The Leader in Event Critical Timing Electronics

Model 3800 Timer AC4

Four Timer Autocross Timing System Owner's Manual

Rev O

Table of Contents

RACE**A**MERICA

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.

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PACKAGE COMPONENTS

Each Timer AC4 Autocross package includes:

1 - 3800ES (sss.fff code F.10.0) or
      3800EM (m.ss.fff code E.10.0)
      Timer AC4 Console Unit
2 - IR Beam Emitters (5040)
2 - IR Track Sensors (5140)
2 - Track Sensor Cables - 100ft each
1 - Owners Manual

POWER REQUIREMENTS

You will need these additional items to operate your Timer AC4

1 - 12VDC automotive battery/12VDC-3A reg.
8 - AA Alkaline batteries (for emitters)

PRODUCT SPECIFICATIONS

The following listing provides the designed performance specifications for the Model 3800 Timer AC4:

Start/Finish Lane Width	4 to 50 Feet
Timer Capacity (m.ss.fff)	9:59.999
(sss.fff)	999.999 sec
Time Accuracy	0.001 seconds

Power Requirements:

3800 Console	12.6VDC-3A reg.
IR Beam Emitters (2)	8 - AA Batteries

Model 3800 AVAILABLE OPTIONS

5800 T-Link Wireless track electronics
5805 T-Link Wireless with included sensors
6070B Carry/Storage Case
6502A AC Power Adapter (for timer)
5050B Extended range Beam Emitter - 75 ft
5060A Extended range Beam Emitter - 250 ft
7540B Foam Stands (for sensors & emitters)
6560/6860/6650 Digital Displays
4500B Data Communication PODs (for displays
      greater than100ft from console)
4520/4620 Wireless Data Comm Links -displays

THEORY OF OPERATION

The Model 3800 Timer AC4 is a completely self contained race timing system made with the latest technology CMOS circuit components to provide a highly accurate autocross 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 timer console and track sensor components of the 3800 Timer AC4 by the 12VDC automotive battery connected to the RED and BLACK alligator clips or regulated DC power source. Under normal conditions, a properly charged battery will operate for 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 (IR) light. The coded light frequencies are constantly received by the Track Sensors until a car interrupts reception ('breaks' the beam). Connections to the console can be hard wired or wirelessly connected via T-Link track electronics.

The IR Beam Emitter to Track Sensor transmission operates on Line-of-Sight principles. This makes alignment of these units critical but simple. 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 timer console will continue to 'monitor' the track sensor at the start line to start the next timer or at the finish line to stop the next timer.

NOTE: once the start or finish line beam is interrupted, the system imposes a 5-second lockout of that sensor to allow blowing depris to settle. During the last second of the 5-second lockout, the system performs alignment testing of the triggered sensor to determine if the alignment has changed. Failure of the starting line beam alignment is indicated with **[SbAd]**. **[FbAd]** would indicate the finish line alignment has failed testing. These

4

messages are displayed until another message updates the Status Display. This feature helps in early detection and resolution of a low battery in the Beam Emitters, someone tripped over a cable, or a sensor has been bumped out of alignment.

NOTE: Once all four timers are actively counting, any additional interruption of the start line beam will not start a new timer until one of the current timers is stopped by a finish line crossing or manually stopped via the keypad.

SET-UP STEPS - TIMER AC4

The Timer AC4 will be set up to operate with either T-Link wireless [t-Ln] sensors or hard wired [-on-]. Keypad functions for each mode are described in this manual.

STEP 1 -
Familiarize yourself with the Components pictured in this manual and how they interconnect. Track Sensor Cables are used to connect the starting line and finish line to the timer console or T-Link Wireless units.

All connectors are keyed 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. Do not connect to an operating motor vehicle! Optional 110/230VAC adapters can also be used instead of a battery.

The free standing, battery powered Model 5040 IR Beam Emitters are placed on the end of the start line and finish line away from the timer console and the Model 5140 IR Track Sensors are placed on the console side of the start line and finish line (See Fig 1). Each of the Beam Emitter and Track Sensor units are fully interchangeable with each other. The Track Sensor cables plug into their respective start and finish connectors on the underside of the console.

If the T-Link Wireless option is used to connect the track sensors, follow set-up per the diagrams (Fig 2 or 3). The 'Z' unit cable plugs into the Serial Port connector on the underside of the console.

