor cable which adds to the overall racing experience (and not supplied). The projector should have a minimum resolution of 1024 x 768.
- For the solenoid starting option then the firing mechanism is required, e.g. the firing pins (not supplied).

Product Support and Warranty

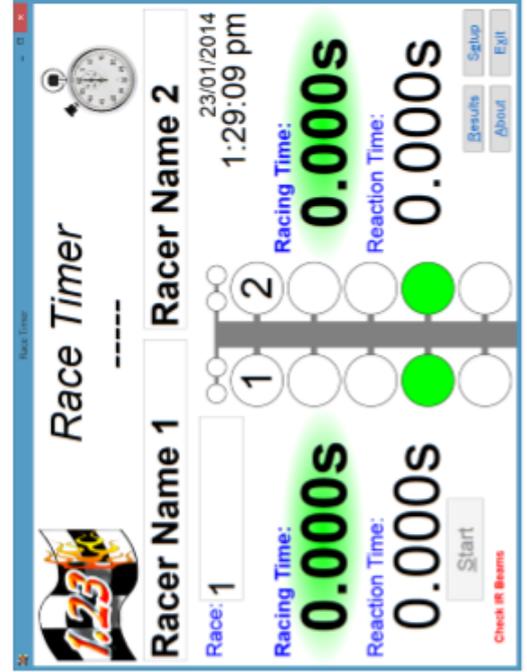
This product is fully supported and guaranteed for reliable and consistent operation:

- Installation and initial operational support as required: contact email at end of the manual
- Ongoing queries, requests, suggestions, etc: contact email at the end of the manual
- Replacement and optional parts can be ordered separately: see link at the end of the manual

Race Timer – Infrared Starting



Windows Software



Notes:

1. Window's computer provides system control and display. It is required but not supplied.
2. The projector and screen are optional (not supplied) and add to the overall racing experience.

Screen (optional²)

Projector (optional²)

Windows computer (required¹)

2. Connection Instructions – Infrared Starting Beams

These instructions apply to the standard option where infrared beams are at the start and end of the racing track.

Please refer to the installation diagram named “Race Timer – Infrared Starting”. The numbers on the diagram refer to the numbered points below.

Follow the steps below before operating the modules and the PC software when infrared starting beams are deployed.

