RACE AMERICA

INNOVATION. TECHNOLOGY. RELIABILITY.

Model 2450P XL Professional S4

Four Lane Drag Timing System Owner's Manual

Rev E

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RACE AMERICA

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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.,

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

THEORY OF OPERATION

The 2450 Series XL Professional S4 four lane Drag Timing System is a completely self contained race timing system made with the latest technology CMOS circuit components to provide a highly accurate drag timing solution. The system contains an internal quartz crystal clock for time accuracy and display of race results to one thousandth of a second.

Power is supplied to the trees, console and track sensor components from the 'Christmas' Tree power sources.

The on track electronics are controlled via a wireless data network from a PC (not included). Additionally, all remote printers and scoreboards are controlled from the same wireless network (with their own transceiver).

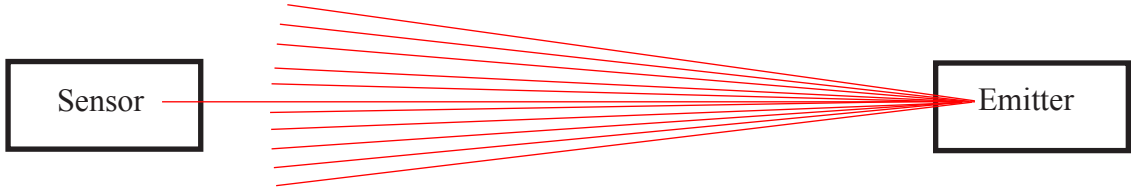
The Beam Emitters and Track Sensors operate on invisible (to the unaided human eye) infrared light. The coded light frequencies are constantly received by the Track Sensors until a car interrupts reception ('breaks' the beam).

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 and flat. 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 sensors each time the tree is started and a run is made.

Accuracy of the speed detection is 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 10 feet. A small placement error will cause a significant error in the speed measurement at 100 MPH.

In preparation for a typical run, the Starting Sequence is selected and for Full or PRO Tree racing, the drivers bib numbers are entered before the race. Each lane is staged by interruption of the STAGE beams by the drag vehicle. Note illuminating the staging lights is not required to begin a race. Once staged the countdown starting sequence is started by the PC running the XLSCORE S4 Software. The driver starts when the Green light is illuminated. The system begins timing the drivers reaction time when the last Yellow is illuminated. Elapsed Time begins and the Reaction time is stopped once the vehicle leaves the line and the Stage beam re-establishes (or the Guard beam is interrupted). As each vehicle progresses down the track, breaking the optional 60 ft beams captures the ET at that point. Breaking the optional Speed Detection beams start the speed detection process. Breaking the Finish Line beam ends the speed detection and the vehicle's ET for that run. Fouls are indicated for each lane if the Stage beam re-establishes (or Guard is interrupted) prior to the illumination of the Green light.



The Emitter throws a spot light like beam of infrared light; the Sensor should be aligned near the center of the beam for optimal reception and alignment.

PACKAGE COMPONENTS

Model 2450P Standard Package:

2 - XL Electronics Boxes (01-2450)
2 -110V 'Christmas' Tree with stand (02-2502)
4 - Dual-Beam Emitter (5054R/L-Start Line)
4 - Dual-Beam Sensor (5156R/L-Start Line)
2 - Cable Console to TREE (40 Ft) (05-2850)
4 - Cables for STAGE/GUARD (05-2851)
1 - PC blue serial cable 25' (06-PC02)
3 - Wireless Link Communication Units (4520)
3 - AC Adapter for Wireless Link Unit
2 - Red RS422 cable console to Tree Wireless (40') (07-3434-040)
1 -XLSCORE S4 Control & Display software (3124A)
2 - Lane Selection Key (1/2 & 3/4)
1 - Owners Manual

Centerline Cable Option includes
- 2 - Track Sensor Cable Console to Speed with drops for 60 Ft ET
- 2 - Cable for SPEED/FINISH (05-8453)
- 4 - IR Beam Emitters (5040-Finish Line)
- 4 - IR Track Sensors (5140-Finish Line)

Outside Cable Option includes:
- 2 - Timer to 60 Ft ET and outside ('Y' Cable)
- 2 - Cable for SPEED/FINISH
- 2 - Extension Track Sensor Cable
- 4 - IR Beam Emitter (5040-Finish Line)
- 4 - IR Track Sensors (5140-Finish Line)