Model 5040/5050 - 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. Picture shows top and bottom of units.

Model 5140 - IR Track Sensor

Note cable connector is located in the side facing away from the track. Track Sensors are interchangeable with one another. Track Sensor is pictured with both top and bottom sides up.

STEP 2 -
Identify the emitter/sensor placement at the start line and finish line. The lane width should be set between four (4) and fifty (50) feet. To help in determining initial Beam Emitter to Track Sensor alignment in larger track widths, use a string stretched between the beam emitter and track sensor or eyeball a straight line between units.

STEP 3 -
Layout the cables on the track site. The large connector (RJ45) connects to the console or T-Link Wireless unit and the smaller connectors (RJ11) connect to the Track Sensors at the start line or the finish line.. Connect the two Cables to the Timer Console and the Track Sensors.

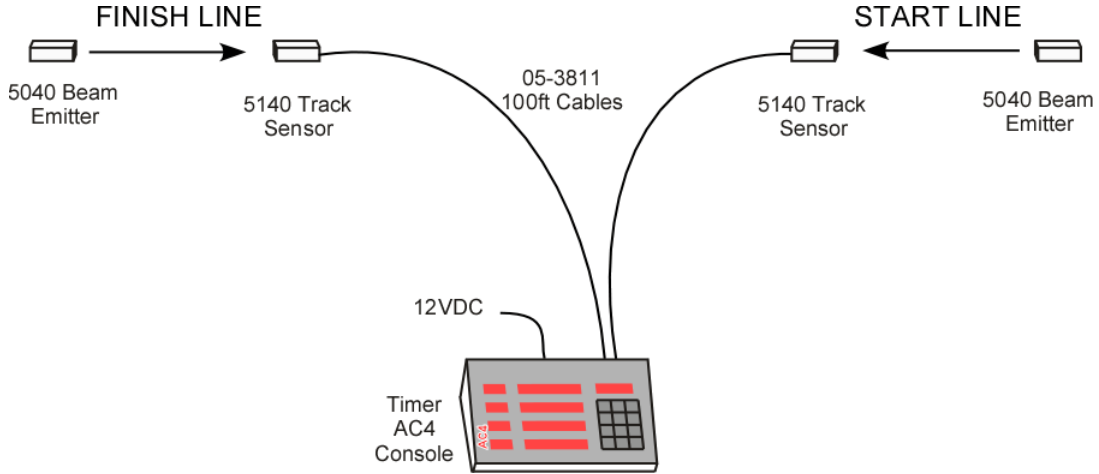If T-Link wireless sensors are being used, 5

