

The K1C - Son of a cheap kit timer

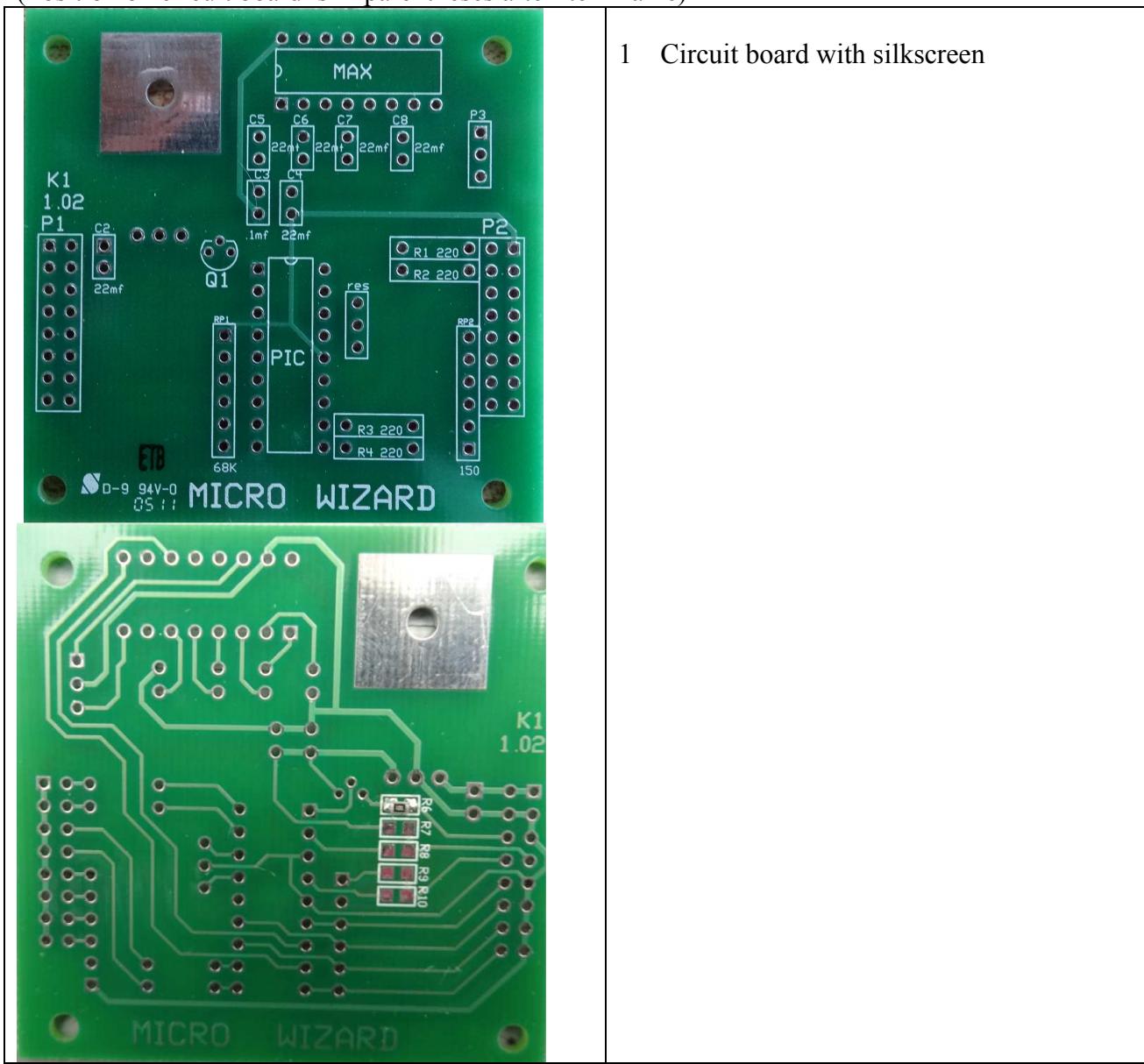
This is not suitable for a beginner! You must have soldering skills in order to build this kit.

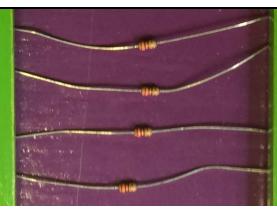
(You may order this circuit board assembled (K1CA) for an additional cost.