Model 2450P Available Options:

02-2505 230VAC TREE
02-2503 12VDC TREE
Cabling Options:
Centerline 500'/660'
Outside 500'/660'
6020E Speed Detection: (MPH)
6013E Intermediate ET - 60 Ft:
6038S Timeslip Printer Package - serial
6038P Timeslip Printer Package - parallel
7540 Foam Stands
6070 Carry/Storage Case
6804C/6604C Finish Order Scoreboard
4520A Wireless Link Units (for Printer/Scoreboard)

PRODUCT SPECIFICATIONS

The following listing provides the designed performance specifications for the 2450 Series timing systems:

Lane Width	4 to 50 Ft
ET Timer Capacity	up to 90.000 sec
Speed Capacity	up to 999.99
RT Timer Capacity	up to 9.999 sec
ET Time Accuracy	0.001 seconds
Speed Accuracy	0.01 mph

Power Requirements:

Tree/system	110 VAC/20A 230 VAC/10A
IR Beam Emitter (5040)	4 'AA' Batteries
Dual Beam Emitter (5054)	4 'C' Batteries

LOCAL REQUIREMENTS

Additional items required to operate the standard 2450 Series timing system package:

2 -110VAC 20 Amp (230VAC 10 Amp) circuits
4 - 'AA' batteries per Beam Emitter (5040)
4 - 'C' batteries per Dual-Beam Emitter
1 -PC or Laptop with CD Drive
- Pentium 100 mhz or better, 256 Mb RAM
- Color Monitor suggested
- Minimum one 9-pin Serial Port or USB to Serial adapter
- Windows 95 or newer O/S

16 - 60W 110VAC Stage/Pre-Stage Bulbs
40 - 100 W 110VAC Floodlights (24 Yellow, 8 Green, 8 Red)

Extension Cords for 110VAC power (if needed):
50' - 12 Gauge wire with ground
100' - 10 Gauge wire with ground
200' - 8 Gauge wire with ground

SET-UP STEPS

This manual addresses the system setup with discussion of most available options. If the specific system does not have a particular option or it is not available because of cable length, simply ignore the references.

It may be desirable to set up the system in a simulated environment (driveway or garage) to become familiar with the operation without laying out all the cable. Beams can be interrupted by walking through them; times reviewed, timeslips printed and scoreboards illuminated. This will verify all system operations.

STEP 1 -

Familiarize yourself with the components pictured in this manual and how they interconnect. The 60 ft, Speed, and Finish IR (infrared) Sensors are model 5140 while the IR Beam Emitters at these locations are model 5040 . The starting line contains 5156L and 5156R Dual-Beam IR Sensors and 5054L and 5054R Dual-Beam IR Beam Emitters for Stage/Guard positions.

The Tree contains a module referred to in this manual as the Tree Electronics. The enclosure containing the timing and control electronics is the XL Electronics Box.

The base system ships with several cables; review the cables and cabling diagrams in this manual for placement. The 40 ft cable with round four conductor connectors on both ends is the Tree Interconnect Cable, The two 10 ft cables with the 8-conductor RJ45 connector on one end and a 6-conductor RJ11 connector on the other end are the Dual-Beam Start Sensor Interconnect Cables.

All connectors are labeled for proper orientation, if required.

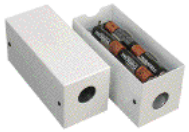
The free standing, battery powered Beam Emitters are placed on the race surface at the 60 foot lines, speed line, and finish line opposite the IR Track Sensors per the cabling diagrams. Each of the 5040 Beam Emitters or 5140 Track Sensor units are fully interchangeable with each other. Start Sensors and Emitters are position sensitive and not interchangeable.

The Trees are assembled as shown with the pipe clamp and then screwed into the threaded flange on the Base Plate. Bulbs can be screwed into the sockets once the Tree is assembled and standing upright. Additional base plates can be screwed together to add weight and increase stability in windy racing environments.

The system operation and control is via

Infra-red Emitter and Sensor Offerings

Picture shows one unit from the top and one unit from the bottom.