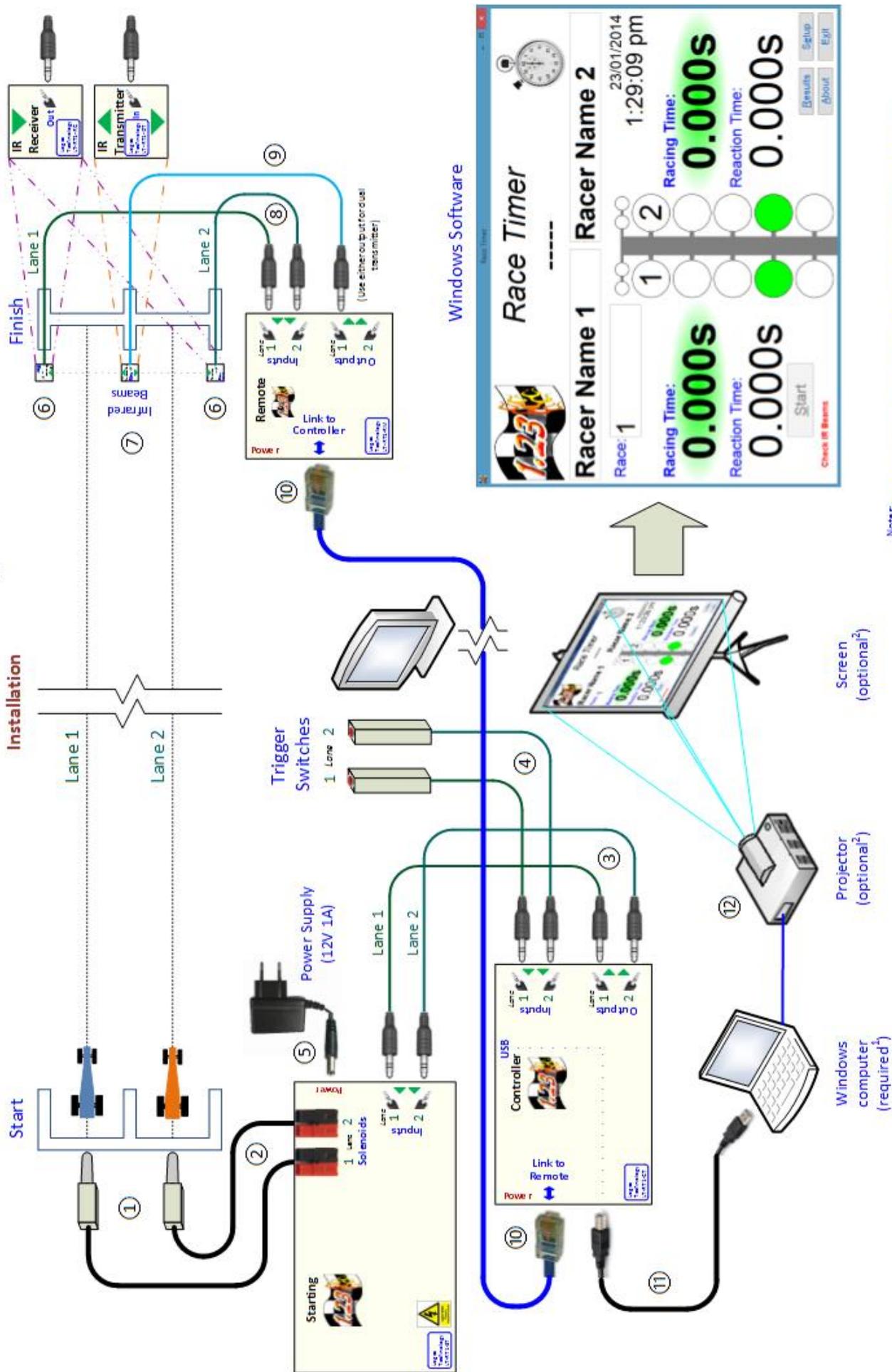
1. Mount two (2) IR receiver modules on either side at the start line, clear of the front of the racing cars so that the IR beam will not be blocked. Make sure that the IR beam module entrance holes point across the track, so there is no interruption of the line-of-sight path of the beam. Double sided tape or glue can be used to fix the IR receiver and transmitter modules in their correct locations. Note that the receiver and transmitter modules can be placed either way up so that IR light beam is aligned and the connections are conveniently placed to ensure the signal lead is kept clear of the moving car. Finally ensure that the IR beam height is such that it will be decisively interrupted by the moving car (e.g. a beam height of 20-30mm above the base of the track for CO₂ racing cars).
2. Mount a single start IR dual transmitter between tracks and point directly to each of the IR receivers from the IR beam holes on each side.
3. Connect 3.5mm leads from the IR receiver modules to the correct receiver *inputs* on the main controller unit for both lanes 1 and 2. Note that any leads should be physically secured (e.g. taped down) in order to keep them clear of any moving components/vehicles and secure them against trip hazards.
4. Connect a 3.5mm lead from the IR dual transmitter module to the main controller unit on either transmitter *output*. Note that the lead can go either way around.
5. Repeat steps 1 to 4 for the finish end of the track, connecting the IR receiver and transmitter units to the remote module located at the end of the track.
6. Connect the network lead between the remote and main controller units, linking them together. Note that the lead can go either way around.
7. Connect the USB B plug (square) to the main controller and the USB A end (rectangular) to the computer and switch on the computer.
8. Optionally connect a projector to the computer for viewing the racing on a large screen. This adds to the racing experience.
9. Switch on the computer and check all the connections:
 - a. Check that both the main controller and remote modules have lit power lights.
 - b. The lights where the IR transmitter units are connected should be lit on both the main controller and the remote modules.
 - c. The lights where the IR receiver units are connected on both the main controller and remote modules will be lit when IR beams are aligned: this is essential for correct operation.

Notes:

1. The IR (Infrared) light is invisible to the naked eye and also harmless.

2. Optionally two single transmitter modules can replace the single dual transmitter module when a central dual transmitter is physically possible to mount. In this case mount each single transmitter module as required and point it at its counterpart receiver. The leads for each transmitter connect to either transmitter *output* of the controller module.