Micro Wizard has been manufacturing Pinewood Derby timers for over 10 years. We are now marketing a very low cost timer based on our K1 timer. This Timer is geared more for the serious hobbyist/(tightwad). The kit requires soldering and is geared to save every penny. The only components we solder are the surface mount resistors – the rest is up to you. This saves us \$\$ on the cost of the kit and we pass the savings to you. We only include the electronics in our “cheap kit” - no enclosure or frame, so carpentry skills are also required for a nice finished product. To reduce the cost even more we will only post the directions on the Internet. You will not get any directions with your kit. So you may want to read these directions and print them before you order the kit. If you’re real tough you will just look at the photos anyway, and discard the written directions.

What you get (without serial option)

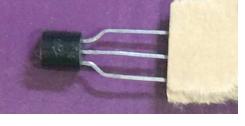
(Position on circuit board is in parentheses after item name)

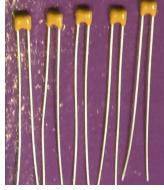


	1 Preprogrammed microcontroller (Fits in socket at PIC) (Programmed for the timer to auto-reset after 10 seconds)
	1 4mhz resonator with build in caps (res)
	1 18-pin socket for microcontroller (PIC) (I debated this extravagance, but it only adds minimally to the cost of the kit.)
	1 7805-voltage regulator with mounting screw (large silver square on board)
	4 220-ohm resistors (R1, R2, R3, R4)
	1 10 mf cap (C2)
	1 0.1mf cap (C3)
	1 68k ohm (RP1) resistor network
	1 150-ohm resistor (RP2) network

	2 Multi color ribbon cables with IDE connectors
	4 Phototransistors
	4 IR LEDs
	5 High bright LEDs (includes 1 test LED for serial port)
	2 Headers (P1, P2)
	4 Red lenses
	1 each Power connector and Battery clip

If you purchased the serial option, in addition to the above you get:

	1 NPN 4401 (Q1)
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	5 more 0.1mf caps with serial interface (C4,C5, C6, C7, C8)
	1 Max 202 chip (MAX)
	1 female DB9 connector

What is not included

- Directions
- Remote Start switch and USB interface converter
- Framework or enclosure
- Battery, battery holder or power adapter

Notes on assembling the circuit board.

(Important! Be sure you are grounded before handling the microcontroller chip. Static electricity can damage it!)

The silk screen on the circuit board is a pretty good guide to assembling the circuit board. The exceptions are: Disregard the 22 mf on the board. The flat side of the NPN4401 (Q1) should point toward the bottom of the board, unlike what is specified on the silkscreen. The square pad is positive for the electrolytic capacitors. Pin 1 is on top for the 68K network and on the bottom for the 150-ohm network.

NOTE: When handling the microcontroller, you have to be very careful of static electricity. It can damage the chip. Most of the time static is not a problem, but if you can see or hear static, then take precautions

What does what

Power comes in on the top 2 pins of connector P1 and goes to the cap C2 and then the 7805 voltage regulator. The output of the voltage regulator is 5 volts and powers the rest of the board. The 1k-ohm surface mount resistors are for the reset switch and laser reset. The 220 ohm resistors R1-R4 are dropping resistors for the high bright display LED's. The 68K resistor network RP1 is a pull up for the sensors changing RPI to smaller value so the resistor network will make the sensors less sensitive to light. The 150 ohm network RP2 is the dropping resistor for the high output infrared LEDs. Next to the microcontroller is a 3 pin ceramic resonator with build in capacitors. The resonator is the clock for the microcontroller, without it nothing happens. The ribbon cable is in two pieces- the sensor side (left side of circuit board) will be longer than the output side (right side of circuit board).

If you want to run your timer on a 6 volt battery, replace the 7805 with the IN4007 diode, skipping over the middle regular hole.

The specifications for the AC Adapter are: 9 volt –200 millamps or better – center positive. – Or, you can purchase one from us, or get one from Radio Shack – part #273-1767, with adapaplug#273-1717.

NOTE: If you have less than 4 lanes, don't hook up the sensors for the lanes not in use.