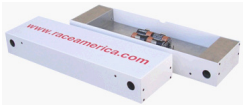


Model 5040
IR Beam Emitter

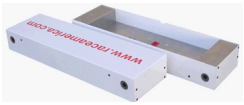
Model 5140
IR Track Sensor

Emitters - note On/Off switch and placement for four ‘AA’ batteries for each Beam Emitter.

Sensors - note the cable connector is located in the side facing away from the track; all 5140 Track Sensors are fully interchangeable with one another.



Model 5054L/R
IR Beam Emitter
for Stage/Guard



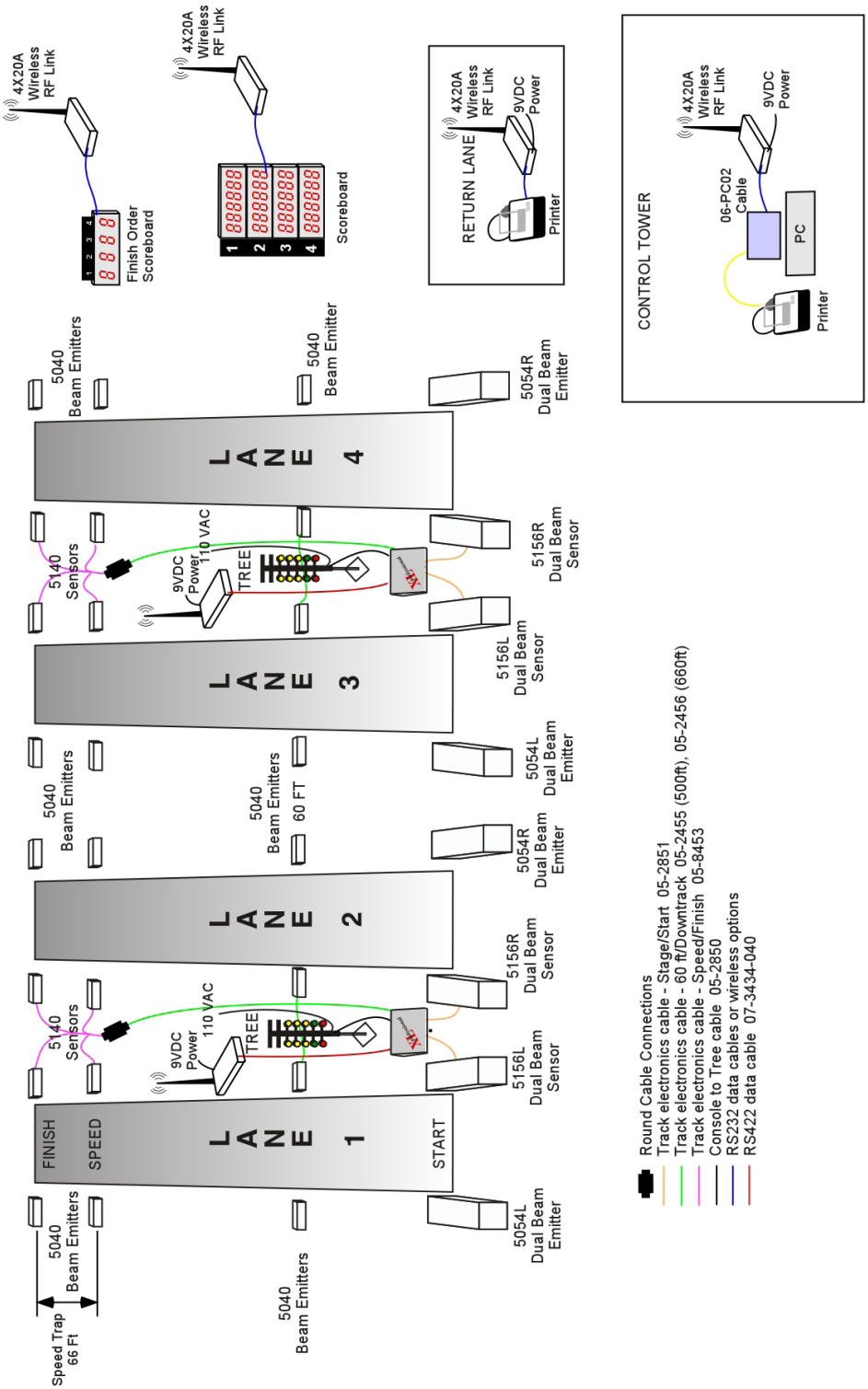
Model 5156L/R
IR Track Sensor
for Stage/Guard

Emitters - note On/Off switch and placement for four ‘C’ batteries for each Beam Emitter. These emitters shoot two beams out one side and are marked for Left/Right lane position at the outside of the track at the Start.

