

## TIMING & RACE CONTROL

There are a number of free 'software only' packages available in Windows and DOS. There are also pay to download Windows ones, and some systems you can purchase which consist of both a hardware board or box, which you plug into your PC; and a software package that controls it. No one size fits all. \*\* The most commonly used packages

### SOFTWARE ONLY

**\*\* Race Coordinator \*\*** - Donation-ware - powerful and friendly, well supported.

<http://www.racecoordinator.net/>

Race Coordinator now works as software only or using the Trackmate interface board, Arduino interface boards, DS Systems, Slotmaster and other hardware boards. Widely used as alternate software with the TRACKMATE hardware board below. Fully programmable screens, and there are many clever users offering their customization for free on forums. The developer often visits Auslot, SCI and Slotforum UK to interact.

The screenshot shows the 'Race Coordinator' software interface. The main window displays 'Round Robin' racing at 'Bright Plume Raceway'. The current time is 9:53, and it's Heat 1 of 6. A table lists the drivers and their lap times:

Name	Lap	Lap Time	Best Lap
Olden McGroin	0	N/A	N/A
The Pants	0	N/A	N/A
Peo Fuente	0	N/A	N/A
Bull Dog	0	N/A	N/A

To the right, a 'Leader Board' window shows 'Heat 1 of 6' with 'Olden McGroin' at 0.000. Below it, a list of drivers shows 0.000 for each: The Pants, Peo Fuente, Bull Dog, Boy Wonder, and Swamper Gene. At the bottom, an 'On Deck' window shows 'Swamper Gene'.

**\*\* Ultimate Racer 3.0 \*\*** - Donationware <http://www.uracerweb.org/> (includes powerful track designer)

The screenshot shows the 'Ultimate Racer 3.0' software interface. At the top, a timer shows 0:13 and a progress bar indicates 5 laps. The interface is divided into two driver panels:

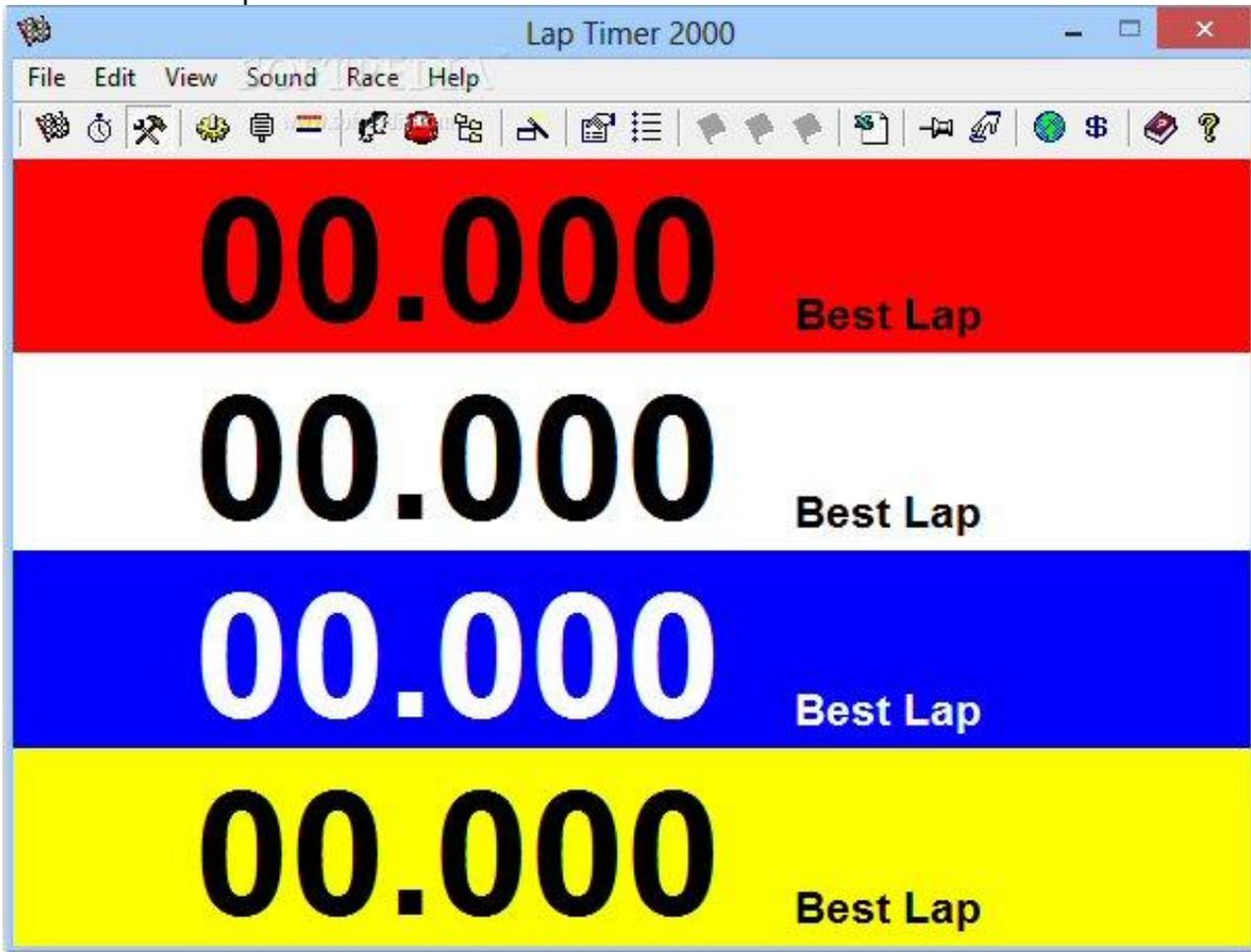
**Driver 1: #5 Ford Escort**

- Position: 1
- Laps: -1 laps
- Time: 7.888
- Distance: 19.00 meters
- Lane Length: 19.00 meters
- Last Lap: 7.888 s
- Best Lap: 7.888 s
- Avg Lap: 7.888 s
- Last Speed: 219.88 km/h
- Best Speed: 219.88 km/h
- Avg Speed: 219.88 km/h
- Fuel: Full