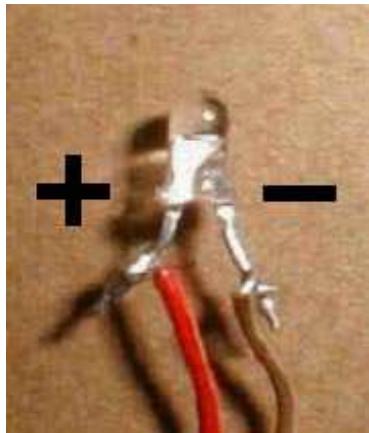
What the ribbon cable connections are:
 (We will provide headers and put the IDC connectors on the ribbon cables)

Left side of circuit board

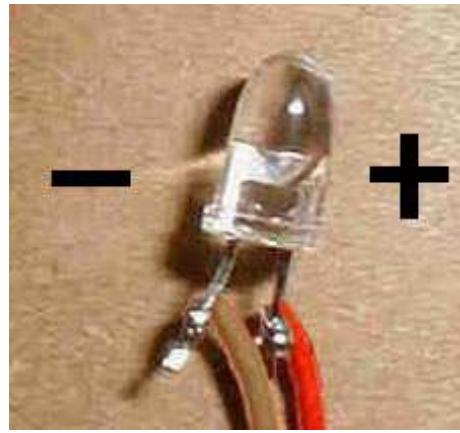
Power +	Brown * * Red	Power + (Red and Brown wires both go to positive)
Power -	Orange* * Yellow	Power - (Orange and Yellow both go to negative)
Common	Green * * Blue	Laser (Blue is the positive laser drive output)
Laser Reset	Purple * * Gray	Sensor/Timer Reset (Purple is laser reset switch while Gray is the laser sensor or timer reset switch)
Sensor-	White * * Black	Sensor+ for Lane 1
Sensor-	Brown * * Red	Sensor+ for Lane 2
Sensor-	Orange* * Yellow	Sensor+ for Lane 3
Sensor-	Green * * Blue	Sensor+ for Lane 4

Right side of circuit board

Display LED-	Brown * * Red	Display LED + for Lane 1
Display LED-	Orange* * Yellow	Display LED + for Lane 2
Display LED-	Green * * Blue	Display LED + for Lane 3
Display LED-	Purple * * Gray	Display LED + for Lane 4
IR LED-	White * * Black	IR LED + for any lane over any sensor
IR LED-	Brown * * Red	IR LED +
IR LED-	Orange* * Yellow	IR LED +
IR LED-	Green * * Blue	IR LED +



Phototransistor

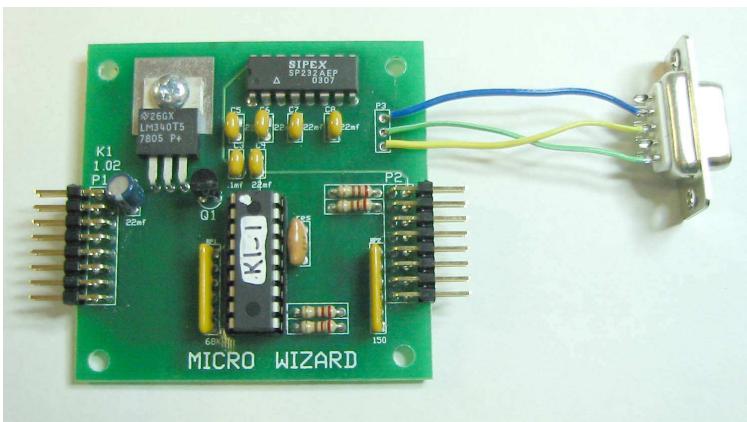


Hi-Brite LED



Purple Tinted or
Orange Tinted
Infrared LED

Your kit could be either of these boards.



There is no polarity on R1-R4, C3-C8 or RES.
NOTE: The .1mf caps that are shown in this photo as the color gold may be blue in your kit.

Caution!

The flat side of the NPN 4401 (Q1) should point toward the bottom of the board, unlike what is specified on the silkscreen.