Race Timer – Solenoid Starting Module



3. Connection Instructions – Solenoid Starting Module

These instructions apply to the solenoid option where solenoids are at the start of the racing track and infrared beams at the end.

Please refer to the installation diagram named “Race Timer – Solenoid Starting.” The number on the diagram refer to the numbered points below.

Follow these steps for before operating the units and the PC software when the optional starting module and associated solenoids are deployed.

1. Mount both solenoids so that they launch the race as required (M4 screws are provided). For example when launching CO₂ racing cars the following considerations are vital:
 - a. The solenoid plunger must be directly against or fixed to the CO₂ firing pin. If not then the gap will significantly reduce the force applied to the pin.
 - b. The impact of the pin and the CO₂ cylinder should be around 3mm (1/8”) from the end of the 12mm (1/2”) travel of the solenoid. This will maximise the impact and puncture force. The firing pin should be sharp and made of hardened steel.

Warnings:

1. Solenoid damage will occur if the mounting screws penetrate the solenoid body beyond the internal plastic shield.
 2. When triggered, a lot of power is discharged into a solenoid which closes with considerable force. Ensure appropriate safety precautions are employed in mounting and operating the solenoids.
2. Plug the solenoid for each lane into the starting module matching the red and black plugs to the correct lanes.
 3. Connect 3.5mm leads from the starting module control *inputs* to the associated *outputs* on the main controller module for both lanes 1 and 2. Note that any leads should be physically secured (e.g. taped down) in order to keep them clear of any moving components/vehicles and secure them against trip hazards.
 4. Connect 3.5mm leads from the main controller module *inputs* to the two trigger switches for both lanes 1 and 2. Note that the lead can go either way around.
 5. Plug in the power pack to the mains and the power input of the starting module. Make sure that the power LED illuminates.
 6. Mount two (2) IR receiver modules on either side at the finish line, clear of the end of the track so that the IR beam will not be blocked. Make sure that the IR beam module entrance holes point across the track, so there is no interruption of the line-of-sight path of the beam. Double sided tape or glue can be used to fix the IR receiver and transmitter modules in their correct locations. Note that the receiver and transmitter modules can be placed either way up so that IR light beam is aligned and the connections are conveniently placed to ensure the signal lead is kept clear of the moving car. Finally ensure that the IR beam height is such that it will be decisively interrupted by the moving car (e.g. a beam height of 20-30mm above the base of the track for CO₂ racing cars).
 7. Mount a single finish IR dual transmitter between tracks and point directly to each of the IR receivers from the IR beam holes on each side.
 8. Connect 3.5mm leads from the IR receiver modules to the correct receiver inputs on the main controller unit for both lanes 1 and 2.

9. Connect a 3.5mm lead from the IR dual transmitter module to the main controller unit on either transmitter output.
10. Connect the network lead between the remote and main controller units, linking them together. Note that the lead can go either way around.
11. Connect the USB B plug (square) to the main controller and the USB A end (rectangular) to the computer and switch on the computer.
12. Optionally connect a projector to the computer for viewing the racing on a large screen. This adds to the racing experience.
13. Switch on the computer and check all the connections:
 - a. Check that both the main controller and remote modules have lit power lights.
 - b. The lights where the IR transmitter units are connected should be lit on both the main controller and the remote modules.
 - c. The lights where the IR receiver units are connected on the remote controller and remote modules will be lit when IR beams are aligned: this is essential for correct operation.
 - d. Check that the inputs of the main controller module light when the associated trigger button is pressed.

Notes:

1. The IR (Infrared) light is invisible to the naked eye and also harmless.
2. Optionally two single transmitter modules can replace the single dual transmitter module when a central dual transmitter is physically possible to mount. In this case mount each single transmitter module as required and point it at its counterpart receiver. The leads for each transmitter connect to either transmitter *output* of the controller module.
3. For testing purposes a trigger switch can be temporarily connected directly into an input of the solenoid starting module. When powered up the switch will close the associated solenoid attached to the starting module. This allows the solenoid mounting and firing mechanism to be tested.

4. Combined Infrared and Solenoid Starting

It is possible to combine the above infrared and solenoid starting systems. With this alternative option the solenoids manually start the race separately from the Infrared beams which time the race from beginning to end.

Follow these steps before operating the units and the PC software when the optional starting module and associated solenoids are deployed.