**Driver 2: #3 Lancia Stratos #03**

- Position: 2
- Laps: 2 laps
- Time: 12.882
- Distance: 20.00 meters
- Lane Length: 10.00 meters
- Last Lap: 3.710 s
- Best Lap: 3.710 s
- Avg Lap: 3.291 s
- Last Speed: 310.5 km/h
- Best Speed: 310.51 km/h
- Avg Speed: 104.00 km/h
- Fuel: Full

**\*\* Laptimer 2000 \*\*** - Freeware, <http://www.hoslotcarracing.com/> been around many years, doesn't have a lot of fancy features, but for home racer who don't need lane rotation and totaling, is typically the easiest to set up and use.



However you will need an old PC with a DB25 parallel port or a Joystick/serial port

**SCRaceTime** - <http://www.scracetime.de/> (German package, don't know anything about it)

**SlotRaceManager** -

DOS based, no longer available online or supported. I have a copy should anyone need it.

**SlotCarManager** (Donationware, includes track designer)

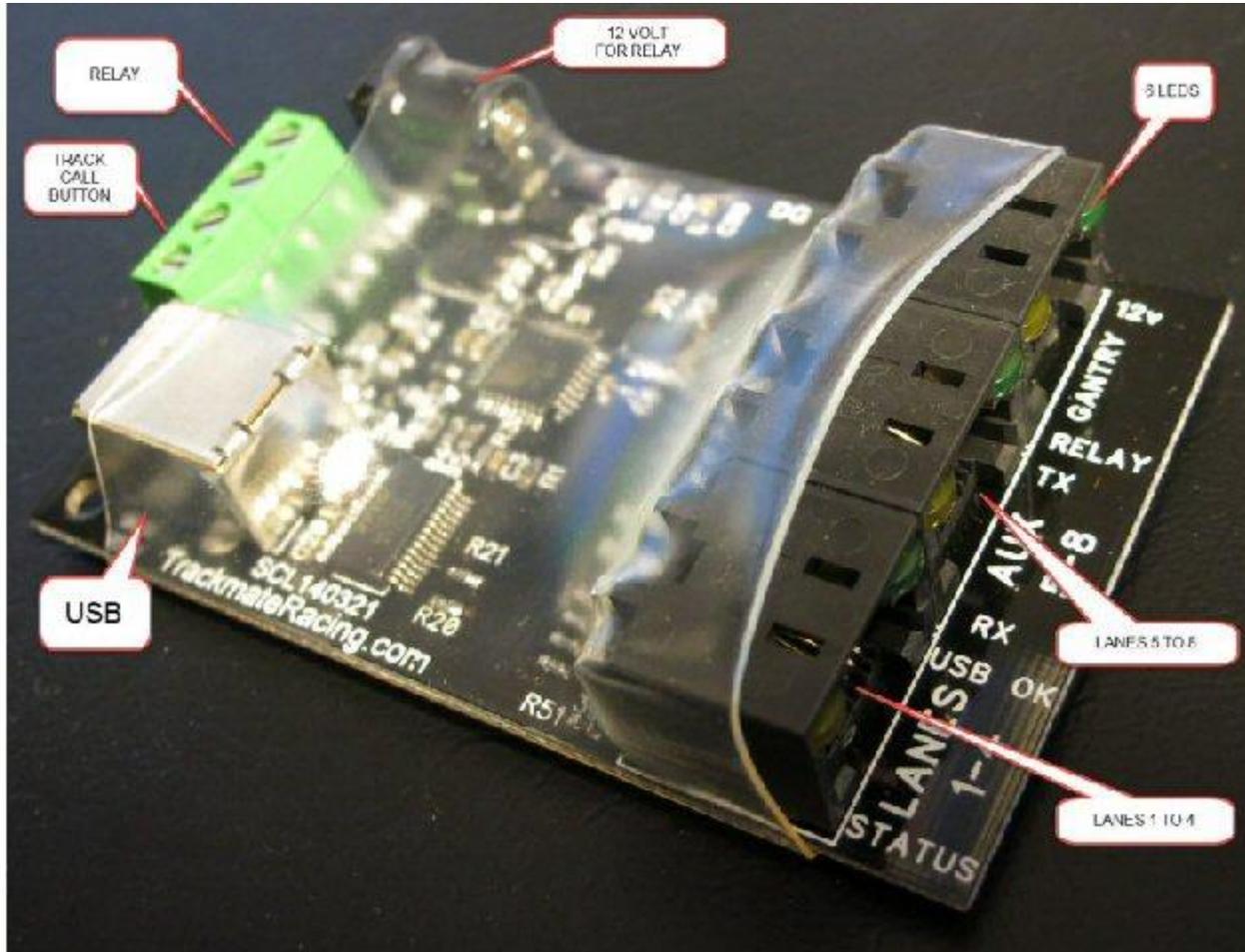
No longer available online. I have a copy if anyone needs it.

## HARDWARE BASED

\*\* **TRACKMATE** - <http://www.trackmateracing.com/shop/>

A medium priced solution which is rock solid. The latest version has Cat5 cable connections to the timing loom and USB connection to the PC, whereas older versions needed a serial to USB adapter which often made matching it with modern PCs an issue.