DB-9 connections:

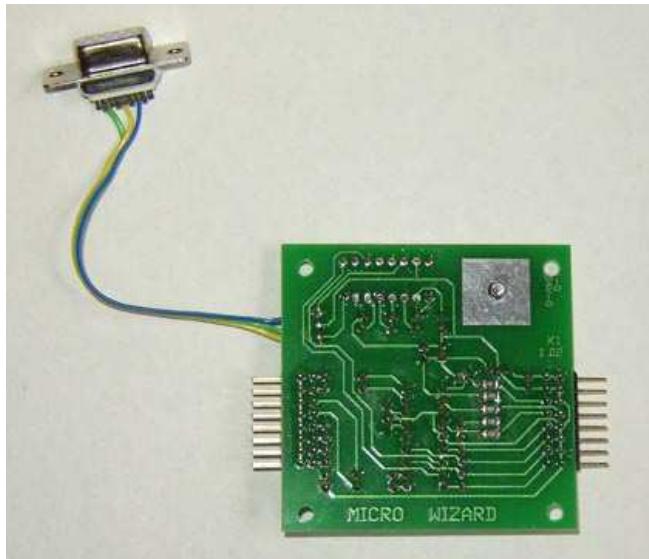
Top (Blue)	Pos.2
Middle (Green)	Pos.5
Bottom (Yellow)	Pos.3



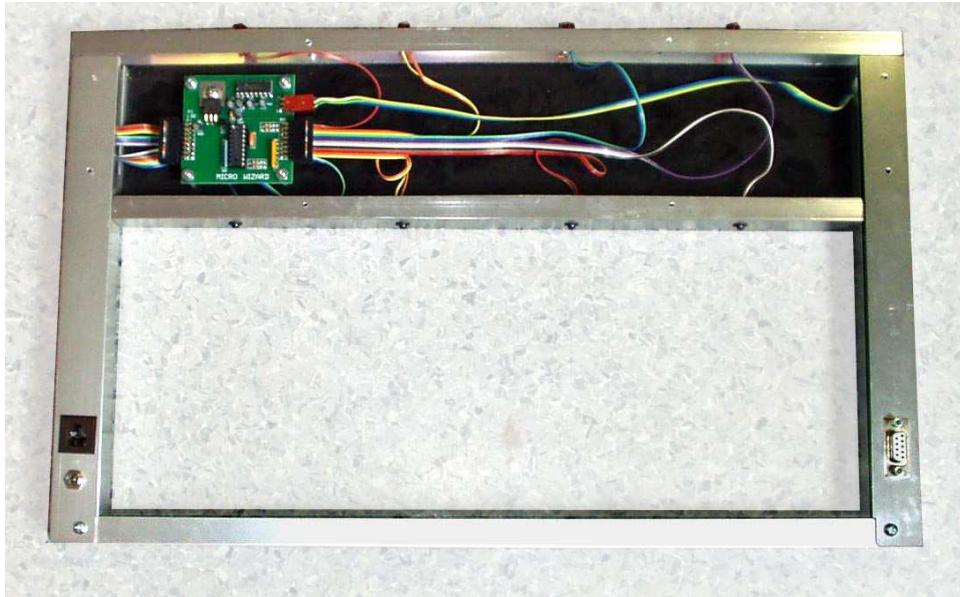
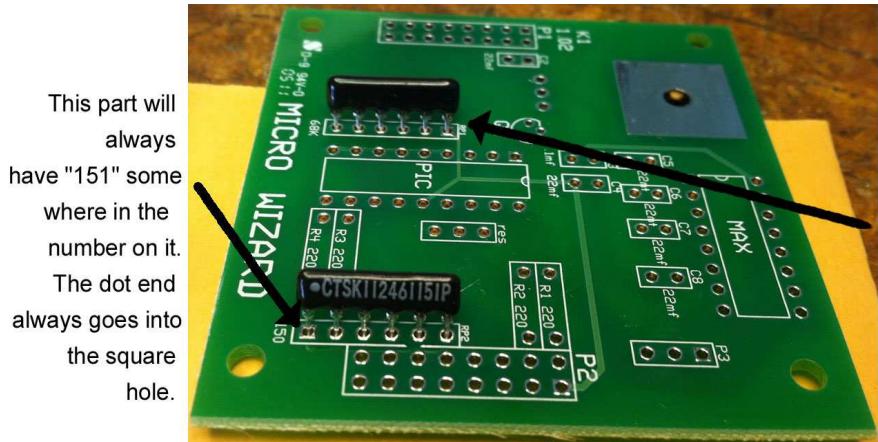
If you didn't order a serial option, you may get this board.



There is no polarity on R1-R4, C3 or RES.