1. Follow the instructions in section 2: Connection Instructions – Infrared Starting Beams.
2. Connect 3.5mm leads from starting module *inputs* to the two trigger switches for both lanes 1 and 2. Note that the lead can go either way around.

5. Software Installation

The software installation procedure only needs to be completed once on the computer (Laptop or Desktop) being used for controlling and monitoring the race. If you are unsure of these steps please seek advice from your IT administrator.

1. Install Microsoft .Net 4.5 on the computer (if this hasn't already been done).
If you are not sure if it installed then proceed to step to which should automatically instruct you to install .Net and direct you to the correct location on the Microsoft web site.
Here is the link for the software on the Microsoft site (see also note 2 below):
<http://www.microsoft.com/en-au/download/details.aspx?id=40779>
Once installed it should appear as "Microsoft .Net Framework 4.5" under Control Panel/Programs and Features.
2. Install the Race Timer application software by selecting the following link:
<http://www.logotechnology.com/racetimer/publish.htm>
If, during the installation process, a Windows Smartscreen message pops up ("Windows protected your PC") the select "More Info" and "Run Anyway".

Notes:

1. An active internet connection will be required only initially when installing the prerequisites and application software. However when completed the software will operate without an active internet connection.
2. Microsoft .Net 4.5 can also be installed via the Windows Update option on the computer.
3. New versions of the software should be automatically downloaded and installed when connected to the internet.

6. Software and Timer Checking

Follow this procedure whenever starting up the Race Timer application software and timer hardware:

1. Start the software from: Start/All Programs/Logos Technology/Race Timer/Race Timer (this may vary slightly depending on your windows operating system). There may also be a link on your desktop.
2. Check the status on the bottom left of the screen and take the appropriate action:
 - a. **“Race Timer hardware is disconnected”**: make sure the controller is plugged into the computer via USB and the power light is lit on the main controller unit.
 - b. **“Check IR Beams”**: ensure that all the infrared beams are aligned and the receive lights are all lit on the main controller (for IR option only) and remote module. When corrected then this message will disappear. Note that the “start” lights associated with the lanes (at the top of the lane light stack) will turn green when IR beams are aligned.
 - c. **“Capacitors Charging”**: Please wait while the capacitors are charging for operating the starting solenoid module.
 - d. **“Ready”**: everything is operating correctly.
3. Press the start button (which is only possible when all the IR beams are correctly aligned) and watch the start lights count down and the reaction time begin counting for both lanes.
4. Depending on the starting option perform one of the following steps to start the race, causing the racing time to begin to count and end the reaction counter:
 - a. Infrared beam start: break the start beams by waving your hand through them for both lanes.
 - b. Starting Module: press the starting trigger buttons for both lanes. The switches will turn the starting lane lights from amber to green and fire the solenoids.
5. Break the end beams by waving your hand through them for both lanes and watch the racing times stop for each lane. When complete the winner is highlighted and the race speeds are calculated.

7. Race Timer Operation

The procedure below outlines the full operation of the Race Timer software and hardware.

Racer Name 1 **Racer Name 2**

Race:

Racing Time: 00.0 km/h **0.000s** Reaction Time: **0.000s** Start

Racing Time: 00.0 km/h **0.000s** Reaction Time: **0.000s**

Date Time

Results Setup About Exit

Status

1. Start the software from: Start/All Programs/Logos Technology/Race Timer/Race Timer (this may vary slightly depending on your windows operating system). There may also be a link on your desktop. Adjust the software window size as required for best viewing.
2. If necessary follow the check procedure above in order to ensure everything is operating correctly.
3. Ensure all the start beam lights (above the lane light stacks) are green and the cars are in place.
4. Enter the names of the racers for each lane in the position required (or selected them if they have been previously entered – see Setup Options below).
5. Press the start button on the computer and wait for the green racing signal.
6. Then depending on the starting option perform one of the following steps to start the race:
 - a. Infrared beam start: manually trigger the tracks starting mechanism.
 - b. Starting module: press the starting trigger buttons for each lane.
7. Watch the progress of racing times and for race completion on the computer screen.
8. Repeat steps 4 to 7 above for each and every race.
9. At any time the “Results” button can be pressed to display the results for the day. Note that the results screen can be resized as required.
10. The results of the entire racing session are stored in a local file (see below).

