

RACEAMERICA

T i m i n g S y s t e m s

Model 2500P Pro Tree

Dual Lane Drag Timing System Owner's Manual

Rev B

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T i m i n g S y s t e m s

LIMITED WARRANTY

To the original purchaser of this RACEAMERICA product, RACEAMERICA warrants it to be in good working order for a period of ninety (90) days from the date of purchase from RACEAMERICA or an authorized RACEAMERICA distributor. Should this product malfunction during the warranty period, RACEAMERICA will, at its option, repair or replace it at no charge, provided the product has not been subjected to misuse, abuse, or alterations, modifications, and/or repairs not authorized by RACEAMERICA.

Any product requiring Limited Warranty service during the warranty period should be returned to RACEAMERICA with proof of purchase. If return of merchandise is by mail, the customer agrees to insure the product, prepay shipping charges, and ship the product to RACEAMERICA, Inc., 2005 De La Cruz Blvd., Suite 245, Santa Clara, CA 95050.

ALL EXPRESSED AND IMPLIED WARRANTIES FOR THIS PRODUCT ARE LIMITED IN DURATION TO THE ABOVE NINETY DAY PERIOD.

UNDER NO CIRCUMSTANCES WILL RACEAMERICA BE LIABLE TO THE USER FOR DAMAGES, INCLUDING ANY LOST PROFITS, LOST SAVINGS, OR OTHER INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OF, OR INABILITY TO USE, SUCH PRODUCT.

THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH MAY VARY FROM STATE TO STATE.

PACKAGE COMPONENTS

Each 2500P Pro Tree package includes:

- 1 -2500 Series Display Unit
- 1 -PRO TREE 'Christmas' Tree
- 1 -Tree Base Unit
- 4 -IR Beam Emitters
- 4 -IR Track Sensors
- 2 -Tri-Beam Emitter Unit
- 2 -Tri-Beam Sensor Unit
- 1 -Interconnect Cable Assembly for
Sensors for START/STAGE/PRESTAGE
- 1 -Interconnect Cable Assembly for
Sensors for SPEED/FINISH
- 1 -12-button Keypad with Cable
- 1 -Jumper Connector for Demo Mode
- 1 -Owners Manual

POWER REQUIREMENTS

You will need these additional items to operate your 2500 Series timing system:

- 1 - 12VDC automotive battery
- 4 - AA-size or D-size Alkaline or rechargeable batteries per Beam Emitter

PRODUCT SPECIFICATIONS

The following listing provides the designed performance specifications for the 2500 Series timing systems:

Lane Width	to 50 Feet
ET Timer Capacity	up to 90.000 sec
MPH Capacity	up to 250.0 mph
RT Timer Capacity	up to 9.999 sec
Time Accuracy	0.001 seconds

Power Requirements:

Pro Tree Base	12VDC Battery
IR Beam Emitter	AA or D Batteries

THEORY OF OPERATION

The 2500 Series Drag Timing Systems are completely self contained race timing systems made with the latest technology CMOS circuit components to provide a highly accurate drag timing solution. The system contains an internal quartz crystal clock to maintain time accuracy and display of race results to one thousandth of a second.

Power is supplied to the LED display and track sensor components of the 2500P by the 12VDC automotive batteries connected to the RED and BLACK alligator clips located in the PRO TREE tree base. An absolute minimum of 11.0VDC is required for reliable operation of the system. Under normal conditions, a properly charged battery will operate for more than an entire day of racing without requiring a recharge.

The Beam Emitters and Track Sensors operate on invisible (to the unaided human eye) Infra Red light. The coded light frequencies are constantly received by the Track Sensors until a car interrupts reception ('breaks' the beam).

The IR Beam Emitter to Track Sensor transmission operates on Line-of-Sight principles. This makes alignment of these units critical. Tips are provided to aid alignment on surfaces that are other than ideal. These units will operate over a wide range of conditions but should not be operated beyond the specification parameters (less than 4 ft or more than 50 ft).

Once the system is properly set up and aligned on the racing surface, the system microprocessor will 'monitor' the track sensor each time the tree is started and a run is made.

Accuracy of the speed display is very closely related to the placement accuracy of the Speed Trap emitters and sensors. The distance from the finish line to the speed trap Emitter/Sensor pairs must be exactly 66 feet. A 3 inch placement error will cause a 0.1 MPH error in the speed measurement at 100 MPH. In preparation for a typical run, the Starting Sequence and Reaction Time modes are selected. For Index or Bracket racing, the drivers times are entered before the race. Each lane is staged by interruption of the

beam signal between the PRESTAGE and STAGE Emitters and the PRESTAGE and STAGE Sensors by the drag vehicle. Fouls are indicated for each lane if the vehicle interrupts the beam between the START Beam Emitter and the START Sensor prior to the illumination of the GREEN light. Once staged the countdown starting sequence is started by pressing '2' on the keypad. The driver starts on the GREEN light signal for their particular lane. The system begins timing the drivers reaction time when the last Yellow is illuminated. Reaction time is stopped once the car interrupts or "Breaks" the START beam.

