LIGHTNINGACCUTIMERS

WHEN ITS A RACE AGAINST TIME

Arena Timing System

V1.5

A Product Line by MICROCode Consulting

www.lightningaccutimers.com

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1.0 Introduction

Imagine the feeling: Rounding the last barrel and accelerating towards the finish line during what you know is a great run. You race over the line to discover you have the winning time with no penalties. Such a rodeo event can be quite thrilling, but to achieve it requires lots of practice. And the right equipment.

But, let's face it: arena timing systems can be very expensive. Professional systems cost $2000 or more and even small systems suitable for personal use cost $1000 or more. That is why many arenas still use stopwatches, flags, and other methods. And, don't even think about measuring interval times without adding significantly more cost – if the system can even support it.

Now, add another problem for those with home arenas: How can you really practice? Even if you can afford it, this is no longer a solo activity: somebody needs to operate the timing system – someone other than the rider.

Introducing the **Lightning AccuTimers** Arena Timing System by ***MICROCode Consulting***. Although this name will never roll off your tongue, it will bring you great delight. For a fraction of the cost of large scale rodeo timing systems, you can set up a solo-operable completely wireless timing system in your own arena for under $400. Thanks to modern technology that was unavailable even a few years ago, a full-blown professional system with interval timers and multiple connected units costs around $1000.

2.0 Features

Lightning AccuTimers Arena Timers are packed with features that previously were only found in much more expensive systems. Common to all systems, from the low-cost personal arena timing package to the complete professional arena system, are the following:

- **Accuracy:** One of the hallmarks of **Lightning AccuTimers** is their accuracy (and that is why it is right in the name). A quietly kept secret is that timers drift over temperature and what is accurate at room temperature could be worse than a sundial in hot or cold conditions. Our systems have built-in accuracy of 0.001 seconds (1 millisecond) from a teeth-chattering 32°F to a Nevada desert-floor outdoor oven of 160°F. How many other timers can make this claim? They keep this accuracy for up to 16 minutes.
- **Works in direct sunlight:** OK, other systems claim to work in direct sunlight – but you have learned otherwise. And ingenuity finds a solution: run around and swap locations of the units, create a sun umbrella with masking tape and a nacho-chip paper tray, or – the most expensive – setup a backup system at a different height.

  With **Lightning AccuTimers**, all of these are unnecessary. We have tested our systems in direct sunlight from early in the morning through sunset and it just plain works. (For those of you who enjoyed the challenge of getting your archaic electric-eye to work in bright sunlight, we sincerely apologize.)

- **Quick setup:** You can set up the tripods, place the units, power it up, and align a personal arena in a couple minutes or a professional arena with interval timers in less than five minutes. Quick setup also means rapid disassembly and packing up.
- **Easy to use:** Operating any timer should be simple, at least that is our philosophy. Operation of our console units and portable handheld units is the same. Moreover, it is intuitive. In fact, **Lightning AccuTimers** are so simple to operate, we probably wasted a lot of time writing this manual because you will never need to read it.
- **Solo operation:** Another unique feature of **Lightning AccuTimers** is they are designed to be operated without outside help. Practice barrel runs and see your interval (if measured) and overall time without having someone else shout it out or forced to get out of your saddle to walk over to some stationary display.
- **Low cost of operation:** **Lightning AccuTimers** use either AA and 9v batteries, available everywhere. Although alkaline batteries are recommended (for more accurate battery life tracking), there are no restrictions. Use any other type: NiCd, NiMH, modern exotic types or your grandfather's carbon-zinc. These are easily replaced at any time, so you don't have to worry about always recharging or inserting a fresh battery before you leave home. This keeps your wallet happy as well.
- **Designed for outdoor use:** Not surprisingly, arena timers will experience heat, cold, sun, and dust. **Lightning AccuTimers** operate in all of these conditions and can even handle some light rain. If you accidentally take it swimming, remove the battery immediately and dry it out. Seriously, it takes a lot to ruin these units.
- **Versatile:** **Lightning AccuTimers** were designed to support the wide range of activites associated with arenas. The packages support barrel racing, roping, penning, archery (lane timing), relays, and bull-riding – and new options are being added regularly. Our systems were designed to be powerful and field upgradeable – no need to buy new hardware because the existing equipment did not have the functionality required.
- **Wireless operation:** Connecting the system is easy as there are no wires. No wires to get tangled, no wires to trip on, no wires to lose. You cannot get any simpler.
- **Lightweight:** With the use of modern technology, **Lightning AccuTimers** only weigh ounces. Even when you include the batteries, complete personal arena systems weigh less than a pound with the professional systems only being a couple pounds more.
- **Durable:** Do not let the small size and weight let you think these are fragile units. While they may not withstand being stepped on by anything larger than a Shetland pony, we expect them to be knocked over or dropped on a regular basis – just like we did throughout testing (although not intentionally) – and designed them to survive such punishment. A worn box may have a number of scratches or chips in it (or dog teeth marks), but it will still work and the warranty remains intact. The handheld units are even more durable and can handled being stepped on without breaking.