The board will come with the surface mount resistors already soldered in place.



This is the circuit board in the enclosure we use for our timers. When building your enclosure the emitters should be around 6" above the track. You might want to refer to the K1 kit instructions we send with our regular timer. It's at: <http://www.derbywizard.com> on the support page.

The K1CS Cheap Kit with Serial Interface and Computer Data Options

**(Important! Be sure you are grounded before handling the microcontroller chip.
Static electricity can damage it!)**

(You may order this circuit board assembled - K1CSA for an additional cost).

You can upgrade your K1 Cheap kit to use with a computer for an additional cost. The serial interface will permit your K1 to time races to one thousandth of a second and send the time to a computer or our remote time display unit (RTD). If you have the serial interface you can run race management software packages like Grand Prix Race Manager Pro, Grand Prix Race Manager Lite or DerbyMaster.

The K-Series Timers have powerful Data Options that come with this kit.

The additional parts you get with Serial interface

The circuit board looks exactly the same, only we will program the PIC Chip with the serial and data options. See page 1 for the additional electronic parts. The remote start switch is not included in this kit.

What is not included

- Cable or wire
- Disk or software (you can download some freeware at ftp.microwizard.com)
- Hard copy of the directions
- Hood for db-9 connector
- Remote Start Switch (RS) You can purchase one assembled from us, or you can make your own. The instructions are on the next page of these directions.
- Male/female DB9 Serial Cable to attach timer to your computer. The USB to serial interface converter is not included. You can purchase one from us.

Troubleshooting

To test the serial interface put the high bright LED into the db-9 socket. Connect the short negative lead of the LED to pin 5 of the db-9 and connect the long positive lead of the LED to pin 2 of the db-9. Now when you power up the board the LED should be unlit. If the LED is lit then the LED may be plugged into the db-9 backwards or you may have some deeper problem. If the LED is off (like it should be) then trip each lane sensor while watching the LED. When the last sensor is tripped the LED will flash briefly and go out. The LED should flash once more when the start/reset switch is closed. If you get the LED to flash, then your serial interface is most likely working. Plug the db-9 into a PC com port and run the FUNterm program to display the times for your race. Go to www.microwizard.com and download the Funterm program from our downloads page. FUNterm set-up instructions can be found on the last page of this document.

If you have problems after the unit is built and on the track...

1) If you are not getting any readings at all, the problem could be that too much ambient light is getting to the sensors in the bottom rail. To test for this, put your timer into a dark room, plug in the AC adapter, and trip the bottom sensors with your hand. If the timer works, there is a light problem with the bottom sensors. Possible problems: the hole might be too big (it should be 3/16"), the sensors might be placed too close to the surface of the track (they should be recessed at least 1/4" from the top edge of the track), or there might be too much light getting in from under the track (solve this by covering the sensors underneath with duct tape, or dark plastic).

2) If nothing is working: unplug the power adapter from the side post of the finish line banner. Make sure the outlet is functional. Reconnect the power adapter and plug it In.

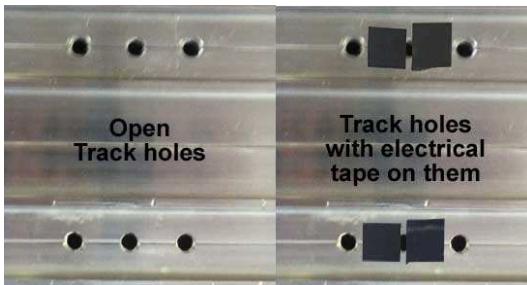
3) If you still have a problem: give me a call, Stuart Ferguson, at (888) 693-3729 (office) or (859) 380-3882 (cell phone). We have a three year warranty on the Fast Track system. If it hasn't been abused, we'll fix or replace it free, (including ground shipping), or refund the purchase price if we are unable to meet your satisfaction.

If you are trying to use the timer in direct sunlight

You may have trouble running our timer in direct sunlight, although it may run in shade. Here are several ways to improve the performance in sunlight:

- Make sure no light is getting to the back of the sensors. Cover the back of the sensors with black tape.
- Use a small hole in the track. 1/8 inch hole should work fine.
- Make the interior of the hole flat black, or other dark color, so indirect light is not reflected down to the sensor.
- Make the sensor hole deep. It should be at least 1/2 inch deep for best results.
- Put black electrical tape on either side of the hole in the track below the infrared transmitters to make a slot that will let in less light. See photo below.