SET-UP STEPS - 2500 SERIES

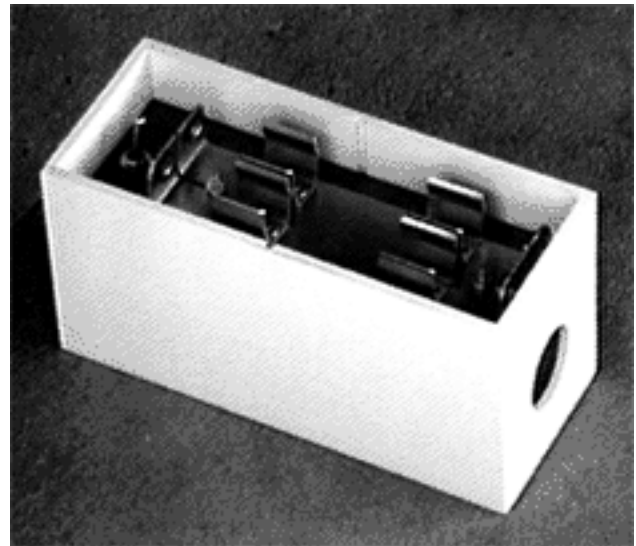
STEP 1 -

Familiarize yourself with the components pictured in this manual and how they interconnect. The Track Sensor Interconnect Cables are configured for connection between the LED Display and the Speed & Finish track sensors or the Start & Stage track sensors.

All connectors are labelled for proper orientation. The 12VDC battery is connected with the RED alligator clip to plus (+) terminal of the battery and the BLACK alligator clip to (-) terminal of the battery.

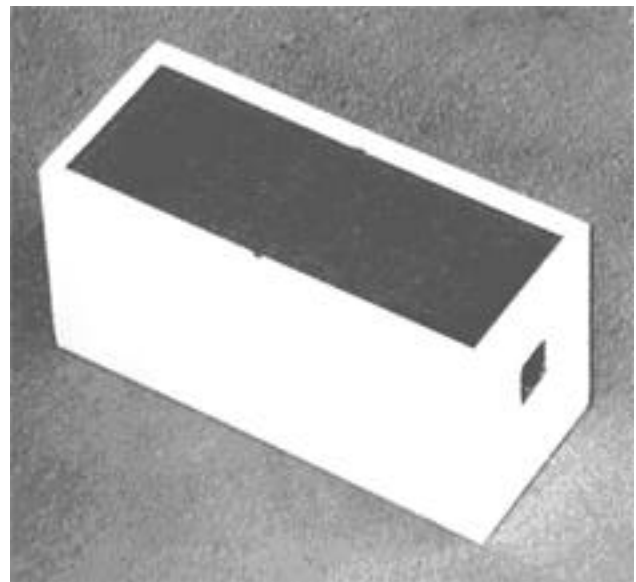
The free standing, battery powered Model 5040A, 5040D, 5064L/R IR Beam Emitters are placed on one side of the prestage/stage/start line, speed line, and finish line and the Model 5140C, 5164L/R IR Track Sensors are placed on the other side of the prestage/start/stage line and speed/finish line for each lane. Each of the 5040A/D Beam Emitter or 5140C Track Sensor units are fully interchangeable with each other. The Track Sensor Interconnect Cable is labelled to match the right and left at the starting line and speed/finish line track sensor, position identified at the track sensor end of the cable.

Remove the side panels of the Tree Base by lifting up in the middle bottom. This is accomplished by placing your finger in the slot at the bottom of the side panel and pushing up until the side panel lifts out of the lower slot. Swing the bottom of the panel out and pull down .