3.0 Unit Description

Lightning AccuTimers is a state-of-the-art electronics timing system that has many unique features that provide you an easy-to-use yet advanced system while retaining an objective to keep costs low. Different packages contain different unit combinations, each unit type of which is described in this section including how to install the batteries and antennas.

3.1 Primary trip-beam detector/timer

Figure 1: Trip-Beam Detector/Timer

Each arena must have one primary **Lightning AccuTimers** system that consists of a beacon and detector (that together is also known as a trip beam or an electric eye).

To get started, you must first install the matching antenna onto the trip-beam detector/timer. It should easily screw onto the mating connector on the top of the trip beam detector/timing unit. NEVER OPERATE THE UNIT WITHOUT THE ANTENNA INSTALLED.

With the antenna installed, press down and slide open the battery cover (on the back side of the unit). You will note the detector ID printed on both the backside as well as inside the battery compartment. insert a 9v battery (note the polarity!), and replace the cover. Inserting the battery incorrectly will not harm the detector unit but (surprise!) the unit will not operate. If the unit does not turn on (by pressing the red button), just shake your head briefly in embarrassment, unobtrusively flip the battery over, and try again.

3.2 Secondary trip-beam detectors

At a glance, the secondary (or supplemental or interval) trip-beam detectors look identical to the primary detector/timer. It can be distinguished by the markings on the middle bottom surface as well as inside the battery compartment. These detector types are clearly identified with a label of "**Primary**" (or "**Master**" for older versions) and "**Supplemental 1**" or "**Secondary**", "**Supplemental 2**", or "**Supplemental 3**" as well as the ID.

3.3 Trip-beam beacon

Figure 2: Trip-Beam Beacon

As shown at the right, the **Lightning AccuTimers** trip beam beacon is a small battery-powered unit with a switch containing an embedded red LED status indicator. It also has a push button to change the beacon power level. The protrusions on the black face is the business end of the unit where the beacon is emitted.

Before you begin, slide open the battery cover on the back side, install two AA batteries (carefully note the polarity!) and close the cover. Alkaline batteries are recommended but the unit is capable of using NiCd and NiMH as well. Battery lifetime depends upon the battery type and power mode of the beacon.

Ensure you put the batteries in the correct way. Improper installation

might damage the unit if turned on with batteries installed backwards. If the indicator on the switch does not light up immediately when you turn power on, turn it off and check that the batteries are installed properly.

The primary detector/timer and each/every secondary or supplemental detector must have an associated trip-beam beacon.

3.4 Handheld monitor and controller

Each main timer unit can support up to three handheld monitor/controllers. To get started, slip off the silicon protective grip and press down and slide open the battery cover (on the back side of the unit). Attach a 9v battery to the battery snap, and replace the cover. Slide the unit back into the protective grip. Inserting the battery incorrectly will not harm the unit.