We have used J-B Weld, or J-B Kwik epoxy to fix holes that were too big. You can fill the big hole with the epoxy, then redrill them to a smaller size. The new hole is a flat gray color that works well.



How to Make Your own Remote Start Switch for the K1 Cheap Kit

The ribbon cable on the left side of your circuit board relates to the following, if you are using a RJ11 telephone type jack or a micro switch:

Ribbon cable	-	RJ11 wires	Micro Switch
Purple	-	Yellow	
Green	-	Green	- negative or common
Gray	-	Red	- positive, or normally open
Blue	-	Gray	

Commands that can be given through the serial port:

- M(A-G) Mask unused lanes**
MA would mask out lane A. MB would mask out lane B and so on. MG would enable all lanes by clearing the mask.
- RL (0-6*) Reverse lane if 0 is set to normal * Number of Lanes of your track**
This command reverses the data stream sent from our timer to your computer or remote time display – ie- Lane ABC becomes CBA on your computer.
- RE Reset Eliminator mode**
If the timer is in the Eliminator mode, it will reset back to the standard mode of racing.
- RF Return features in binary**
This command will return 8 binary bits like 0011 0111. A 1 means the option is enabled:
1111 1111 all feature bits set. 0000 0000 all feature bits clear
- RS Return serial number**
- RA Reset lane – Force results**
Force the timer to end the race and send the results of all lanes that have finished. This is great feature for when a car crashes, burns and falls off the track.
- LR Reset laser gate**
When the race is over the computer can reset the laser gate. This can work like the RA command, but does nothing if the customer does not have a Laser Gate.
- LE Set timer for Eliminator mode**
Eliminator will score only a first and second place for lane pairs. Makes 3 races on a 6 lane track or 2 races on a 4 lane track.
- LF Load feature**
This feature is enabled only with a password – guessing a serial number will give you an error and may disable features in your timer.
- LX (A-O) Change time or disable automatic reset**
In the command line, each of the letters of the alphabet A through O will add 2 seconds to the reset time. So to change the automatic reset time to 6 seconds enter: LXC, and to change the automatic reset time to 25 seconds enter: LXO
To disable the automatic reset enter: LXP
- N0 Old format**
Converts the race time data to the old timer format:
A=3.001! B=3.002 C=3.003 D=3.004 E=3.005 F=3.006 <LF> <CR>
- N1 New format**
Converts the race time data to the new timer format:
A=3.001! B=3.002" C=3.003# D=3.004\$ E=3.005% F=3.006& <CR> <LF>
- N2 5 digit time format start switch closed and open status**
Only on 2012 and newer timers.

RM	Read mode Shows the current modes set for the timer: 6 000011 0 0 0 Number of lanes used in reverse order mode - 6 Lanes E and F are masked - 000011 Lanes are not reversed - 0 Not in eliminator mode - 0 Old data format - 0
RG	Returns start switch condition The timer will return a “1” if the start switch is closed and “0” if the switch is open.
LO	Turns off the laser bit or gate release bit
LN	Turns on the laser bit and causes the motor gate to open Only for the automatic gate release.
LG	Pulse laser bit for solenoid style gate release
RV	Return version of firmware and serial number
RX	Simulate the closing of the start switch for half a second This ends the race and sends any results to the computer. You must have the “Force Print” option.
LX(0-9)	(K2 & K1 Models A-O) Change time or disable automatic reset In the command line, each number after the x will multiply 2 seconds to the reset time. So, to change the automatic reset time to 6 seconds enter LX3 , and to change the automatic reset time to 18 seconds enter LX9 . To disable the automatic reset enter LX0 .
LX	K3 model time interval between alternating position then times on the finish line display In the command line, each number after the x will multiply 2 seconds to the alternate time. So, to set the rate of change to 6 seconds enter LX3 and to set the rate of change to 18 seconds enter LX9 . To display only the time without displaying position enter LX0 .