Track Sensor Connections

FINISH LINE

START LINE

05-3811
100ft Cables

5040 Beam
Emitter

5140 Track
Sensor

5140 Track
Sensor

5040 Beam
Emitter

12VDC

Timer
AC4
Console

Fig 1 - Hardwired Track Sensors

FINISH LINE

06-TL02
25ft Cable

5800 T-Link
'B' Unit

5800 T-Link
'A' Unit

06-TL02
25ft Cable

START LINE

5040 Beam
Emitter

5140 Track
Sensor

5140 Track
Sensor

5040 Beam
Emitter

5800 T-Link
'Z' Unit

T-LiNK
WIRELESS

12VDC

06-TT02
25ft Cable
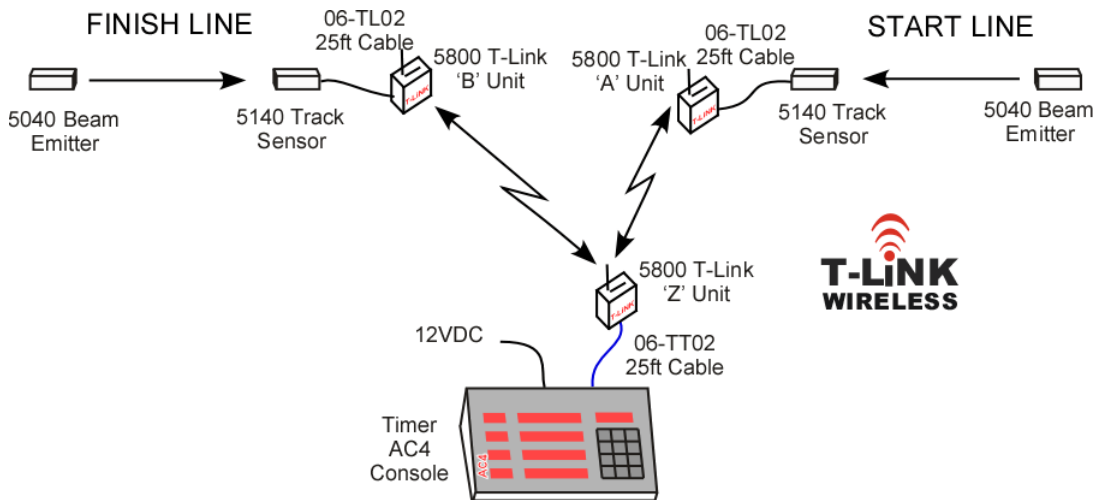
Timer
AC4
Console

Fig 2 - T-Link wireless with external Track Sensors

FINISH LINE

5805 T-Link
'B' Unit

START LINE

5805 T-Link
'A' Unit

5040
Beam
Emitter

5040
Beam
Emitter

5800 T-Link
'Z' Unit

T-LiNK
WIRELESS

12VDC

06-TT02
25ft Cable
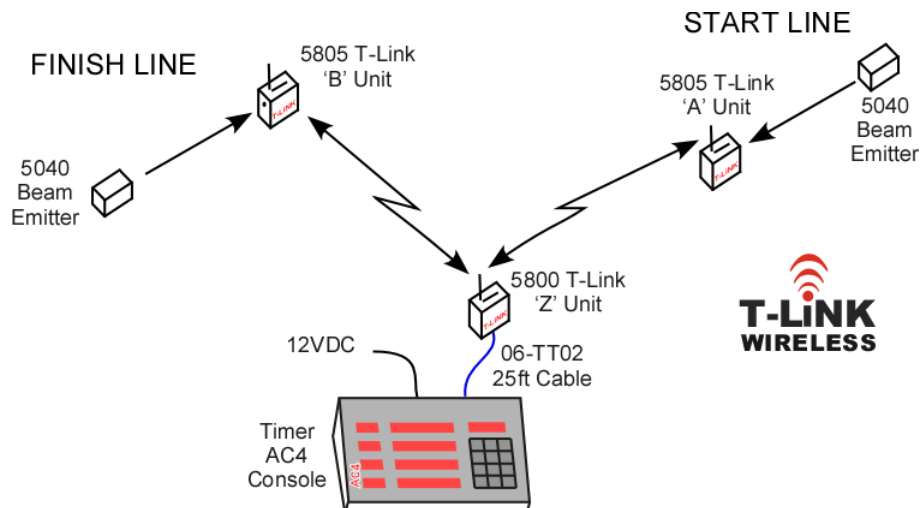
Timer
AC4
Console

Fig 3 - T-Link wireless with internal Track Sensors

6

CONSOLE FEATURES

Connectors on bottom

Status Display

Keypad

Run Number   Timer Displays
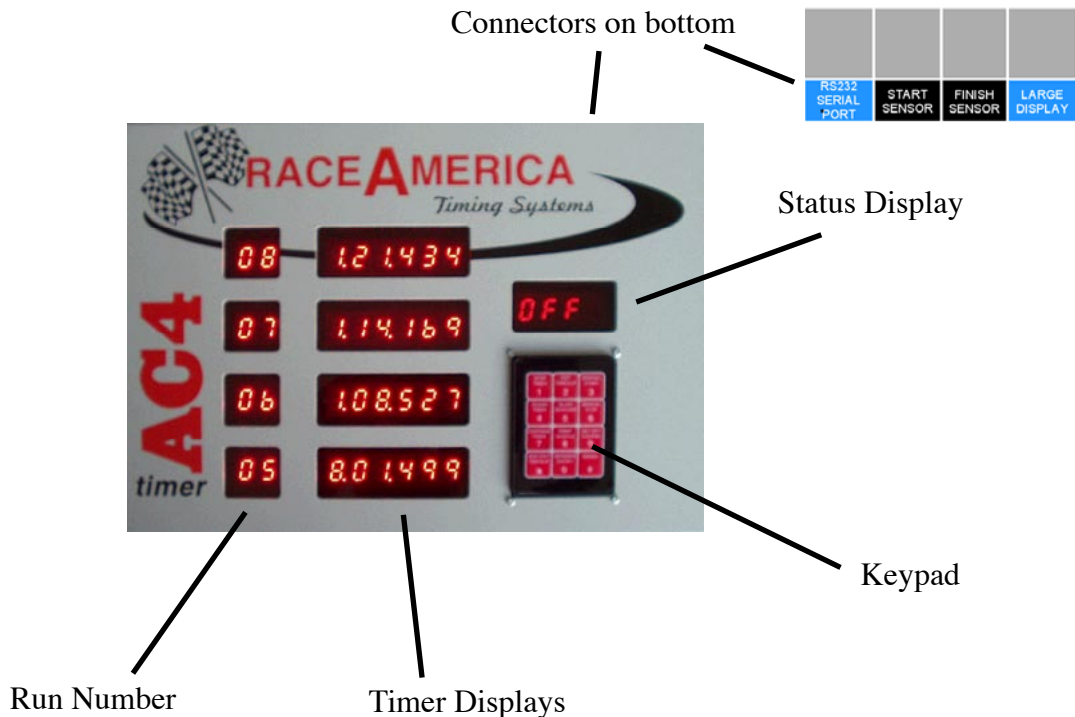
The Timer AC4 Console contains a Status Display for display of the current mode of operation of the timer, comfirm detection of a car by the Track Sensors, and Emitter/Sensor alignment.