Figure 3: Handheld monitor/controller

Features of this handheld unit:

- Handheld monitor has a high-contrast back-lit LCD display to show you the time of your most recent run, or to display any prior run that is still in memory.
- Individual runs are precisely timed in 0.001 second increments up to a maximum of 16 minutes
- Handheld unit is very rugged and can not only be dropped repeatedly without damage (outside of minor blemishes) but can be stepped on by humans without ruining the unit. The handheld unit is intended to be strapped to you or your saddle via the convenient loop on the backside of the cover.
- Complete wireless operation allows the handheld unit to communicate and control the **Lightning AccuTimers** main detector/timer unit. All operations can be done directly from the handheld unit without requiring a second person or dismounting
- Each unit has a unique ID associated with it (printed on the back surface of the unit)
- USB interface for updating the firmware on the handheld unit and detectors as needed (sheltered within the battery compartment to prevent dirt and water from getting in)

3.5 Arena console

The arena console is a wedge-shaped unit with three buttons and a large back-lit LCD display as shown at the right.

To get started, you must first install the appropriate antenna onto the unit. It should easily screw onto the mating connector at the right rear of the console unit. NEVER OPERATE THE UNIT WITHOUT THE ANTENNA INSTALLED.

With the antenna installed, remove the battery cover, attach the 9v battery to the battery clip, and replace the cover. Inserting the battery incorrectly will not harm the console unit but the unit will not operate. (But you already know how to solve that problem.)

Figure 4: Arena console

Features of the console unit:

- Console display has a high-contrast back-lit large-character LCD display to show you the time of your most recent run, or to display any prior run that is still in memory
- Individual runs are precisely timed in 0.001 second increments up to a maximum of 16 minutes (longer times could be supported, please talk to us)
- Complete wireless operation allows the console unit to communicate with the **Lightning AccuTimers** main detector/timer unit
- Starting runs and/or halting runs can be done directly from the console unit
- Internal buzzer that beeps once when the timer starts and twice when the timer stops
- Optional horn audio output (3.5mm jack) to be plugged into your arena sound system
- Each console has a unique ID associated with it that is printed on the back surface
- USB interface for operation using our Windows software, updating the firmware on the console and detectors as needed (located at the rear of the unit)

3.6 Remote display interface

The remote display interface is used to turn any TV/monitor into a remote scoreboard. Features of the **Lightning AccuTimers** remote display unit are:

Figure 5: Remote display unit

- Show the current runtime and final time anywhere near the arena
- Wirelessly connects to the console unit up to a distance of 400 feet
- Plugs into any TV/monitor that has an HDMI interface
- A single timing system with a console can operate up to four displays of any type simultaneously to put multiple **Lightning AccuTimers** scoreboards at convenient locations
- Viewing distances are much longer than typical scoreboard displays; a 48-inch LED display shows a digit size of 8 inches for

a viewing distance well over 200 feet!

- Display offers several settings including current time, current plus best time, and custom messages
- Much lower cost option than a custom 5 digit large LED number display!s
- Runs off AC outlet via the included AC adaptor

Figure 6: Remote display screen shots

3.7 Wireless 8-inch LED display

The 8-inch height 5-digit LED wireless display is the traditional way to show time. Features of the **Lightning AccuTimers** wireless 8-inch LED display are:

- Bright red LED digits

Figure 7: 8-inch LED display

- Show the current runtime and final time anywhere near the arena
- Wirelessly connects to the console unit up to a distance of 400 feet
- A single timing system with a console can operate up to four displays of any type simultaneously to put multiple **Lightning AccuTimers** scoreboards at convenient locations
- A digit size of 8 inches for a viewing distance well over 200 feet!
- Runs off AC outlet via the included AC adaptor
- Optionally run off of any 12v battery

3.8 Wireless 10-inch LED display

The 10-inch height 5-digit LED wireless display is large professional water-resistant package. Features of the **Lightning AccuTimers** wireless 10-inch LED display are:

- Extremely bright red LED digits can be seen long distances
- Show the current runtime and final time anywhere near the arena
- Wirelessly connects to the console unit up to a distance of 400 feet

Figure 8: 10-inch LED display

- A single timing system with a console can operate up to four displays of any type simultaneously to put multiple **Lightning AccuTimers** scoreboards at convenient locations
- Extremely bright 10 inche digits for a viewing distance well over 300 feet!
- Runs off AC outlet

3.9 USB serial interface unit

The USB serial interface unit is the smallest of the **Lightning AccuTimers** units. Only available in the professional systems, it is designed to connect to a Windows PC that collects timing information as well as control the timing system itself. It has a connector for an antenna at one end, a mini-USB plug at the other, and three LEDs along its upper surface.

Figure 9: USB serial interface unit

To get started, you must first install the antenna onto the USB serial interface unit. It should easily screw onto the mating connector on one end. NEVER OPERATE THE UNIT WITHOUT THE ANTENNA INSTALLED.

Next, you should insert the included CD into your Windows PC system. It includes the drivers for the USB serial interface unit as well as setup and testing software. (For those without a DVD or CD reader, the package can be downloaded from http://www.microcode.us/lightning/pcdriver). You must install the driver before the unit will work properly and you should install the driver before plugging the unit into your Windows PC.

4.0 Arena Setup

The type of setup for a given arena depends upon the equipment purchased, the event being run, and finally the arena size. Included below are guidelines for setting up any system for proper operation.

4.1 Trip-beam beacon setup

Each trip-beam beacon should be mounted on a tripod and placed on one side of the arena with its outlet pointing into its associated main or interval trip-beam detector. The trip beam height should be set properly (generally 2-3 feet) and aligned with the trip beam detector inlet.

Flipping the switch on the unit will activate the trip-beam beacon which then enters *Setup Mode*. During *Setup Mode*, the beacon shows (blinks) the power mode which can be changed. After approximately 8 seconds without any button press, the beacon auto-changes to *Broadcast Mode*.

CAUTION: The beacons as well as the tripods are very light and can be knocked over in windy conditions. Hanging some weight on the cross-members of each tripod is highly recommended.

A complete list of the status indicated by the beacon LED are shown below:

LED Activity	Meaning (Beacon)
Solid on (1-2 seconds)	Beacon is in power-up initialization and self-test
Blinks once, pauses, repeats	*Setup Mode*: Beacon will be in its lowest power setting when it reverts to *Broadcast Mode*. Pressing the button changes to the next power setting.
Blinks twice, pauses, repeats	*Setup Mode*: Beacon will be in its medium power setting when it reverts to *Broadcast Mode*. Pressing the button changes to the next power setting.
Blinks three times, pauses, repeats	*Setup Mode*: Beacon will be in its highest power when it reverts to *Broadcast Mode*. Pressing the button changes back to the lowest power setting.
Rapid flashing for ~one second, then LED off	Beacon is transitioning from *Setup Mode* to *Broadcast Mode*. The beacon starts broadcasting at the specified power.
Brief flash, very long pause (~4 seconds), repeats	*Broadcast Mode:* Beacon is broadcasting at the chosen power level. Pressing the button forces the unit back into *Setup Mode*.
Blinks slowly, no pauses	*Broadcast Mode:* Beacon broadcasting; batteries have less than 8% power remaining
Blinks rapidly, no pauses	*Broadcast Mode:* Beacon broadcasting; batteries have less than 4% power remaining
Blinks 5 or more times, pauses, repeats	Problem detected with beacon that may require returning for repair or replacement (section).

Table 1: Beacon LED States

The table below indicates the approximate range for each of the beacon power settings. Actual range will depend upon environmental conditions (indoor versus outdoor, dusty versus clear, etc.). Use the lowest power setting that provides a reliable trip-beam as that maximizes battery life.