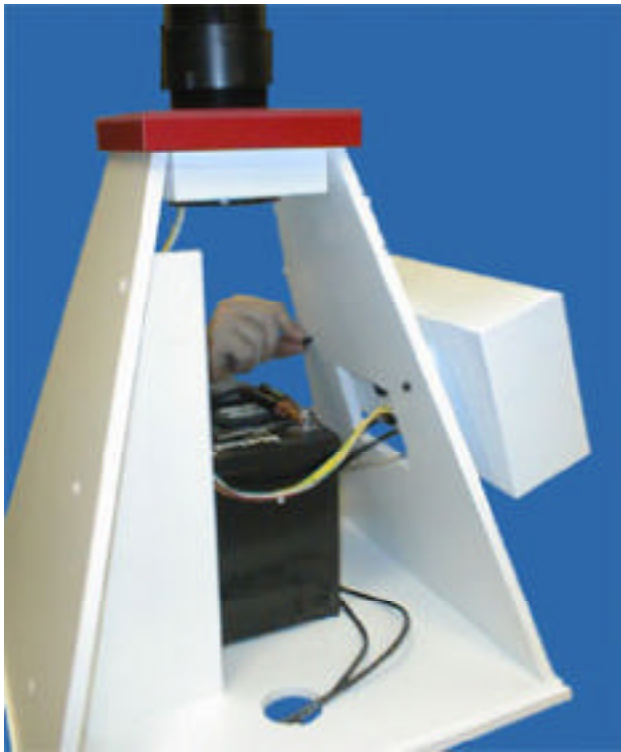
Model 5040A - IR Beam Emitter

Note On/Off switch and placement for four AA batteries for each Beam Emitter. All Beam Emitters are fully interchangeable with one another.



Model 5140C - IR Track Sensor

Note cable connector is located in the side facing away from the track. All Track Sensor are fully interchangeable with one another. Track Sensor is pictured bottom side up.



Console Display Securing

Note the knurled screws (2) used to secure the display unit to the Tree Base. All cabling is routed through the hole in the bottom panel of the base.

Some preliminary assembly of the Tree Base, the Pro Tree tree, and the LED Display is performed at this point. The tree is inserted into the top of the base and hand tightened by rotating the tree. The Display is attached to the front of the Base by two screws. These screws are inserted from the inside of the Base, through the base's front panel holes and into the back of the LED Display as shown above. Cables for power from the battery and lights can be connected with the appropriate connectors. Connectors are labelled for proper orientation. The battery should be placed in the base to maintain stability before the tree is attached.

STEP 2 -

Identify the emitter/sensor placement at the start line, speed trap line, and finish line. The lane width should be set at a maximum of fifty(50) feet.

To help in determining initial Beam Emitter to Track Sensor alignment in larger track widths, eyeball a straight line between units or use a string stretched between the beam emitter and track sensor. The speed trap line is located 66 feet before the finish line for NHRA 1/4 mile drag racing. For other drag racing programs with much shorter track lengths, the speed trap is designed to be 10 feet before the finish line.

For all fullsize applications, the PRE-STAGE/STAGE/START beams have dedicated beam emitters spaced at standard NHRA distances of 7 inches prestage to stage and 16 inches stage to start or guard beam.

STEP 3 -

There are two cables connecting the LED Display on the front of the Base and the IR Track Sensors. Layout the Track Sensor Interconnect Cables on the track site as illustrated on the Cabling Diagram in this manual. The large connector (RJ45) connects to the LED Display and the four smaller connectors (RJ11) connect to the Track Sensors at the start/stage/prestage lines or the speed trap and finish line indicated on the cable near the RJ11 connector.

STEP 4 -

Next connect the 12-button Keypad by routing the cable from the front of the base up through the hole in the bottom of the base to the back of the LED Display connector marked KEYPAD.

STEP 5 -

Place the Tree Base over both track sensor interconnect cables and route them through the hole in the bottom of the base to the back of the LED Display.

Place the Automotive battery in the base opposite of the cable hole with the long side of the battery running front to back. This will provide a side view of the battery.

Once the battery is connected, replace the side panels by inserting them into the upper guide groove and lifting. Swing the bottom of the panel inward and lower it into the lower guide groove.



Console Display Securing

Note the knurled screws (2) used to secure the display unit to the Tree Base. All cabling to be connected to the display is routed through the hole in the bottom of the base and through the hole in the front panel of the base.