Sensors - operate opposite the Beam Emitters at the center of the track. Note position for Left/Right lane. Connect with cables to the XL Electronics box.

A ‘Start’ is recorded when the Stage beam re-establishes as the vehicle pulls away or when the guard beam is interupted.

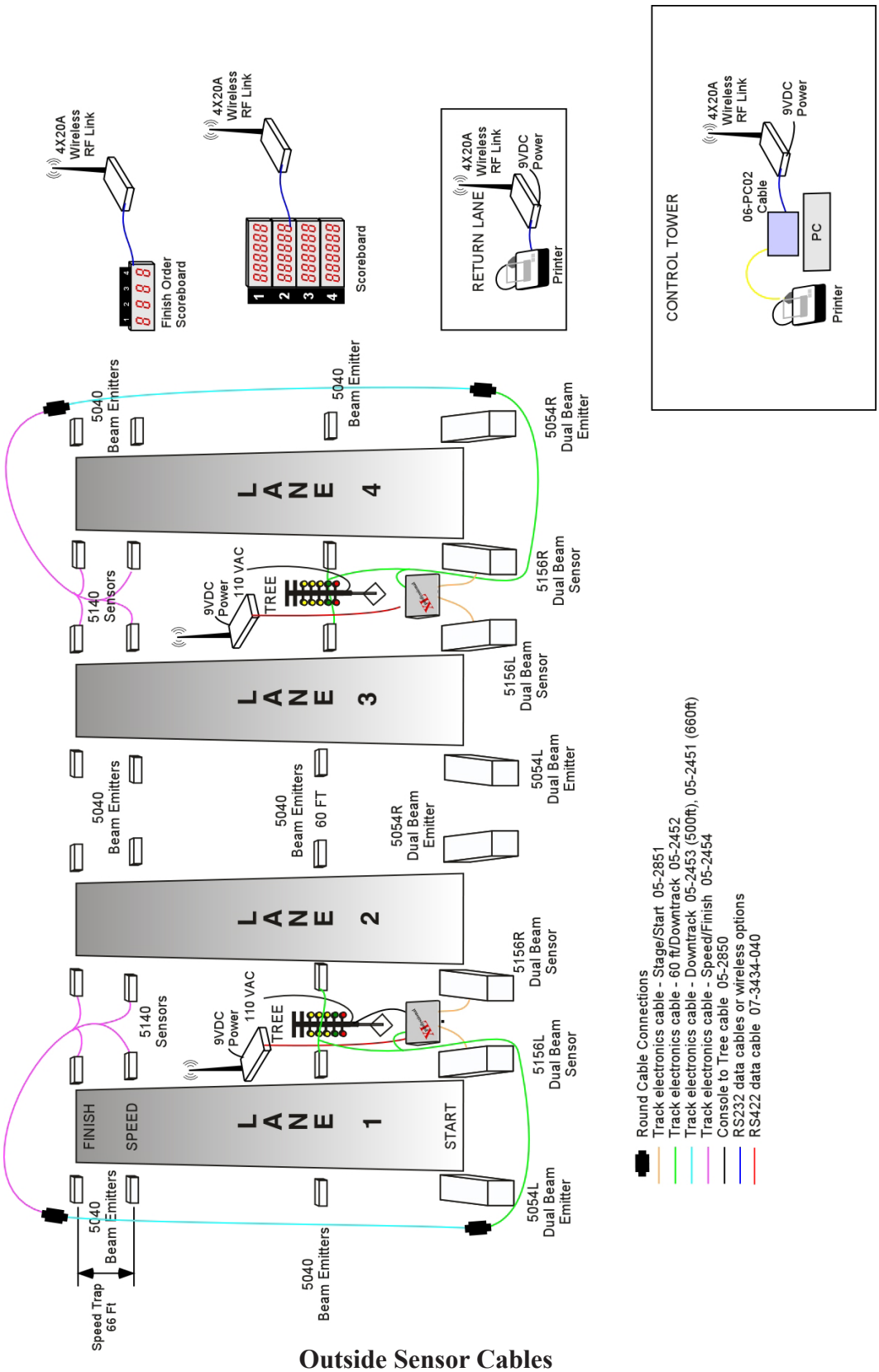
CENTERLINE
Cabling Diagram and Equipment Placement