Race Data Finish Order Punctuation:

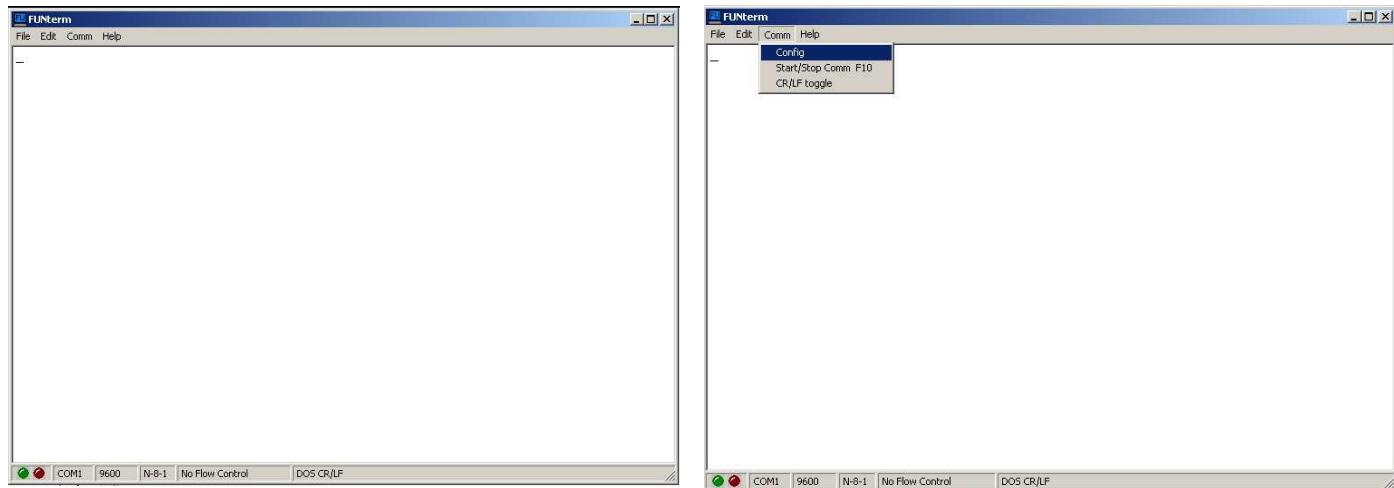
21h	-	!	-	First Place
22h	-	“	-	Second Place
23h	-	#	-	3rd
24h	-	\$	-	4 th
25h	-	%	-	5 th

To change Options or view times from your race in FUNterm:

- Plug your timer into a power source
- Using the computer serial cable and/or the USB converter, plug your timer into the com port or USB port on your computer

Go to Microwizard.com and under “downloads” on the menu, download the program “FUNterm.exe”

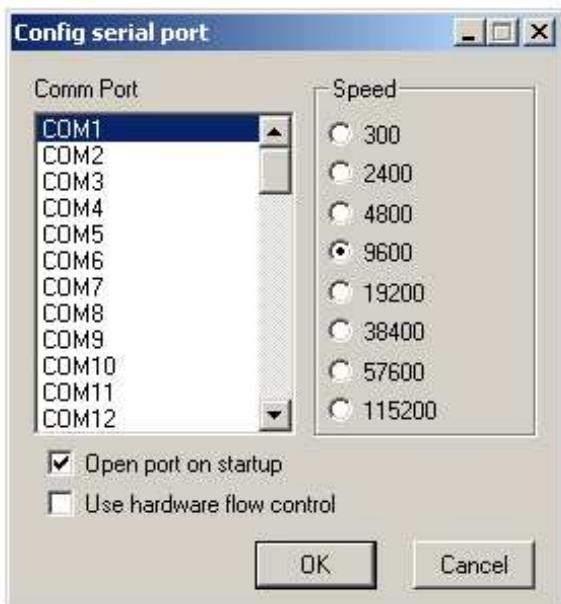
- This is a stand alone program that doesn’t require an install
- Double click on the saved FUNterm.exe file



1. This window will come up

2. Put down Comm

- Click on Config



3. A New Window will come up:

- Choose the correct comport that your timer is connected to. Don’t change anything else because the timer uses the default settings.
- click okay

4. You should now be able to type commands to the timer through the computer, or, once all the cars have raced and the lanes have finished, the times should automatically display.

To enter commands - type RV and hit enter. The version number of the timer should display on your computer screen. If it does, you are ready to enter the option commands of your choice.

If you don’t see the version number, you probably have a comport conflict. See “Frequently Asked Questions” on our web site for a list of ways to trouble shoot the problem.