Purchase of the board gives you the software as well, and free updates when they come out. It is also widely used for the hardware package only, in conjunction with Race Coordinator Software.



\$  **Auto Delay**

Round Robin #1/4

00:11

Pause  
Abort

	T-Lap	Lap	Lap Time	Median	Best La
Allan	1	1			
Bob	1	1			
First	1	1			
Leadfoot	1	1			

## **\*\* Arduino robotics boards**

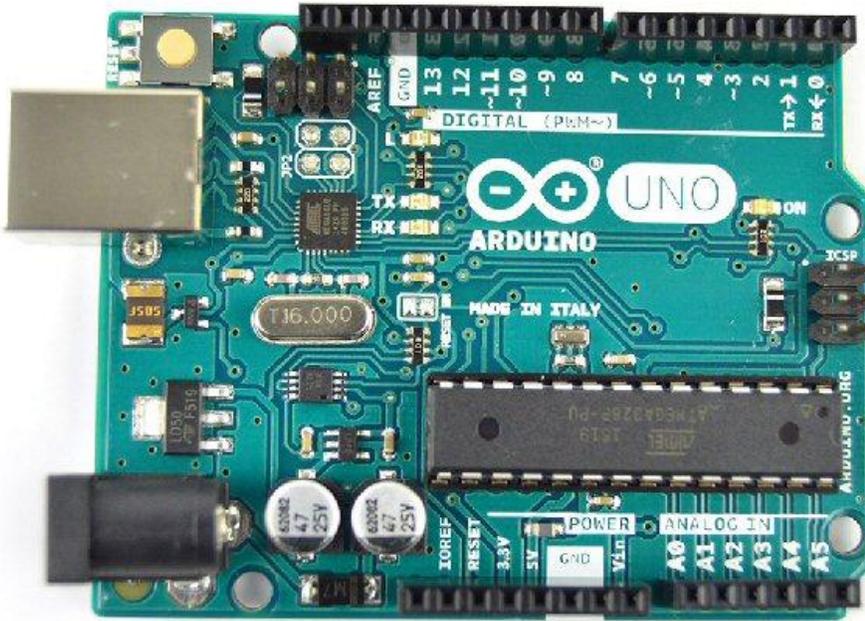
Arduino is the name of a line of Italian robotics boards, of which many Chinese factories make clones - or close to clones.

With a firmware patch available from **Race Coordinator**, and the **Race Coordinator software**, two versions of this board called UNO and Mega can be used as hardware to run the race control on tracks, and perform the functions like track power switching.

The advantage is that they are much cheaper than a proprietary board made by a company specifically for Slot racing.

The dis-advantage is that it takes a fair bit of computer savvy to configure the electronics side, and wire them to the timing and power control correctly; and, not all cloned Arduino boards work properly.

Also, some PCs seem to need certain windows updates and extensions manually installed to enable them to work properly with the Arduino system.



**DS-RacingProducts** - [DS-Racing Products](#) - Sophisticated and more expensive system made in Spain by IBB Slotracing. More suited to large club or public raceway setups. The most favoured solution in European clubs. It is now available in Australia.

I haven't used it, but those who do swear by it as being rock solid and capable of recording lots of data - which they love analysing. Race Coordinator software can also be used with it.



IBB are currently developing a new race control system with smaller boards. I am not aware of when it will reach the market.

Slotmaster - [www.slotmaster.com](http://www.slotmaster.com)

Lap Counter! Multiplexed with Last Time

<b>Driver1 on Black</b> <b>5.200</b> Pos 3 Laps 2	<b>Driver2 on Yellow</b> <b>5.200</b> Pos 2 Laps 2	<b>Driver3 on Blue</b> <b>5.360</b> Pos 1 Laps 2
<b>Driver4 on White</b> <b>4.480</b> Pos 4 Laps 2	<b>Driver5 on Green</b> <b>4.480</b> Pos 5 Laps 2	<b>Driver6 on Red</b> <b>4.560</b> Pos 6 Laps 2
<b>Driver7 on Purple</b> <b>4.560</b> Pos 7 Laps 2	<b>Driver8 on Pink</b> <b>4.560</b> Pos 8 Laps 2	<b>Laps Completed</b> <b>2</b>

Track Power:  All,  Black,  Blue,  Green,  Purple,  Yellow,  White,  Red,  Pink

Session Paused: 00:00:16 Elapsed Time

Race Information:

Date and Time	01/07/2006 11:18
Race Length	5
Laps Completed	2
Laps To Finish	3
Fastest Lap	3.488 - 4.281
Fastest Speed	191.4 - 8.0000
Elapsed Time	00:00:16
Class Name	Sports
Race Status	Paused

PCLapcounter - <http://pclapcounter.be/> hardware & Software package, fairly pricey

Pc Lap Counter - [Pc lap counter v5.00 (www.pclapcounter.be)]

Pos	Car Picture	Driver	Lap	Lap time	Gap	Best lap time	Fuel Left	Fuel Meter	S.Lap	S.Pos	Reaction time	Driver Picture	Laps
1	Warning	Fred	30	6.117		5.615	5,0 / 100	Max Fuel	30	1	1.474		5
2		Curd	30	6.164	0.254	5.418	95,1 / 100	Max Fuel	30	2	1.090		3
3		Brian	28	5.853	2 L (2 L)	5.597	0,0 / 100	Fuel Empty	28	3	0.674		1
4	GO	Ben	28	5.594	2 L (59.738)	5.594	100,0 / 100	Max Fuel	28	4	0.914		2
5		Dan	28	6.117	2 L (0.269)	5.574	100,0 / 100	Max Fuel	28	5	1.282		4
6		Guy	26	6.258	4 L (2 L)	5.584	20,2 / 100	Max Fuel	26	6	1.650		6

Qualifying Practice End Lap Pause Race Elapsed Segment Record Lap: 5.417 Brian Seg Best Lap: 5.418 Curd

00:05:42 00:05:18 00:05:42

**Startline** <http://www.startline.net.au/>

Australian made hardware and software package, unsure if still available or supported.