Centerline Sensor Cables

Cable diagram showing options available with XL S4 System

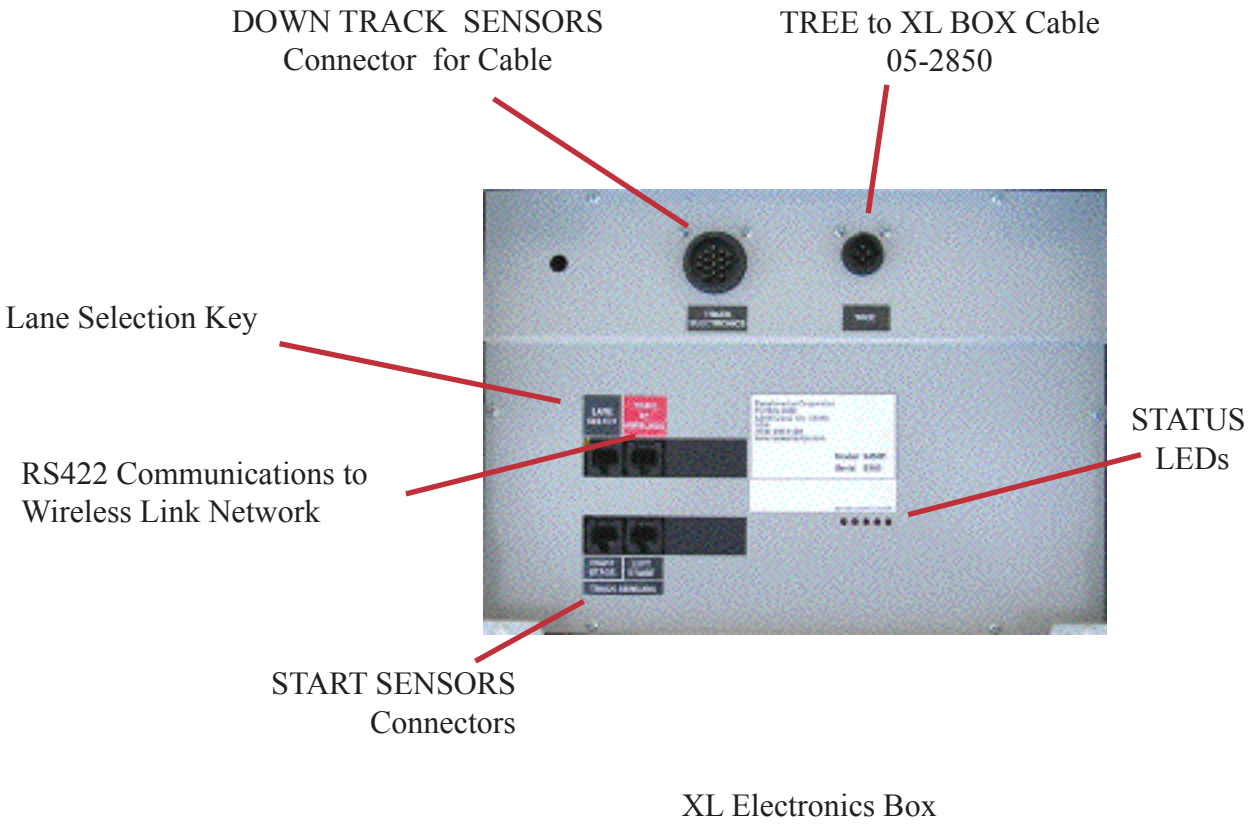
OUTSIDE
Cabling Diagram and Equipment Placement