Each of the four timers are assigned a Run Number at the start of each run indicated on the left side of the console. The elapsed time associated with each run is indicated in each of the four Timer Displays in the center of the console.

Place the 'A' unit at the Start and the 'B' unit at the Finish per diagrams (Fig 2 or 3). Place the 'Z' unit in the proximity of the console and connect to the Serial Port. Positioning the antenna(s) as high in the air as possible will optimize performance.

STEP 4 -

Connect any optional scoreboards, displays or PCs per owner manuals at this time. The drawings in Figs 4 thru 6 show some of the connection options.

Connections are for RS232 serial data at 9600 baud. When the option is located more than 100ft from the console, using wireless or RS422 communication PODs will accomplish the task.

STEP 5 -

Connect the RED and BLACK alligator clips to the 12VDC battery or 110/230 VAC AC Adapter and you're ready to begin.

POWER ON/SELF-TEST

Connecting the 12VDC power source places the RaceAmerica Timer AC4 into a self-test of the microprocessor circuitry and LED displays (Light Emitting Diode). This is an internal test as well as a visual check of each display. The Status Display sequences through each segment of all four digits, then illuminates each segment and decimal point of all four digits until the number 8 is illuminated with the decimal point. The LED Display then places an 8 with decimal point in the far right digit and shifts the display to the left through all four digits.

The Run Number displays and the Timer displays then sequence 0 through 9, blank out, then reset to the initial timer setting of 0.000 seconds.

The Status Display then sequences through the PRODuct number and the CODE revision level contained within the timer.