### **Most of these systems can be used with several types of sensing to activate the software counting.**

- 1) **Photo-transistor sensors** that respond by turning on and off in response to the presence and removal of some kind of visible light, or infra-red light.
- 2) **"dead-strip"** which is a short section of track where the left and right rails are isolated from the rest of the circuit (on each lane), The braids of the car short from one side to the other through the motor like turning on a switch for a moment as the car passes over that isolated section of track.
- 3) **Micro-switches** or **magnetic switches**, which just act like the above, usually triggered by the car guide, or the motor magnet.

In all these cases, the "sensor" is simply acting like an electrical light switch, ie, it completes the circuit as when you turn on a light, or "opens" it, as when you switch off a light.

The software is "looking at" the wires connected to these "switches", and goes *"oh yeah, it turned on for a moment", - or "it turned off for a moment" - better add one more lap to that lane count, and oh yeah, it's been 4.65 seconds since it last happened, so that's how long it took the car to do the lap.. I better add all that into the race data for the guys and store it till the race ends"* . . . really, it's that simple....

Some packages such as Ultimate Racer can also be driven by a web camera attached to the PC, where a defined screen area of what the camera sees, gets triggered by the movement of a car. [sounds weird, and I haven't tried it, but I've read a number of reports where people use it quite successfully.] To me the downside is that between the car and the camera, hands can get in the way and falsely trigger it, and also, if the camera gets bumped, you lose the actual correct "triggering"]

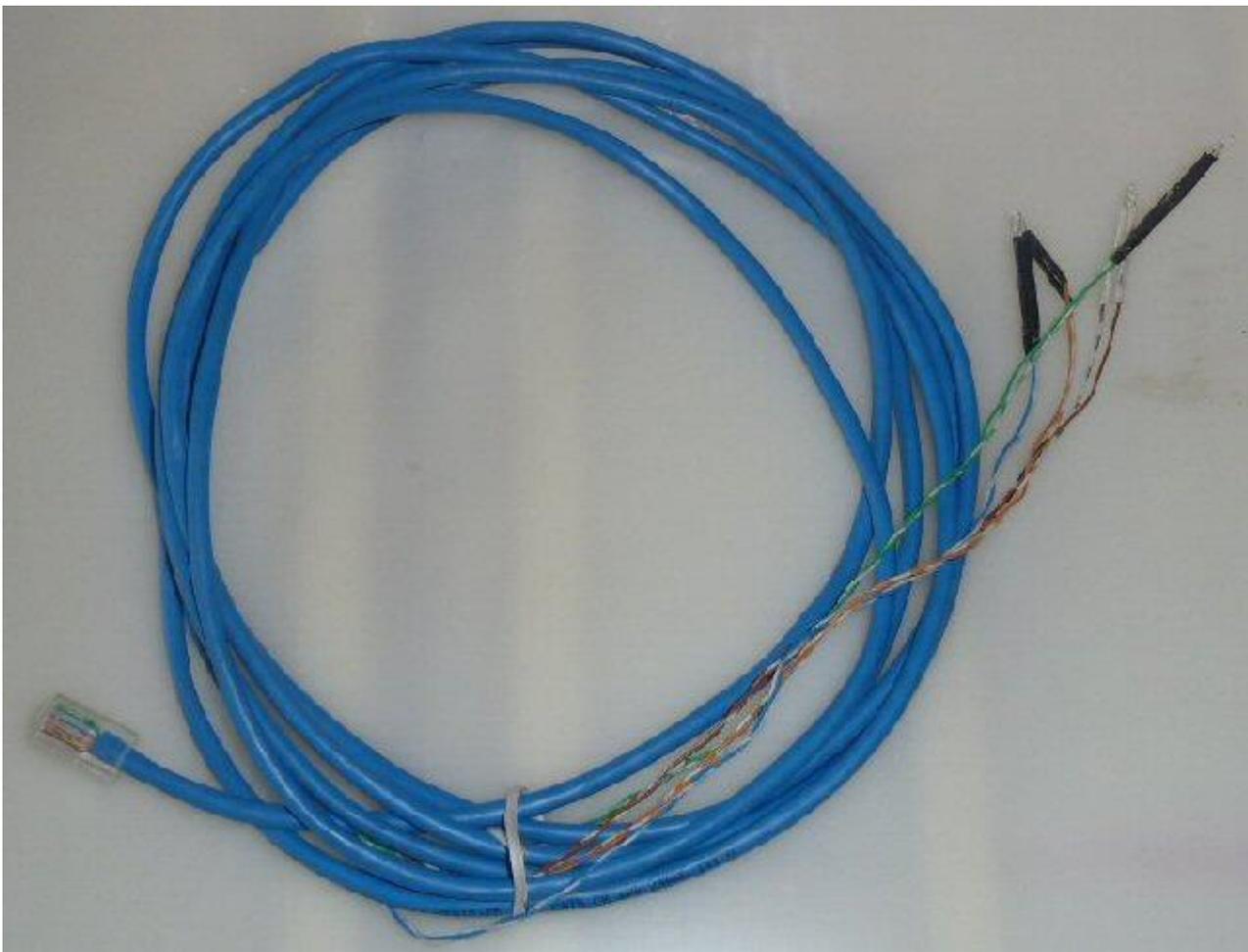
Ultimate Racer can also be configured to work with outside hardware boards to do more sophisticated things. . . but that's another story.