Outside Sensor Cables

Cable diagram showing options available with XL S4 System

WIRING AND CONNECTOR DEFINITION



TREE CLAMP ASSEMBLY

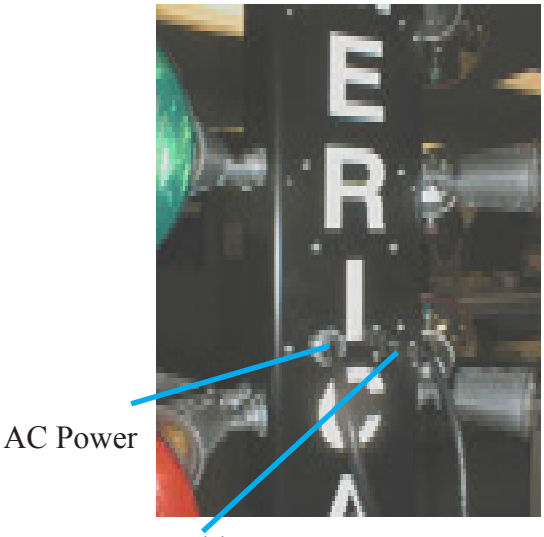
The iron pipe is held in place by two clamps at the base of the tree. Assembly is easy if the pipe is inserted into the base of the tree with the tree sitting face up horizontally. Push up the clamp from the bottom to allow the pipe to go through each of the two clamps; a Stop bolt is in place to limit the pipe travel.

The iron pipe clamps from the back side - the nuts should be tightened to a little more than finger tight to hold the tree adequately in the vertical orientation.

Assembled Tree and Base Plate

The assembled Tree - note the base orientation is at a 45 degree angle to the tree for increased stability.

Multiple base plates can be screwed together to increase stability if required for windy environments.



The Tree as seen from the back; do not connect the AC power until all cables have been connected and the system is ready for power up.

wireless link network communication units between the XL electronics boxes and the PC. The wireless link units are intended to be placed on the Tree with cables to the XL Electronics boxes (07-3434) and at the control tower (06-PC02); make sure there is line of sight between the units. One PC unit communicates to both XL box units as well as all other remote printer and scoreboard units. Each Wireless Link Unit will require power. Each XL Box is assigned to two lanes using the Lane Selection Keys for Lanes 1/2 and Lanes 3/4.

STEP 2-

Identify the emitter/sensor placement at the start line, 60 foot, speed trap line, and finish line using the Cabling Diagram for your track. The lane width should be set at a maximum of fifty (50) feet. The XL Electronics Box is placed between the left and right Start Beam IR Sensors at the starting line for each XL box (Lanes 1/2 and Lanes 3/4). 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 for Mile per Hour measurements is located 66 feet before the finish line.

STEP 3 -

Layout and connect the Track Sensor Cables on the track site as illustrated on the appropriate cabling diagram. The round connector connects to the XL Electronics Box or connecting cables and the smaller connectors (RJ11) connect to the Track Sensors at the 60 foot, speed and finish line as indicated on the cable near the RJ11 connector.

The 10 ft Start Beam Interconnect Cables connect between the XL Electronics Box and the Stage/Guard Beam Sensor units. These cables connect into the LEFT STAGE SENSOR and RIGHT STAGE SENSOR jacks in each XL Electronics Box.

To record accurate speeds, the SPEED/ FINISH Sensors and Emitters must be carefully spaced on the track. The System is configured to provide speed based on a 66 foot trap (MPH). Small errors in placement and out of square

relative alignments will result in significant errors in speed information.

STEP 4 -

Connect cables to the underside of the XL Electronics Box in the appropriate connector.

STEP 5 -

Connect the RS232 blue PC cable (06-PC02) to the Wireless Link PC Network (4520A); connect the 9-pin connector to the serial port of the laptop or PC to be used to control the XL Timing System. Connect the XL Electronics Box to the Timer side Wireless Link Network units with the (07-3434-040) red cable at the connector marked PC RS422 Wireless (XL Box) and at the red RS422 connector of the Wireless Data Network Link units. Each XL Box will have a wireless unit; the units are to be velcroed to the tree top so as to have clear air to the Link unit at the control tower. Each Wireless Link needs power (12VDC or AC Adapter).

STEP 6 -

Connect the Tree cable (05-2850) to the XL Electronics Box connector marked TREE and to the round connector on the back of the TREE.

STEP 7 -

Insert the proper Lane Selection Key (1/2 or 3/4) into the connector on the XL box. Generally, lanes 1/2 will be on the left when viewed from the start line and 3/4 will be on the right. Either XL box can be used in either position with the proper Key.