STEP 6 -

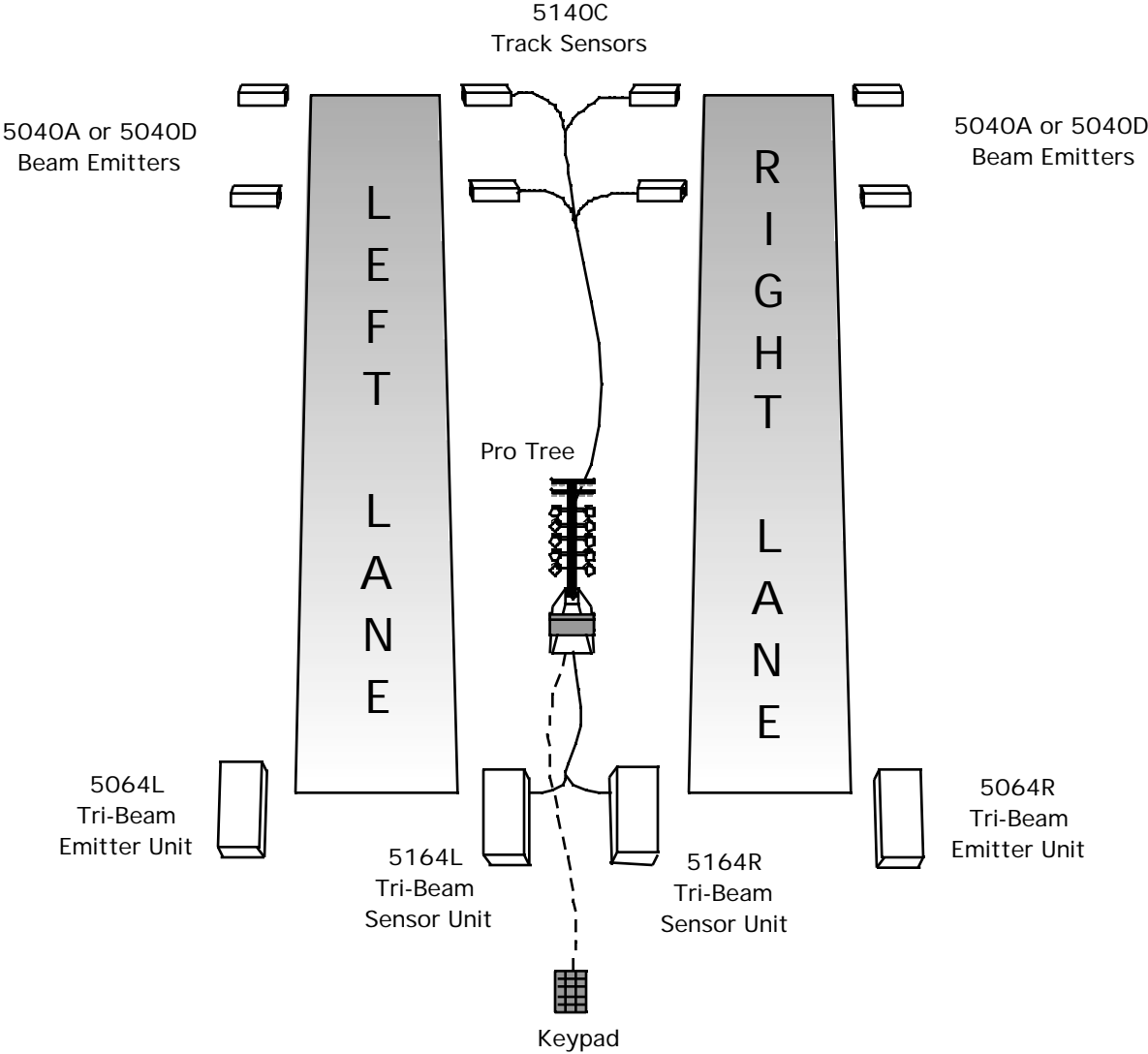
If Center Lane Dividers have been purchased, install them by placing the end plate and lower spacers on the track. Place the side panels into the lower groove and insert the upper red panel starting at one end and sliding in the panel.

STEP 7 -

Final alignment of the Emitter/Sensor pairs is accomplished after the timing system is powered up and completes its selftest. This step is covered in detail under the next section titled **CONFIGURATION OF THE SYSTEM.**

NOTE: When using timing equipment in areas with high electrical and radio interference or for longer track lengths, shielded cabling is strongly recommended to insure proper operation and accuracy. When shielded cabling is supplied, a single conductor wire is present at the console end of the cable marked 'External Ground Connection'. When electrical interference is at very high levels, it may be necessary to connect the external ground wire to a water pipe or metal stake installed into the ground earth. Very high electrical interference will cause the alignment of the emitter/sensor pairs to appear to continuously count or randomly go in and out of alignment even when the sensor and emitter pair are aligned at close distances.

CABLING DIAGRAM AND EQUIPMENT PLACEMENT



CONFIGURATION OF THE SYSTEM

STEP 1: POWER-ON SELFTEST

Connect a 12 volt auto or marine battery to the timing system using the red and black alligator clips connected to the LED Display. RED to positive (+) and BLACK to negative (-). Each time power is applied to the timing system, a selftest sequence is initiated by the microprocessors to insure proper operation of the display and electronics. To insure all visual components are operational, the following sequence should be observed:

LED Display:

A [1] will sequence through every display location.

A [2] will sequence through every display location.

A [4] will sequence through every display location.

A [8] will sequence through every display location.