### **1) PHOTO-TRANSISTOR SYSTEM WIRING SETUP**

These days this is the most common way to trigger the race control software.

You wire up SENSORS to the appropriate pins on a lead which connects to the hardware board of your timing system if you have that kind; or directly into a port on your computer which is specified by a software only system.

**SENSORS :** You can use photo-transistors which sense visible light, or ones which sense "I.R." Infra-red light which is invisible to the human eye. I.R. is popular because you don't have to "see" the bright light shining down onto the track, especially if you do night racing, but you do need a bit more electrical savvy and confidence to set them up. (They are visible as a pink light through the lens of a digital camera or cell-phone, which is how I always check that they are working.) Then; you supply a light source for the photo-transistors.



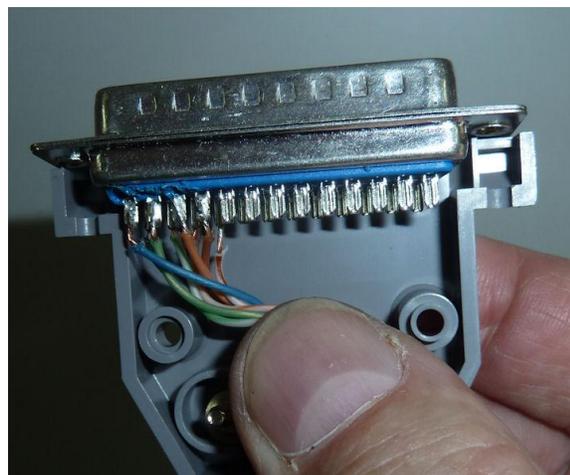
A typical 4 lane timing cable/loom, wired with a Cat-5 connector to go into a Trackmate board, and 4 photo-transistors on the other end.

**If you have a red coloured Trackmate board, or an older PC with a DB25 printer port, you can wire a cable to go directly into that DB25 port**

You wire up the Photo-transistors to the appropriate pins on a lead connected to a DB25 printer plug (the old standard printer plugs.) These are SENSORS – a switch operated by light. Below is a 4 lane sensor wired up.

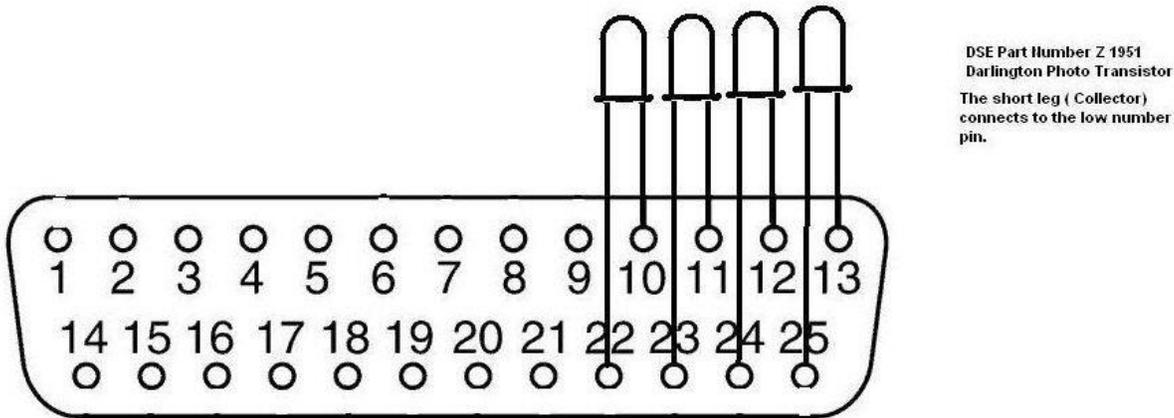
In the picture:

the Brown wire is connected to pin 10 for lane one of the sensor, and it's Brown/white "partner" underneath to Pin 22  
the Orange wire is connected to pin 11 for lane two of the sensor, and it's orange/white "partner" underneath to Pin 23  
the Green wire is connected to pin 12 for lane three of the sensor, and it's Green/white "partner" underneath to Pin 24  
the Blue wire is connected to pin 13 for lane four of the sensor, and it's blue/white "partner" underneath to Pin 25



One quick note - Make sure you have the "legs" the right way around on the photo transistor, or it won't work. **The diagram below appears as being switched left to right because it is displayed from the PINS side of the plug, not the REAR of the plug where I took the photographs.**

But as it shows, you need the short leg of the sensor wired to the TOP pin, and the long leg of the sensor wired to the BOTTOM pin. It also does show you the pin numbers each wire is connected to. You will need those numbers if you use UR3.0, because that software package allows you to decide which pins are assigned to which lane counting.



25 pin D connector ( Male ) Viewed from the Pin side

You can do a "dry run" by leaving one leg of the sensor (photo-transistor) unsoldered, but make and break the circuit for each lane with a screwdriver, just touching the two sides together, which should trigger the software! That forms an easy test of your parallel port, your wiring, and the settings of the software.