At the end of the power-up sequence, the   7

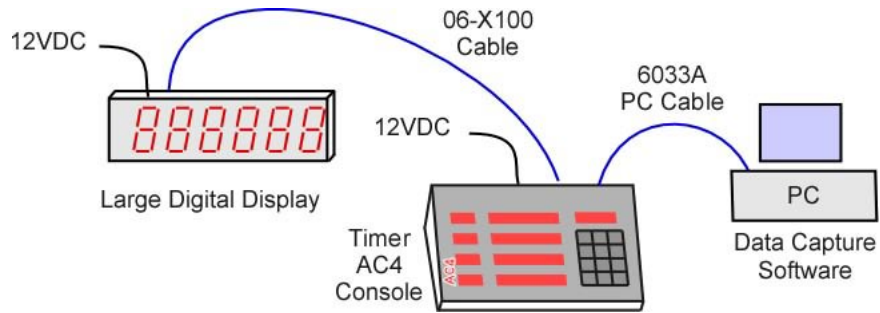# Connecting System Options

Fig 4 - RS232 Hard wired Digital Display and/or PC
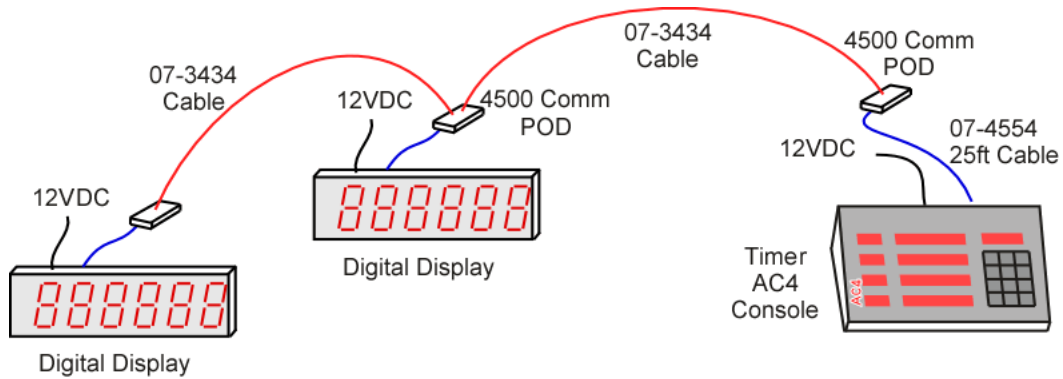Limited to 100ft cable lengths

Fig 5 - Hard wired Digital Displays utilizing Communication PODs
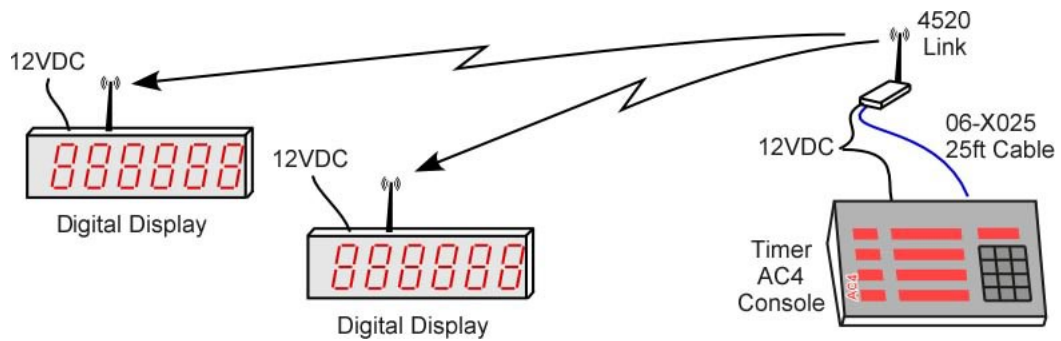

Fig 6 - Wireless Digital Displays

system goes into T-Link Wireless mode.

If the wireless sensors are present and the 'Z' unit is powered ON, the status display will show [t-Ln]; if the 'Z' unit is not powered on or not present, the status display will show [OFF-].

ALIGNMENT MODE

Hard Wired Sensor Alignment -

To verify hard wired Track Sensors are properly aligned with their Beam Emitters, select the hard wired Alignment Mode by pressing the **[8]** key on the Keypad with the Track Sensors disabled (this is covered later in these instructions). The Status Display momentarily indicates the position on each sensor on the display with letters represent each emitter/sensor pair **[-SF-]** with the SF blinking. The **[S]** indicates the START emitter/sensor pair, the **[F]** indicates the FINISH line emitter/sensor pair. The Status Display then changes each digit to a zero for each sensor being monitored **[0SF0]**. If the Beam Emitter and Track Sensor are operating properly and aligned, the 0 digit will not change. If the Beam Emitter and Track Sensor are not properly aligned, the 0 digit for each emitter/sensor pair will count slowly if slightly out of alignment or continuously if they are not functioning properly or way out of alignment. Once the emitter/sensor pair are aligned properly, the digit will stop counting. If the alignment is off a little or intermittent, the digit for that emitter/sensor pair will count when they float out of alignment. Remember, the Beam Emitters and Track Sensors operate on a 'Line-of-Sight' concept and may require shims if they are installed on a street with a crown. Leaves, people, and other debris will also break the beams and could give false signals, so keep everyone and everything clear of the Beam Emitters and Track Sensor during racing activity.

To maximize the alignment of the emitter/sensor pairs, it is suggested to rotate the Beam Emitter slowly left and right until the alignment 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. Press the **[#]** pound sign key to exit Alignment Mode.

T-Link Alignment -

Proper alignment can be determined by observing the Left LED on the T-Link connected to the sensor (or with an internal sensor). When the LED is blinking slowly, the emitter and sensor are aligned; when the LED is ON solid, the sensor is not properly aligned. Use the same alignment technique discussed for hard wired sensors to attain correct alignment while monitoring the LED status. Do this for both the Start and Finish sensor.