All digits will count together from 0 to 9
Each decimal point will illuminate in sequence,
left ET, then left MPH, then right ET, then
right MPH.

Light Tree:

Each light on the left side will illuminate in sequence starting from the bottom RED light up through the staging lights will illuminate in sequence starting from the bottom RED light up through the staging lights.

Both lanes will sequence together starting with the staging lights down through the RED lights.

All lights will illuminate in sequence starting from the bottom left up to staging then the bottom right up to staging. The speed of the test will be at 2 times the previous tests.

All lights will go out in sequence starting with the bottom left up to the staging then the bottom right up to staging. Rate of change will remain at 2 times.

The left staging lights will illuminate for 1 second then lights will sequence down the left and up the right until the right staging lights are illuminated. The speed of the test will be another 2 times faster than the previous test.

The right staging lights will remain on for 1 second then sequence down the right side and up the left side. The rate of change will remain at the 4 times rate.

Visually inspect both the LED Display and the Light Tree for proper operation. All other circuitry is internally tested by the microprocessors. Upon completion of both selftests, the timing system will be ready for use with tree and display blank except for the decimal points for the RT. If an error occurs, the timing system will not respond to the keypad or the sequence above will not start or follow to completion.

STEP 2: CONFIGURE THE SYSTEM CLOCK, PRINTER, AND TRACK SENSORS

Set Time:

Press [*] then [5]. The current time is displayed as a 12 hour clock with the first digit flashing. Enter the current time and press [#]. This is the time to be used with the timeslip printout time stamp.

Set Date:

Press [*] then [6]. The current date is displayed as MM DD YY. Enter the current date by entering the month, day of the month, then the year and press [#]. This is the date used with the timeslip printout date stamp.

Configure RS232 Port and Printer:

Press [*] then [4]. LED Display indicates the baud rate, quantity of null characters, and the quantity of line feeds of the RS232 serial printer port. The LED Display is currently flashing the printer baud rate of 1200 bits per second. Press any key to advance the flashing baud rate to the next available speed. Press [#] to accept the displayed printer communications baud rate,

The quantity of NULL characters to be added to the printer as a delay is now flashing. Null characters are used to allow older printers sufficient time to carriage return or line feed without loss of timeslip information. Enter the desired quantity of nulls and press [#].

The quantity of LINE FEEDS is now flashing. Enter the desired number of of line feeds to allow the printout to eject from the printer. Generally, 17 line feeds are used to allow 2 timeslip per page for standard paper but will depend upon the type of printer and the paper size being used as timeslips. Enter the desired quantity of line feeds and press [#].

NOTE: OLDER UNBUFFERED SERIAL PRINTERS MAY REQUIRE A TIME DELAY DURING CARRIAGE RETURNS AND LINE FEEDS. IF THE TIMESLIP IS MISSING SOME INFORMATION OR PRINTS ERRATICALLY, INCREASE THE NUMBER OF NULLS UNTIL ALL INFORMATION IS PRINTED. IF THE MAXIMUM OF 99 NULLS DOES NOT RESOLVE THE MISSING INFORMATION, A SLOWER BAUD RATE MUST BE SELECTED AND THE QUANTITY OF NULLS ADJUSTED. REMEMBER, AT 300 BAUD, 99 NULLS EQUALS A 3.3 SECOND DELAY.

Verify track sensor alignment: START/SPEED/FINISH

Press [*] then [1]. LED Display indicates six 0's, one for each track sensor. The ET digits represents the finish track sensors, the MPH digits represents the speed trap track sensors, and the RT digits represents the start track sensors. The

prestige/stage lights on the tree will illuminate if alignment of the staging sensors are misaligned. If any digit is incrementing, the associated track sensor is out of alignment. Adjust the appropriate sensor until the digit no longer increments. If a digit increments intermittently, a sensor is partially misaligned. Adjust the appropriate sensor until the digit no longer increments.

To verify the alignment after adjustment, press [#] and repeat this function and verify all digits remain at zero.

To maximize the alignment of the emitter/sensor pairs, it is suggested to rotate the Beam Emitter slowly left and right until the alignment digit on the LED Display for that pair begins to count. This technique will determine the maximum lateral detection angle. Rotating the Beam Emitter up and down until the alignment starts counting determines the maximum vertical detection angle. Once these extremes are established, position the Beam Emitter in the center of the left/right detection angle and up/down detection angle. Repeat this same process with the other Beam Emitter and both Track Sensors. This will maximize the alignment accuracy.