I have run a software patch with my own old red "Trackmate" system which causes most PCs and versions of windows operating system to recognise USB inputs as serial "com ports" for input, given that PCs with old fashioned DB25 cables are becoming rarer. You use the DB25 to USB adapter lead that comes with that software. This is called the PL2303, and the patch for various systems can be downloaded from here <http://www.prolific....loads.asp?id=31>

### LIGHT SOURCE FOR Photo-sensors

For visible light, some people just use a fluoro lamp across the track, built into a bridge, others use some small LEDs which emit visible light, usually built into a bridge of some kind. I don't recommend the basic room light, as it is often too low, and can be affected by people moving about.

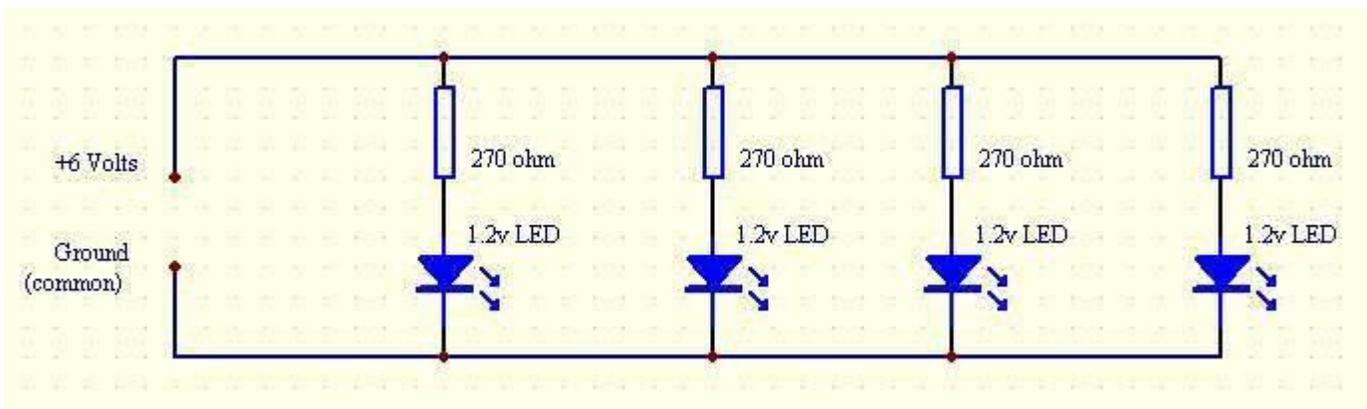
if you use IR photo-transistors, you need to use IR frequency **LEDs** (**L**ight **E**mitting **D**iodes.)

One quick note - Make sure you have the "legs" the right way around on the LEDs, or you will blow them up. One side is positive, the other negative. Generally, the long leg is the positive side, but do check the specification sheet that should come with them.

To power the LEDs you need a small DC source. This only needs to be about 30milli-amp output for each LED, so if you have a 2 or 3 lane track, an old cell phone charger of 100ma or so will be fine.

You can adjust the value of resistors used, to work with anything from say 3 to 12 volts.

Here is a wiring diagram with some typical values and the very simple circuit outlined, and below is a link for an excel spreadsheet which will calculate the resistor value needed to wire in with either visible or Infra-Red LEDs



Click the link below to get a spreadsheet which will help you calculate the resistor value required to use in a circuit with your choice of LED and power supply.

[LED Powering Formula](#)

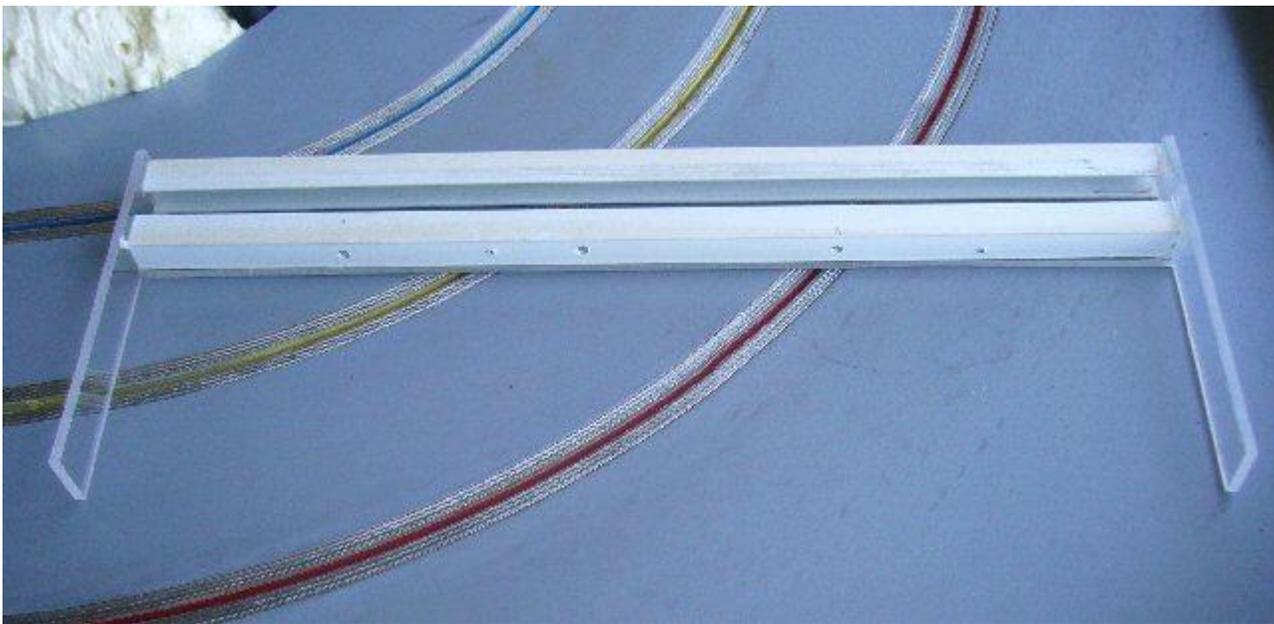
Choose an old phone charger or similar wall-plug DC supply. Input the nominal voltage of the LED (usually about 1.2 volts), and the current rating of the LED - which is usually about 20 milliamps; then choose a resistor of near as value to the big blue figure the spreadsheet kicks out at you.