Notes:

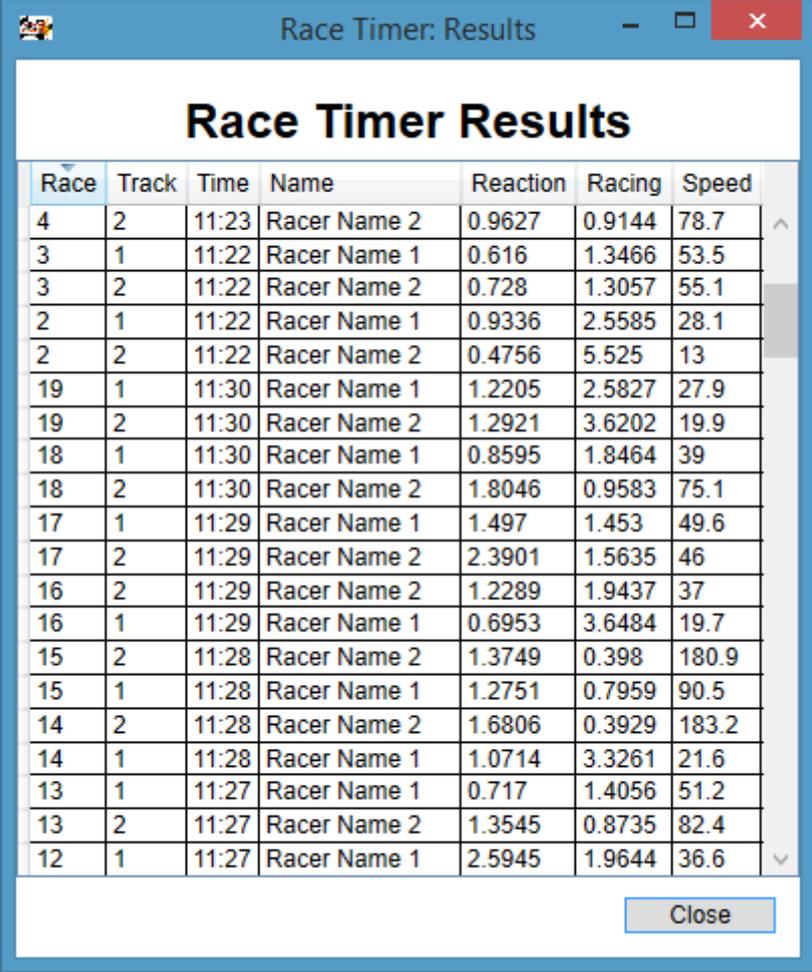
1. On solenoid operation, the start button is disabled until the unit is fully charged.
2. When the race is started before the amber racing lights go green for a lane then the red foul light is lit. In any case the race continues and the race times and speeds are still accurate as they are independent from the reaction time.
3. If there are any error in the operation of the program then the screen may display the problem. Which is also recorded in the following file: "%tmp%\RaceTimerLog.txt".
4. The "About" box can be used to make any comments or requests on the Race Timer.

IR Beams:

The infrared beams at the end of the track and optionally at the beginning of the track detect a passing car when the beam is broken. If this fails to happen then ensure they are correctly positioned to break on the main body of the car. Additionally, tubes of 6mm diameter (or thereabouts) can be placed in the infrared transmitters and receivers to ensure that the beam is contained and directed through the path of the car's main body.

8. Race Results

Whenever a race is completed the screen shows the resulting reaction time, racing time and speed. The “Results” button shows all the results for the day of racing. Press a column name to sort the results as desired. An arrow appears above the column name to show if the results are sorted by ascending or descending order.



The screenshot shows a window titled "Race Timer: Results" with a blue border. Inside the window, the title "Race Timer Results" is centered at the top. Below the title is a table with seven columns: Race, Track, Time, Name, Reaction, Racing, and Speed. The table contains 20 rows of data, with the first row highlighted in blue. A vertical scrollbar is on the right side of the table. At the bottom right of the window is a "Close" button.