The PRESTAGE/STAGE/START emitter/sensor pairs are aligned in a similar fashion. Placing the emitter and sensor parallel to each other will establish an initial setting. Rotate the Emitter Unit left and right noting when the prestige and stage lights illuminate indicating the extreme of the alignment. The alignment digit for the starting line will count when the start beam is misaligned as well as the red light on the tree illuminating. Rotate the Emitter Unit until the prestige, stage, and red lights go out and the alignment digit in the LED Display for the start beam stops counting. Repeat the same process for the Sensor Unit until alignment is achieved.

NOTE: IF ERRATIC TIMES AND SPEEDS OCCUR DURING A RUN, A TRACK SENSOR MAY REQUIRE A SLIGHT ADJUSTMENT. TO MONITOR THE TRACK SENSORS FOR INTERMITTENT OPERATION, PRESS [#] THEN [1] AND VIEW THE DISPLAY OVER SEVERAL MINUTES. IF ANY OF THE

ZEROES ARE REPLACED BY ANOTHER DIGIT, THE TRACK SENSOR HAS DETECTED AN OBJECT OR IS EVER SO SLIGHTLY OUT OF ALIGNMENT. ON WINDY DAYS, LEAVES AND OTHER OBJECTS MAY FOOL THE TRACK SENSORS. THIS WILL GREATLY CONTRIBUTE TO INTERMITTENT INCORRECT MEASUREMENT OF SPEED AND TIME

**Verify accessory track sensor alignment:
6'/60' INTERMEDIATE ET**

When additional sensors are connected to the accessory port, the timing system is able to measure elapsed time at two additional points along the track. For discussion purposes, we are using 6 feet from the start line and 60 feet from the start line.

Press [*] then [9]. The LED Display indicates four 0's, one for each accessory track sensor. The ET digit will remain blank, the MPH digit represents the 60' accessory track sensors, the RT digits represents the 6' accessory track sensors. The stage lights on the tree will illuminate if alignment of the staging sensor require attention. If any digit is incrementing, the associated track sensor is out of alignment. Adjust the appropriate sensor until the digit no longer increments. If a digit increments intermittently, a sensor is partially aligned. Adjust the appropriate sensor until the digit no longer increments.

To verify the new alignments, press # and repeat this function and verify all digits remain at zero.

NOTE: IF ERRATIC TIMES AND SPEEDS OCCUR DURING A RUN, A TRACK SENSOR MAY A SLIGHT ADJUSTMENT. TO MONITOR THE TRACK SENSORS FOR INTERMITTENT OPERATION OF THE TRACK SENSORS, PRESS [#] THEN [9] AND VIEW THE DISPLAY OVER SEVERAL MINUTES. IF ANY OF THE ZEROES ARE REPLACED BY ANOTHER DIGIT, THE TRACK SENSOR HAS DETECTED AN OBJECT OR IS EVER SO SLIGHTLY OUT OF

ALIGNMENT. ON WINDY DAYS, LEAVES AND OTHER OBJECTS MAY FOOL THE TRACK SENSORS. THIS WILL GREATLY CONTRIBUTE TO INTERMITTENT INCORRECT MEASUREMENT OF SPEED AND TIME.

**STEP 3:
CONFIGURE EACH RUN**

Select Full or Pro tree starting format:

Press [3]. The LED Display illustrates the tree starting format to be used. Press [3] again to toggle back between the PRO starting format and the FULL or SPORTSMAN starting format. The selected starting format will remain unchanged until altered by the [3] key. At power on, the default starting format will be the PRO tree.

Bracket and Index entry:

Press [1]. The LED display scrolls up as **0.000 ET 0.000**. Press any number on the keypad for each flashing digit in the display. Press the [*] key for ET's above 9.999 seconds to move the decimal point position. Press the [#] key when bracket entry is complete. If only the left lane is to be entered press [#] after left lane entry. If only the right lane is to be entered, enter [0.000] into left lane, then enter the right lane. At power on, the default bracket/index is set to all zeroes for both lanes.

Run a race:

To run a race using the current bracket/index settings and the selected tree starting format, press [2]. After the system automatically checks the sensor alignments to insure a good run and times, the tree begins the starting sequence.

After each lane (in which a car has started) has finished, run results are displayed. If one lane does not finish, press [#] to end the run and display the results. All foul starts will be indicated for each lane by the RED light. All bracket or index

breakouts will be indicated for each lane by the center YELLOW light. The winning lane is indicated by the flashing GREEN light.

NOTE: IN THE EVENT OF A REDLIGHT OR A BREAKOUT, THE TREE AND LED DISPLAY WILL AUTOMATICALLY APPLY THE NHRA RULES FOR DETERMINING THE WINNER OF THE RACE. THE SYSTEM DOES NOT TAKE INTO CONSIDERATION ANY CENTER LINE CROSSINGS AND THE WINNING LANE MAY NEED TO BE ADJUSTED BY THE RACE DIRECTOR FOR SUCH VIOLATIONS.