Setup Mode	Detector-to-Beacon Distance
One (1) blink	10 ft minimum; ~70 ft maximum
Two (2) blinks	25 ft minimum; ~140 ft maximum
Three (3) blinks	40 ft minimum; ~250 ft maximum

Table 2: Beacon Range Settings

4.2 Primary trip-beam detector/timer setup

The primary detector unit should be mounted onto a tripod and placed on the opposite side of the arena with its inlet pointing across to the main trip beam beacon. The beacon beam spreads out at around **12 ft. wide per 100 feet distance** (as shown in the diagram below).

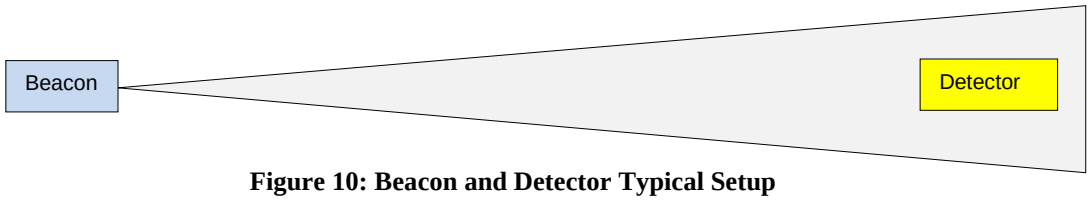

Figure 10: Beacon and Detector Typical Setup

CAUTION: The detectors as well as the tripods are very light and can be knocked over in windy conditions. Hanging some weight on the cross-members of each tripod is highly recommended.

Pressing the red button momentarily on the detector unit powers it up. The LED display is in *Alignment Status Mode* as shown in the following table:

LED Color/Activity	Meaning / Action (Detector/Timer)
Solid red	Timer/Detector is not aligned with beacon
Fast blinking green	Timer/Detector is aligned for the first time since power-up
Solid green	Timer/Detector is (re)aligned with beacon

Table 3: Detector/Timer LED in Alignment Status Mode

By default, the detector/timer LED will stay in *Alignment Status Mode* until alignment has been established for approximately 10 continuous seconds, after which it switches to *Normal Status Mode*. By default, the LED will light up in *Normal Status Mode* as shown in the table on the next page for about 8 seconds after which it turns off the LED (except for a quick flash every 4 seconds) in order to conserve battery power.

It is very important to align the detector with the associated beacon. Sometimes this entails being patient but, once aligned, works well throughout the day. If you having challenges, please consule section 8.3 General Beam Alignment and Break Troubleshooting.

LED Color/Activity	Meaning / Action (Detector/Timer)
LED is off	Timer/Detector is not powered on or battery is dead/reversed Turn on unit by pressing red button; otherwise, replace battery
Solid red	Timer/Detector is not aligned with beacon Ensure beacon is working, then align beacon and detector
Blinking red	Timer/Detector is aligned but not wirelessly connected to console, handheld or interface unit (primary) or to primary detector (supplemental). Ensure the console or interface unit is also operating
Alternating red and green	Timer/Detector is aligned and in standby/paused mode; a beam break will not start the timer (primary only)
Solid green	Timer/Detector is armed and ready to start timing (primary) or connected to primary detector (secondary or supplemental); timing will start when beam is tripped
Blinking green	Timer/Detector is currently timing a run (primary or secondary)
Brief flash of green once every 4 seconds	Timer/Detector is on and operating properly but conserving battery power; press red button to show status
Brief flash of red once every 4 seconds	Timer/Detector is on and operating properly with battery life < 10%; press the red button to show status
Sequence of 5 red and/or green pulses	Problem detected with detector that may require returning for repair or replacement (8.2 Detector/Timer Troubleshooting).

Table 4: Detector/Timer LED in Normal Status Mode

At any time, you can manually change the LED display mode on the detector between *Alignment Status Mode* and *Normal Status Mode*. Switching entails pressing the red button TWICE within one second. The LED will blink green once when changing to *Alignment Status Mode*; the LED will blink red once when manually switching to *Normal Status Mode*.