SERIAL PORT CONFIGURATIONS

The RS232 Serial Port can be configured for T-Link Wireless Track Sensors or to interface to a PC running race management software.

The Serial Port is enabled for two way communications (in for T-Link data, out for PCs and displays. The Display port is also a serial port and only transmits data in Chronomix format.

NOTE: When connecting to the Serial Port, the PC or display must be configured at 9600 baud, 8 data bits, no parity, 1 stop bit, no handshake (9600/8/N/1).

RF INTEGRITY

When operating the Timer AC4 with T-Link wireless sensors, the Radio Frequency Signal integrity can be monitored. Pressing **[2]** on the keypad will cause connected T-Link units to monitor the RF signal integrity. The display will show [-rF-]. The left dash is the 'A' (start line) unit and the right dash is the 'B' (finish line) unit. The dashes on the display will begin to count up as signals are received from the T-Link units on the track. 0 displayed represents 0%, 1 represents

10%, 2 represents 20% etc. until a dash appears representing 100%. This is an indication of the consistency of the RF integrity. If this number jumps around, there is a high level of interference in the area. If the number remains high, the RF signal strength is very good. If the number remains low, the RF integrity is somewhat weak. The position of the T-Links and their antennas can be moved to optimize the RF Integrity level.

WIRELESS BATTERY LEVEL

When operating the Timer AC4 with T-Link Wireless sensors, The battery level of each wireless link unit can be monitored from the console. Press and release the **[5]** key to monitor the Battery Level of the T-Links on the track indicated by **[bAt-]** followed by **[b---]**. The dashes represent 'A' sensor (Start), 'B' sensor (Finish) and 'Z' unit. The dashes will be replaced by the percentage of battery power remaining. 0 for 0%, 1 for 10%, 2 for 20%, etc and a dash for 100%. The 'b' will be blinking; any reading above 40% should be adequate for hours of operation.

TIMER OPERATION

Once set up, operation of the Timer AC4 is very straight forward.

Each time the Start beam is interrupted, a timer will start counting. After each start, the beam is locked out for five seconds to allow the car to pass through and the dust to clear. Up to four cars can start before the first car must finish. Once a car has finished, another car can start. A run number is assigned to each start on the console. Cars must start and stop without passing.

Each finish freezes the console and sends the time to the serial ports (PCs and displays) until another run starts.

The console operator can use the Manual Start **[3]** and or Manual Stop **[6]** keys to override the track sensor(s) when the Status Display indicates the sensors are disabled **[OFF-]**.

If a run is stopped in error, the operator can Continue **[7]** which will restart the last run stopped. This will back up and restart timers for all runs on the display without losing any time.

If a car goes off course and cannot finish; press Set Off Course **[*]** when the car should finish and their time will be set to the maximum.

Use Stop Timer **[1]** to stop all currently counting timers when something happens requiring a rerun of all cars on the track. Run numbers are not reset. Alternately, Clear Timer **[4]** will reset the timer to the initial power-up settings.

While timing cars in either T-Link Wireless mode or hard wired mode, status conditions can be checked. Alignment mode is available in hard wired mode. RF Integrity and Battery Level status are available in T-Link Wireless mode. Alignment status is always available on the 'A' and 'B' T-Link Wireless units.

10

KEYPAD FUNCTIONS
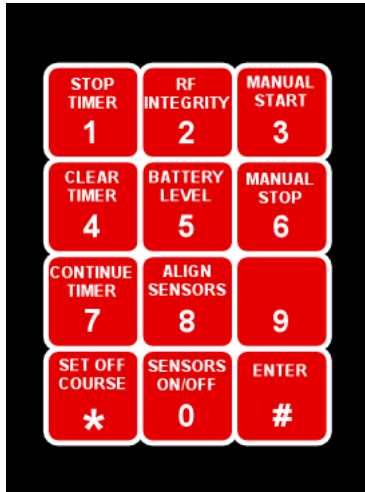
KEY 0

The **[0]** key is used to toggle hard wired track sensors **[-on-]** (enabled) and **[OFF-]** (disabled).

NOTE: If the T-Link Wireless unit is connected and powered on, the **[0]** key is disabled.

NOTE: When the sensors are in either mode, they will not detect any cars crossing the starting or finish line in the other mode.