| Race | Track | Time | Name | Reaction | Racing | Speed |
|------|-------|-------|--------------|----------|--------|-------|
| 4 | 2 | 11:23 | Racer Name 2 | 0.9627 | 0.9144 | 78.7 |
| 3 | 1 | 11:22 | Racer Name 1 | 0.616 | 1.3466 | 53.5 |
| 3 | 2 | 11:22 | Racer Name 2 | 0.728 | 1.3057 | 55.1 |
| 2 | 1 | 11:22 | Racer Name 1 | 0.9336 | 2.5585 | 28.1 |
| 2 | 2 | 11:22 | Racer Name 2 | 0.4756 | 5.525 | 13 |
| 19 | 1 | 11:30 | Racer Name 1 | 1.2205 | 2.5827 | 27.9 |
| 19 | 2 | 11:30 | Racer Name 2 | 1.2921 | 3.6202 | 19.9 |
| 18 | 1 | 11:30 | Racer Name 1 | 0.8595 | 1.8464 | 39 |
| 18 | 2 | 11:30 | Racer Name 2 | 1.8046 | 0.9583 | 75.1 |
| 17 | 1 | 11:29 | Racer Name 1 | 1.497 | 1.453 | 49.6 |
| 17 | 2 | 11:29 | Racer Name 2 | 2.3901 | 1.5635 | 46 |
| 16 | 2 | 11:29 | Racer Name 2 | 1.2289 | 1.9437 | 37 |
| 16 | 1 | 11:29 | Racer Name 1 | 0.6953 | 3.6484 | 19.7 |
| 15 | 2 | 11:28 | Racer Name 2 | 1.3749 | 0.398 | 180.9 |
| 15 | 1 | 11:28 | Racer Name 1 | 1.2751 | 0.7959 | 90.5 |
| 14 | 2 | 11:28 | Racer Name 2 | 1.6806 | 0.3929 | 183.2 |
| 14 | 1 | 11:28 | Racer Name 1 | 1.0714 | 3.3261 | 21.6 |
| 13 | 1 | 11:27 | Racer Name 1 | 0.717 | 1.4056 | 51.2 |
| 13 | 2 | 11:27 | Racer Name 2 | 1.3545 | 0.8735 | 82.4 |
| 12 | 1 | 11:27 | Racer Name 1 | 2.5945 | 1.9644 | 36.6 |

Also results are stored in the file “RaceTimerResults.csv” in the “My Documents” area of the local computer in CSV format (comma separated values). This can be opened in Microsoft Excel, other spread sheet programs or a text editor to view the results after a racing session. Note that racing results are continually appended to this file.