STEP 4: OPTIONAL POST-RACE FEATURES

Print last race results:

Press [6]. Run results are sent to the Printer along with current tree and bracket information using the configured baud rate, null characters, and line feeds.

Enable/Disable Intermediate ET's:

Press [*] then [8]. The LED Display will momentarily flash six 0's when the Intermediate ET's will be printed on the Timeslip. The LED Display will momentarily flash four 0's (one in each corner with the center two missing) when the Intermediate ET's will be omitted from the Timeslip.

NOTE: THE INTERMEDIATE ET'S WILL ONLY PRINT VALID INFORMATION WHEN THE INTERMEDIATE EMITTERS AND SENSORS ARE CONNECTED TO THE PRO TREE RC. WITHOUT THE ADDITIONAL HARDWARE, INTERMEDIATE TIMES WILL BE 0.000 IF [*] [8] IS SELECTED.

Clear the display and tree:

Press [#]. The LED Display and tree are reset and blank except for the RT decimal points on the display.

Recall and display the last bracket entered:

Press [4]. The LED Display scrolls the last entered brackets for the left and right lanes. At power on, the default bracket is zero for both lanes.

Recall and display the last run results:

Press [5]. The tree and LED Display are updated with the last run results.

SPECIALTY FUNCTIONS

Reaction Time (RT) Practice Mode:

Press [*] then [2]. The LED Display contains **0.000 RT 0.000**. Stage 1 or 2 cars, then press any key except [#] to begin. After a 1 second delay, the Tree will begin the selected starting sequence. At this point, the driver(s) accelerate off the start line. Once all drivers have broken the start line beam, the LED Display will indicate RT for each lane previously staged. Re-stage the cars and repeat pressing any key above for the next RT measurement. To exit RT Practice Mode, press [#] while the RT is being displayed.

Start Demo Mode:

Place jumper connector into the Start/Stage Track Sensor connector on the back side of the LED Display. Press [*] then [3]. The stage lights on the Tree will stage each lane, begin the tree starting sequence, then the LED Display will indicate run results. After 15 seconds, the next demo race run will begin. To exit Demo Mode, press [*] when the LED Display is displaying the run results.

60 Second Timer:

Press [0]. The LED Display begins counting backwards from 60 seconds, decrementing every second. If 60 seconds expire, the LED Display will flash 00 in the center of the MPH to indicate 60 seconds have gone by. To interrupt the 60 second timer and return to the Main Menu Functions, press [#].

Any other function key may also be pressed to exit the 60 second timer and transfer to the selected function. (i.e. pressing the [3] will exit 60 second timer and toggle the tree between the PRO and FULL starting light sequence)

Disable damaged track sensors:

Press [*] then [7]. The LED Display indicates six 0's, one for each track sensor. The ET digits represents the finish track sensors. The MPH digits represents the speed trap track sensors. The RT digits represents the start track sensors.