Initial power-up default mode is T-Link Wireless **[t-Ln]**.

KEY 1

Pressing **[1]** on the keypad will halt all currently counting timers. This is convenient when something happens on the track requiring a restart of all cars being actively timed. The next run will be assigned the next Run Number when the start beam is interrupted.

KEY 2

Pressing **[2]** on the keypad will cause connected T-Link units to monitor the RF signal integrity. The display will show [-rF-]. The left dash is the start line and the right dash is the finish line. The dashes on the display will begin to count up as signals are received from the T-Link units on the track. 0 displayed represents 0%, 1 represents 10%, 2 represents 20% etc. until a dash appears representing 100%. This is an indication of the consistency of the RF signal integrity. If this number jumps around, there is a high level of interference in the area. If the number remains high, the RF signal integrity is very good. If the number remains low, the RF signal is somewhat weak. The position of the T-Links and their antennas can be moved to optimize the RF Integrity level. This key is enabled when **[t-Ln]** is displayed in the Status Display.

KEY 3

Pressing the **[3]** key will manually start a timer. This is the same function as breaking the start beam. If all four timers are counting and the **[3]** key is pressed, the bottom timer will be lost and a new timer will be started at the top of the display. Since this is manual mode, the operator has full control of the timer starting function. This key is enabled when the Status Display indicates **[OFF]**.

KEY 4

Pressing the **[4]** key halts all timers, resets all four timers back to **0.000** seconds, clears the run numbers, and resets the next run number to **01**. This function is used to completely reset the Timer AC4 back to its initial startup point.

KEY 5

Press and release the **[5]** key to monitor the Battery Level of the T-Links on the track indicated by **[bAt-]** followed by **[b---]**. The dashes represent 'A' sensor (Start), 'B' sensor (Finish) and the 'Z' unit. The dashes will be replaced by the percentage of battery power remaining. 0 for 0%, 1 for 10%, 2 for 20%, etc and a dash for 100%. The 'b' will be blinking. This key is enabled when **[t-Ln]** is displayed in the Status Display.

KEY 6

To manually stop the next timer, press the **[6]** key. This is the same function as a car crossing the finish line and blocking the beam. This key is enabled when the Status Display indicates **[OFF]**.

11

KEY 7

If a timer is inadvertently stopped by a worker running through the finish line or manually stopped by pressing the Manual Stop or Off Course keys, the timer can be restored and counting with the correct elapsed time using the **[7]** Continue key. The most recently stopped timer is restarted and updated from a backup timer internally maintained by the Timer AC4. The timer is restarted and updated with the correct elapsed time. A timer can be stopped and restarted an unlimited number of times.

NOTE: All four timers also have a backup timer internally maintained by the Timer AC4. These free-running timers do not stop at the maximum elapsed time, instead, the timers roll over back to zero and continue to count. Care should be taken if a long period of time elapses between when the timer was stopped and restarted.

KEY 8

To enter alignment mode, for hard wired sensors, press the **[8]** key on the keypad; sensor alignment at the start and finish lines indicated by **[-SF-]** displayed. The left dash is the start line and the right dash is the finish line. The dashes will be replaced by a number. The sensors are checked continuously and the display is updated 4 times a second. If the sensor is aligned, the number will not change. If the sensor is intermittently out of alignment or on the edge of alignment, the corresponding number will count intermittently. If the sensor is out of alignment, the corresponding number will count 4 times a second.

KEY *

If a car does not complete the course and their time is no longer valid, wait until their timer is the next timer to stop. Pressing the **[*]** key will stop the next timer (same as the car crossing the finish line) and update the timer with the maximum elapsed time to indicate the car went Off Course and the time is invalid. The maximum value will be 9:59.999 or 999.999 seconds dependent upon the Timer AC4 display format ordered.

STATUS DISPLAY MESSAGES

During normal operation, messages will appear in the Status Display. These messages indicate status, mode of operation, or events occurring on the race track. Many of these messages are covered elsewhere in this manual and are alphabetically summarized in the following section as a reference:

Algn -SF-

When entering Alignment Mode, these messages will appear in sequence to indicate the alignment of the Track Sensors and Beam Emitters will be continuously monitored and the results displayed.

on

This display indicates the AC4 is operating in the hard wired mode and track sensors are enabled.

CLr

This message confirms all timers have been stopped, reset to 0.000 seconds, and run numbers have been reset to start with 01. The Timer AC4 is ready for the next run.