STEP 8 -

Connect the AC power cord to a typical 110VAC/20A (230VAC/10A) line. A surge suppression strip is strongly recommended to minimize line loading.

See notes regarding use of extension cords.

STEP 9 -

Final alignment of all Emitter/Sensor pairs is accomplished after the timing system is powered up, completion of the tree self-test, and the XLSCORE Professional S4 PC Software is loaded and running in the PC. This step is covered in the next section titled SYSTEM POWER-UP and in the XLSCORE S4 software manual.

SYSTEM POWER-UP

STEP 1 - POWER-ON SELF-TEST

Turn the power on at each IR Beam Emitter. Turn on the AC power to each Tree. Apply power to the wireless link units. Each time power is applied to the timing system, a self-test sequence is initiated by each microprocessor to insure proper operation of the display and electronics. To insure all visual components are operational, the following sequence should be observed:

Light Tree:

Each light on the left side, then the right side 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 sequence.

All lights will go out in sequence starting with the bottom left up to the staging then the bottom right up to staging.

All lights will then flash off and on, then turn off (assuming the Starting line beams are powered on and aligned). Lastly, the bottom yellow lights will be illuminated indicating that communications have not been established with the XLSCORE S4 software on the PC.

Each Tree will power up separately so it is not expected the Tree lights will illuminate in synch until after communications have been established with the PC.

Visually inspect the Light Trees for proper operation. All other circuitry is internally tested

by the microprocessor. Upon completion of the self-test, the timing system will be ready for use with all tree lamps off (except the bottom yellows if communications are not yet established with the PC) and the Stage lamps are active when the respective beam is blocked at the starting line. If an error occurs, the timing system will not respond or the sequence above will not start or follow to completion.

STEP 2 - LOAD THE XLSCORE PC S/W

The XL Timing System is controlled by software programs running in a Windows operating system PC or Laptop computer. Refer to the XLSCORE S4 manual for complete integration of the Timing System and System control software.

MAINTENANCE

The 2450 Series Electronics, Beam Emitters, and Track Sensors do not require any maintenance beyond normal cleaning to insure good electrical connection and optical performance of the infrared beams.

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 batteries in the Beam Emitters after about 60 hours use. If you are using rechargeable cells, recharge them each day. Low battery voltage (Emitters below 4.5V 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.

To maintain the highest level of timing accuracy and minimize false trips, annual preventative maintenance and calibration should be performed on all system track sensors and beam emitter units.

SPARE PARTS

Further to minimize race program interruptions, RaceAmerica recommends some spare parts. A spare emitter/sensor pair, wireless link unit, and end of track cable sections should be available in the event of an unfortunate accident during a program. Contact RaceAmerica for availability and pricing of spares items.

SUPPORT AGREEMENTS

Support agreements are available from RaceAmerica providing Telephone Assistance on technical issues and operational questions, repair and/or replacement of hardware failures, Software and Firmware updates and bug reporting, and Annual Preventative Maintenance on all system track sensors and beam emitter units. Contact RaceAmerica for more information and pricing of Support Agreements.

TREE FUNCTIONALITY DESCRIPTION

Align Sensors Mode

When operating in Normal Race Mode

Prestage and Stage lights operate together to position the vehicle at the starting line.

Stage Sensor

Finish Sensor

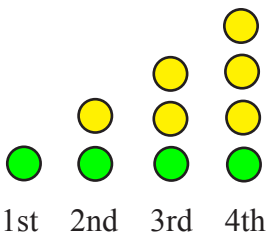
Speed Sensor

60ft Sensor

Power-up

The bottom Yellow lights illuminated indicate communication has not yet been established with the PC

The Red light illuminated indicates an early or fouled start in this lane.



Finishing Order Displayed on the Tree after each Race

Dual-Beam Sensor (5156) (Standard)

Stage Beam

Guard Beam

REVISION HISTORY

A - 05/04 - Initial release based on Rev A 2850 manual
B - 03/06 - Insert correct outside cabling diagrram
C - 10/06 - Convert to InDesign; correct C/L cable diagram; change speed trap to 66ft, misc fixes
D - 11/06 - Change missed 10 ft trap reference to 66 ft
E - 02/07 - Changed console pic on cover to white checkered