- Some common results would be
- 4.5 volts        use 160 ohm resistors
  - 6 volts         use 240 or 270 ohm resistors
  - 7.5 volts       use 300 ohm resistors
  - 9 volts         use 360 or 390 ohm resistors
  - 12 volts        use 510 or 560 ohm resistors

These resistors values at the 1.2 stated voltage will give you a current through each LED of about 20ma. This is the most common rated drive current for LEDs, but in practice, I have driven some myself at up to 3 times that for short periods, and on my own track I have driven them at around 25ma for the past 3 years, and none have failed – we never miss laps as we have plenty of "invisible" I.R. light.



The shot above is a custom PC board in which LEDs are mounted with current control resistors ready for installation in some kind of light bridge. DC power can be fed to the + and - points at either end.

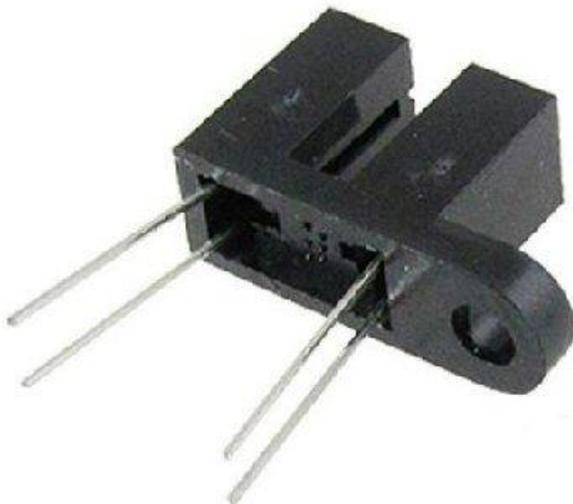


The shot above is what I made for one of my tracks. I mounted the LEDs poking out the bottom of this bridge, then added the 2nd sidewall, and painted and decorated it. The power wires for the LEDs came out one end and disappeared into the Superstructure of the track, where I connected them to a small DC power supply robbed from a defunct cellphone.

The image below shows a start finish banner from another track I built, which has the I.R. LEDs built in. Wiring hidden, very simple - not flash modelling, others will do it better than my ham-fists can achieve.



There is another type of "all in one" photo-transistor unit with LEDs that can be mounted in a slot. The wiring principles are the same but you need to know which side is the photo-transistor to connect to your timing, and which side is the LEDs needing some DC voltage to drive them.



These need to be mounted in the slot so they are as near as possible to flush with the surface. The advantage of these is that they are discreet and false triggers above the track by hands or de-slotted cars passing under the light bridge are eliminated. However as the light source is broken by the slot guide, which is a very short pulse, and blue colour guides are often transparent to the IR light, laps can be missed.

For those who don't feel able to build the timing cable or light bridge for themselves, ask around your club, or on forum for someone who could do it for you. If that fails, contact me, as I still make up systems for people.

## DEAD STRIP SETUP

The idea of a dead strip is that you have a short strip of the "track" where one side of the copper tape/braid or rails of a plastic track is actually isolated from the power. So, as the car passes over the "isolated" section of track which may be 5 to 10cm long (depending on things like typical car speed on your track and the location of the dead-strip), the pick-ups of the car close/complete that small length of isolated circuit from the left to the right side, and you run a wire from each side of that small piece of track back to your timing software to the computer, where it is connected via a printer cable as if it had the photo-transistor type of sensor. So in effect, the car braids are the "switch".

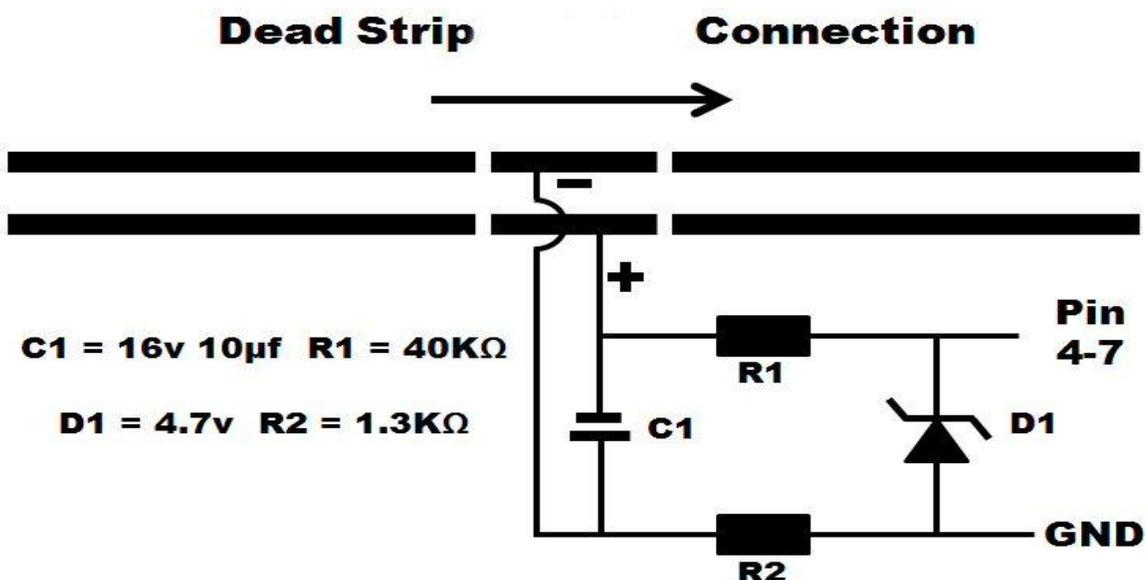
This USED TO BE the default system for counting laps, and in practice is very reliable if you set it up with the right sort of length of "dead-strip".