CodE

This message appears during the power-up sequence and indicates the software code level running in the RaceAmerica timer.

Cont

When a timer is restored after being stopped by mistake, this message appears momentarily to confirm the timer is being restarted

End

This message indicates the stopping of a timer. It will appear every time the finish line beam is interrupted by a car or the manual stop key is pressed on the keypad. The timer in the Timer Display currently counting with the highest time elapsed is stopped and output is sent to the Serial port and Large Display port.

FbAd

This message indicates the alignment of the Track Sensor and Beam Emitter at the finish line has failed to maintain alignment while the Timer AC4 was performing realtime testing after a car passed through the finish line beam. This message will disappear when another message is displayed in the Status Display. It will appear each time the finish line alignment is detected as bad.

OFF

This message will keep appearing if the sensors have been disabled by the operator. This message is a reminder to enable the sensors prior to the start of the race event in order to detect cars at the start and finish lines. This message will also appear if the T-Link Wireless is disconnected or powered off.

Out

This message will appear when the operator determines a car has strayed off course and the respective timer in the Timer Display is no longer valid. The timer in the Timer Display currently counting with the highest time elapsed is stopped, set to the maximum time value, and output is sent to the printer.

Prod

This message appears during the power-up sequence and indicates the product number of the RaceAmerica timer.

SbAd

This message indicates the alignment of the Track Sensor and Beam Emitter at the start line has failed to maintain alignment while the Timer AC4 was performing realtime testing after a car passed through the start line beam. This message will disappear when another message is displayed in the Status Display. It will appear each time the start line alignment is detected as bad.

StoP

This message confirms all timers have been stopped and are ready for the next run to begin with the next run number.

Strt

This message indicates the starting of a new timer. It will appear every time the starting line beam is interrupted by a car or the manual start key is pressed on the keypad. The four timers in the Timer Display are rotated downward. The topmost timer of the Timer Display is reset to zero and starts counting.

t-Ln

This display indicates the AC4 is operating in the hard wired mode.

TECHNICAL DETAILS

Timer AC4 is designed to interface with third party race management software. The timer sends signals to the PC each time a car breaks the finish line beam. The following communication strings are sent to the PC:

Car finishes: [hex80]fffsss[cr][lf]
              or   [hex80]fffssm[cr][lf]

MAINTENANCE

The Model 3800 TIMER AC4 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 4.2V DC) will cause intermittent operation of the system resulting in intermittent cars detected at the starting line or the finish line as the battery 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 and sensor cable 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.

7540C - Foam Stand Assembly Instructions

Base Foam   Top Foam   Emitter   Sensor
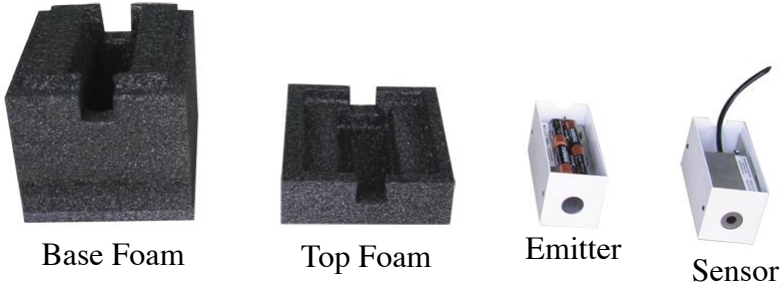
Assembly Components

'AA' Battery Emitter (5040B, 5050B & 5058B)
1. Install batteries and turn on the Emitter.
2. Separate the Base of the Foam Stand from the Top.
3. Place the 5040/5050/5058 Emitter into the Base
   foam with the battery side down.
4. Slide the Top on the Base. Place on the track.

Track Sensor (5140D & 5158D)
1. Separate the Base of the Foam Stand from the Top.
2. Connect the cable to the sensor
3. Place the 5140/5158 Sensor into the base (open end down)
4. Press the Top on the Base. Place on the track.

Sensor/Emitter
placement in Foam Base

'C' Battery Emitter (5042B)
1. Same as above except place the 'C' Battery pack in
   the Base standing on its edge.

For additional stability

1. Place weight in the Base well as required.

Outside Dimensions:
    6.5" W x 7.25" L x 7.5" H

Sensor back
Note cable routing

Complete Assembly