| | A | B | C | D | E | F | G | H | I | J |
|----|------------|--------|--------|-------|-----------|-------------|--------------|---------------|-----------|--------|
| 1 | Title1 | Title2 | Number | Track | Date | Time | Name | Reaction Time | Race Time | Speed |
| 29 | Race Timer | ----- | 9 | 1 | 5/08/2013 | 11:25:58 AM | Racer Name 1 | 0.5419 | 0.7762 | 92.76 |
| 30 | Race Timer | ----- | 9 | 2 | 5/08/2013 | 11:25:58 AM | Racer Name 2 | 0.7673 | 0.6002 | 119.96 |
| 31 | Race Timer | ----- | 10 | 1 | 5/08/2013 | 11:26:28 AM | Racer Name 1 | 1.0319 | 4.3318 | 16.62 |
| 32 | Race Timer | ----- | 10 | 2 | 5/08/2013 | 11:26:28 AM | Racer Name 2 | 1.0959 | 4.3635 | 16.5 |
| 33 | Race Timer | ----- | 11 | 1 | 5/08/2013 | 11:26:50 AM | Racer Name 1 | 1.0197 | 0.6123 | 117.59 |
| 34 | Race Timer | ----- | 11 | 2 | 5/08/2013 | 11:26:50 AM | Racer Name 2 | 1.1115 | 0.6305 | 114.2 |
| 35 | Race Timer | ----- | 12 | 1 | 5/08/2013 | 11:27:30 AM | Racer Name 1 | 2.5945 | 1.9644 | 36.65 |
| 36 | Race Timer | ----- | 12 | 2 | 5/08/2013 | 11:27:31 AM | Racer Name 2 | 3.1957 | 3.0654 | 23.49 |
| 37 | Race Timer | ----- | 13 | 1 | 5/08/2013 | 11:27:55 AM | Racer Name 1 | 0.717 | 1.4056 | 51.22 |
| 38 | Race Timer | ----- | 13 | 2 | 5/08/2013 | 11:27:55 AM | Racer Name 2 | 1.3545 | 0.8735 | 82.42 |
| 39 | Race Timer | ----- | 14 | 2 | 5/08/2013 | 11:28:21 AM | Racer Name 2 | 1.6806 | 0.3929 | 183.25 |
| 40 | Race Timer | ----- | 14 | 1 | 5/08/2013 | 11:28:23 AM | Racer Name 1 | 1.0714 | 3.3261 | 21.65 |
| 41 | Race Timer | ----- | 15 | 2 | 5/08/2013 | 11:28:46 AM | Racer Name 2 | 1.3749 | 0.398 | 180.92 |
| 42 | Race Timer | ----- | 15 | 1 | 5/08/2013 | 11:28:47 AM | Racer Name 1 | 1.2751 | 0.7959 | 90.47 |
| 43 | Race Timer | ----- | 16 | 2 | 5/08/2013 | 11:29:13 AM | Racer Name 2 | 1.2289 | 1.9437 | 37.04 |
| 44 | Race Timer | ----- | 16 | 1 | 5/08/2013 | 11:29:14 AM | Racer Name 1 | 0.6953 | 3.6484 | 19.73 |
| 45 | Race Timer | ----- | 17 | 1 | 5/08/2013 | 11:29:51 AM | Racer Name 1 | 1.497 | 1.453 | 49.55 |
| 46 | Race Timer | ----- | 17 | 2 | 5/08/2013 | 11:29:52 AM | Racer Name 2 | 2.3901 | 1.5635 | 46.05 |
| 47 | Race Timer | ----- | 18 | 1 | 5/08/2013 | 11:30:18 AM | Racer Name 1 | 0.8595 | 1.8464 | 38.99 |
| 48 | Race Timer | ----- | 18 | 2 | 5/08/2013 | 11:30:18 AM | Racer Name 2 | 1.8046 | 0.9583 | 75.14 |
| 49 | Race Timer | ----- | 19 | 1 | 5/08/2013 | 11:30:49 AM | Racer Name 1 | 1.2205 | 2.5827 | 27.88 |

9. Setup Options

The Race Timer software has a number of setup options that are available by pressing the “Setup” button at the bottom left of the main screen.

Race Timer Setup

Title 1:

Title 2:

Image 1:

Image 2:

Names:

Has Header Row Allow Name Entry

Winner includes Reaction Time

Toggle PC Mute while Running

Mode: Start Type Start Points Start Trigger Start Place Lanes

Sensor 1 Point Manual Front Single

Solenoid 2 Points Automatic Rear Both

Sensor Distance: 3

Track Length: Feet Metre

- **Titles:** the top two titles for the centre of the main screen.
- **Images:** The images in the top left and right corners of the main screen.
- **Names:** List of names, one per line, with optional header (check “Has Header Row” option), can be specified in a text file. These names are then available as “Racer Name 1 & 2” from a drop down list in the main screen. Manual name entry can also be selected if required (check “Allow Name Entry” option).
- **Music** played on the computer can be toggled on and off while racing if selected.
- **Mode:** select the configuration for the race timer system:
 - **Start Type:** (1) Infrared sensors at the start of the track or (2) Starting module with solenoids.
 - **Start Points:** Specify the number starting trigger start points (sensors): one or two lanes. For one lane the lane 1 input is used to trigger the start for both lanes.
 - **Start Trigger** (Solenoid option only): (1) manual starting by press button switches, (2) automatic starting by the controller after countdown.

- **Start Place** (Solenoid option only): (1) Select Front when the front of the cars are aligned at the start position, or, (2) Rear if the rear of the cars are aligned at the start position.
- **Lanes**: Specify if only one or both lanes are in use.
- **Sensor Distance**: this can be modified with the given slider if required, adjusting the sensor sensitivity.
- **Track Length**: set feet or metre units is required, along with the actual race track length, in order to display the vehicle speed in MPH or KM/H.

Notes:

1. With the solenoid starting option selected then automatic operation can be enabled. The race will automatically start when starting lights turn green and the trigger switches will be ignored (i.e. manual mode). In this case the left lights at the top of the lane stack remain green; otherwise the lights are amber and go green when the associated switch is pressed.

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Site: <http://www.logotechnology.com/RaceTimer>

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