If it is too short, and the cars go over it too quickly, it may not "trigger", and if you put it somewhere where cars may have just de-slotted, you can miss laps, or get a car straying from another lane to create a false count as its pick-ups brush across the dead strip. Too long, and the car slows more than is desirable during the dead strip - or even stops ..... but done right, they are just fine, and have the advantage of there being nothing needed above the track surface, and never needing maintenance or alignment.

Dead strips are polarity sensitive due to the "back EMF" created by motors. Wired one way, the EMF helps the switching, wired the other way, it tries to prevent it. If you connect a dead strip backwards they will only count properly with very low powered or if the car is moving very slowly.

Many people that encounter that problem think that the dead strips need to be longer, but if the polarity is correct dead strips as short as 1.5 inches will work perfectly.

Here is a diagram showing correct wiring, and some basic components to use, which are to protect the PC input at the "other end" of the cable, and assumes that each of four lanes will connect to pins 4 - 7 on a DB25 printer port.



**Also, you absolutely have to keep track voltage away from the dead strips.**

This can be done by having a gap either side of the dead strip..... long enough to ensure that car braids cannot simultaneously short out the dead strip while being on live track, ie a section say

20 - 25mm where there is no braid/tape at all.

If you want to run a track which has dead-strips for timing both ways; you will need to use some DPDT switches to reverse the circuit so the wires still go to the right pin numbers on your computer, and the

PC is protected by the circuit drown above.

If using a DB25 (old parallel printer port, you may need to set the parallel port to 'SPP' mode in the pc's BIOS, depending upon how many lanes you have, and whether you want to use the software to do tasks other than counting laps.

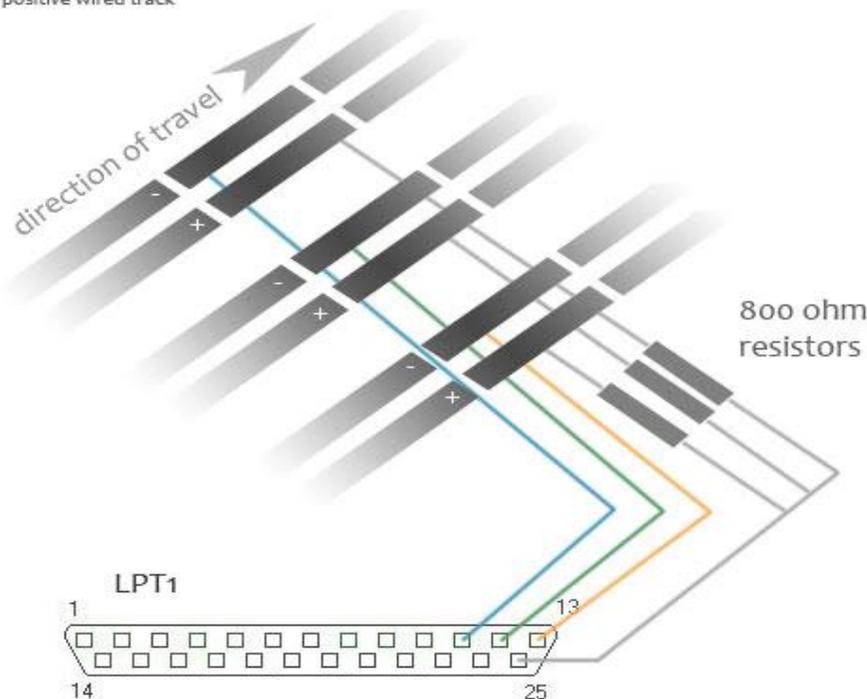
eg, Ultimate racer is capable of running a lot of different add-on facilities, and Race Coordinator can work with at least 8 lanes, requiring use of pins usually configured for the Bi-directional modes of printer ports.

You can then use pins 10-17 for triggers.

These three lanes are wired to pins 11/12/13 with a common ground to pin 25

Make sure you get the port address (ie 0x378) from there and enter it in the settings of **Ultimate Racer** if you are using that package.

dead strip wiring  
for a positive wired track



For use of Dead Strips with Trackmate, the correct protection module supplied by Trackmate is strongly recommended. Also, Trackmate uses specific pins for input.

- Lane 1 = Pin 10
- Lane 2 = Pin 11
- Lane 3 = Pin 12
- Lane 4 = Pin 13
- Lane 5 = Pin 6

Lane 6 = Pin 7

Lane 7 = Pin 8

Lane 8 = Pin 9

These are all tied back to the same common rail of pins 18 - 25

### **OTHER TYPES OF SWITCH**

There are also a couple more sensors that can be used. One type has the lever arm of a micro-switch down in the slot. Micro-switches work well once you adjust them properly. HO tracks mostly use magnetic reed switches, those would work in 1/32nd scale if you always ran with traction magnets, but motor magnets alone are not likely to trip them. SOME reed-switches are also polarity sensitive, so you should check that point out if you plan to use these.

**Whichever hardware and software combination you decide to use, you will need to configure the software, so that it is "looking at" the right pin numbers, on the right connector type and number on your PC.**