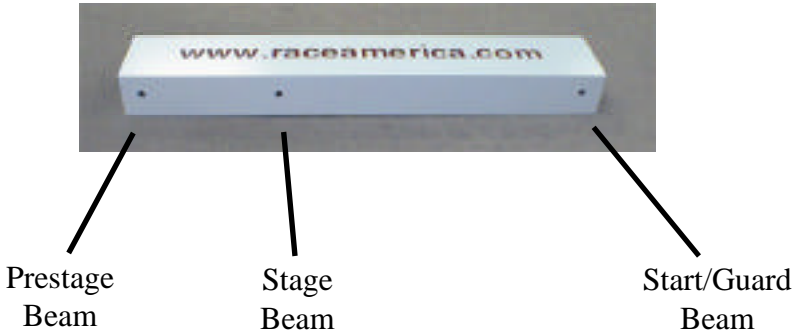
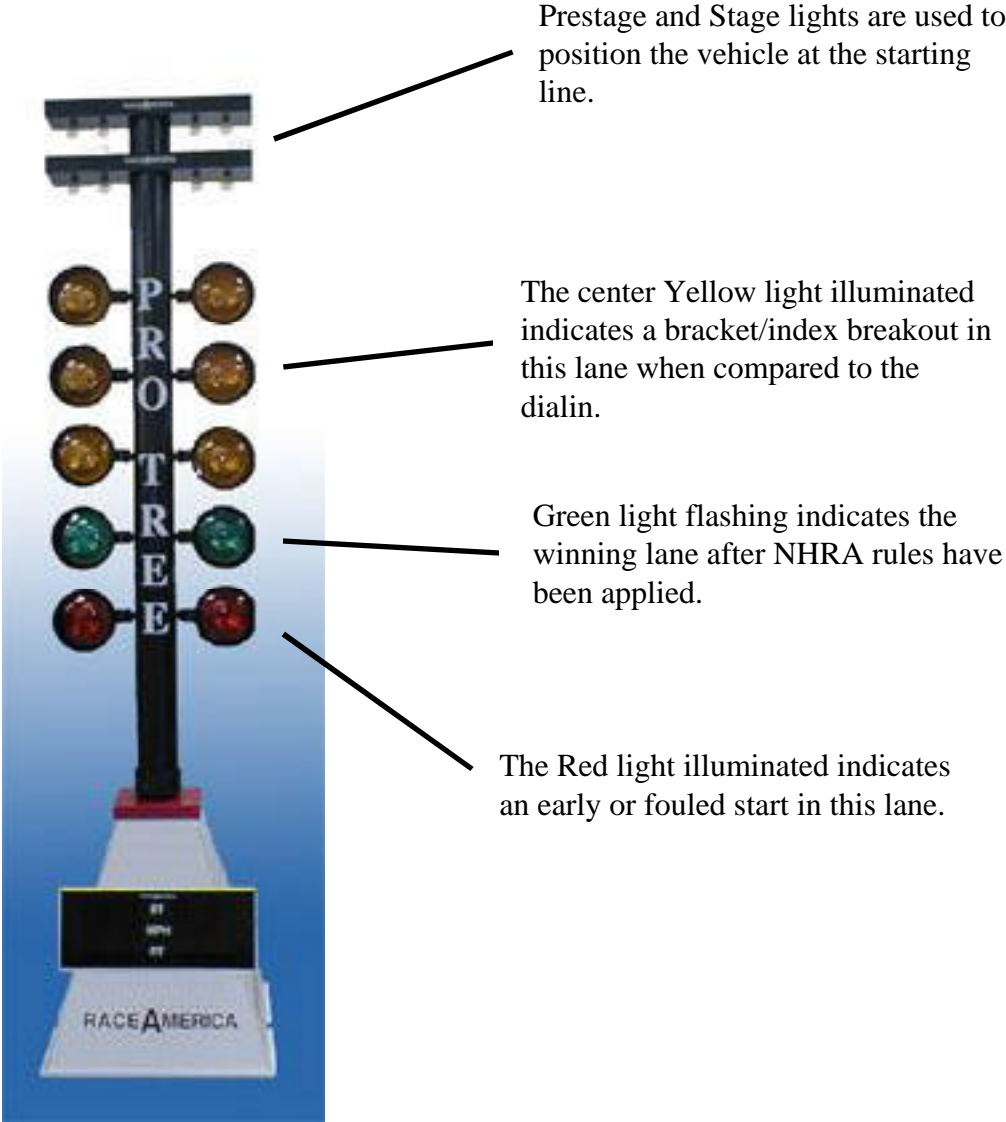
The PRO TREE will prompt for each sensor by flashing the associated digit. If the track sensor flashing represents the sensor to disable, press any key except [#]. The [0] will change to an [8] to indicate the track sensor is disabled from being detected bad at the start of the race. To advance to the next sensor, press [#]. Repeat the above process for each sensor to be disabled. To exit this mode, press [#] until all the digits have flashed in sequence. The LED Display will clear and return to the Main Function Menu.

PC Mode:

Press [*] then [0] to enter PC mode where the PRO TREE will be controlled by software running in a PC. (Race Management Software is purchased separately). The tree will flash both GREEN lights indicating the tree is waiting for the PC to respond. Once the PC has responded to the tree, both GREEN lights will go out.

The tree is now ready to be operated in conjunction with race management software running in the PC. To exit the PRO TREE out of PC mode, press [#].

PRODUCT FUNCTIONALITY DESCRIPTION



MAINTENANCE REQUIREMENTS

MAINTENANCE

The 2500 Series Console, Beam Emitters, and Track Sensors do not require any maintenance.

To insure uninterrupted operation on raceday, it is suggested to keep track of battery usage hours so as to have fully charged batteries. Plan to replace the alkaline AA cells in the Beam Emitters after about 60 hours use. If you are using rechargeable AA cells, recharge them each day. Low battery voltage (Emitters below 4.0V DC) will cause intermittent operation of the system resulting in intermittent cars detected at the starting line or the finish line as the batteries power weakens.

Beyond these items, you should not encounter any routine maintenance with the operation of your timing system.

SPARE PARTS

RACEAMERICA recommends a spare set emitter and sensor be available in the event of an unfortunate accident. Contact RACEAMERICA for availability and pricing of spares items.