4.3 Secondary and supplemental trip-beam detector setup

Secondary and supplemental (or interval) detectors are used to measure intermediate times during a barrel run or start times for other events such as lane timing. Just like the primary detector/timer, secondary and supplemental trip-beam detectors should be mounted onto a tripod and placed with its inlet pointing across to the associated trip beam beacon.

When setting up multiple trip beams (one primary and secondary plus zero, one or two supplemental detectors), care must be taken to ensure that a given detector cannot "see" more than one beam at a time or the trip-beam may not work properly. Some examples are shown on the next page:

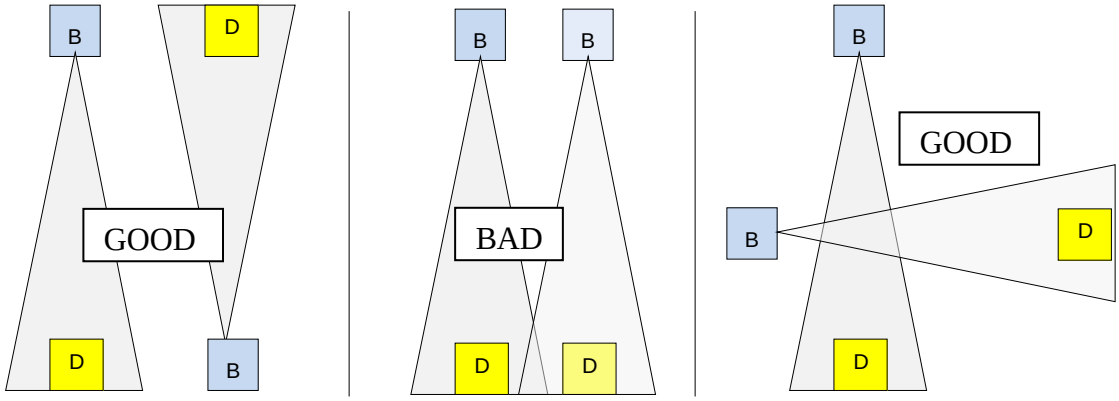

Figure 11: Multiple Beacon and Detector Setup Scenarios

Be aware that beacons are invisible beams that can reflect off of most flat surfaces including walls and windows. Always use the lowest power setting possible or these reflected signals may prevent the trip-beam from working properly. If the beam cannot be interrupted by walking through the location where you expect the beam to trip, then look for interference from other beacons or reflected surfaces. Change the beacon power and/or location to correct it.

4.4 Same versus separate start and finish line events

Different event types will likely entail different setups. The biggest difference is whether the start and finish lines are at the same location or separated by some distance.

For events with the same start-finish line (barrel racing) or that only have a start line (such as roping, some relays, penning and sorting), there is only one basic setup as shown in figure 8 on the next page. When measuring intermediate times, although many setups are possible, for most arenas, a reasonable primary, secondary and supplemental beacon and detector configuration for timing a barrel race is shown in figure 9. This allows one to measure the time around each barrel, time between barrels, and overall time.

An example setup for some roping and all lane timing events where the start and finish lines are separated are shown on the next page. Consult figures 10 and 11 for some examples of how the units should be set up.

4.5 Handheld monitor and arena console setup

The handheld monitor/controller and arena console are the primary means by which you can actually use the system to monitor as well as control timing. The professional systems or those with a console unit have a USB interface where a compatible Windows PC can communicate with and control it. You can also configure any system to your liking. The LCD is used to display results, navigate menus and report status.

Pressing the red button on the handheld monitor/controller or arena console will turn on the unit. After powering up, the unit will attempt to connect to the primary detector/timer. When a wireless connection is established, the status of the connection will be displayed on the LCD

screen plus the associated primary detector/timer LED may change its state as well (depending upon how it is configured).

The console and handheld displays also have a helpful display to explain the connection meanings and symbols. See Table 7: Status display on handheld and console for details.

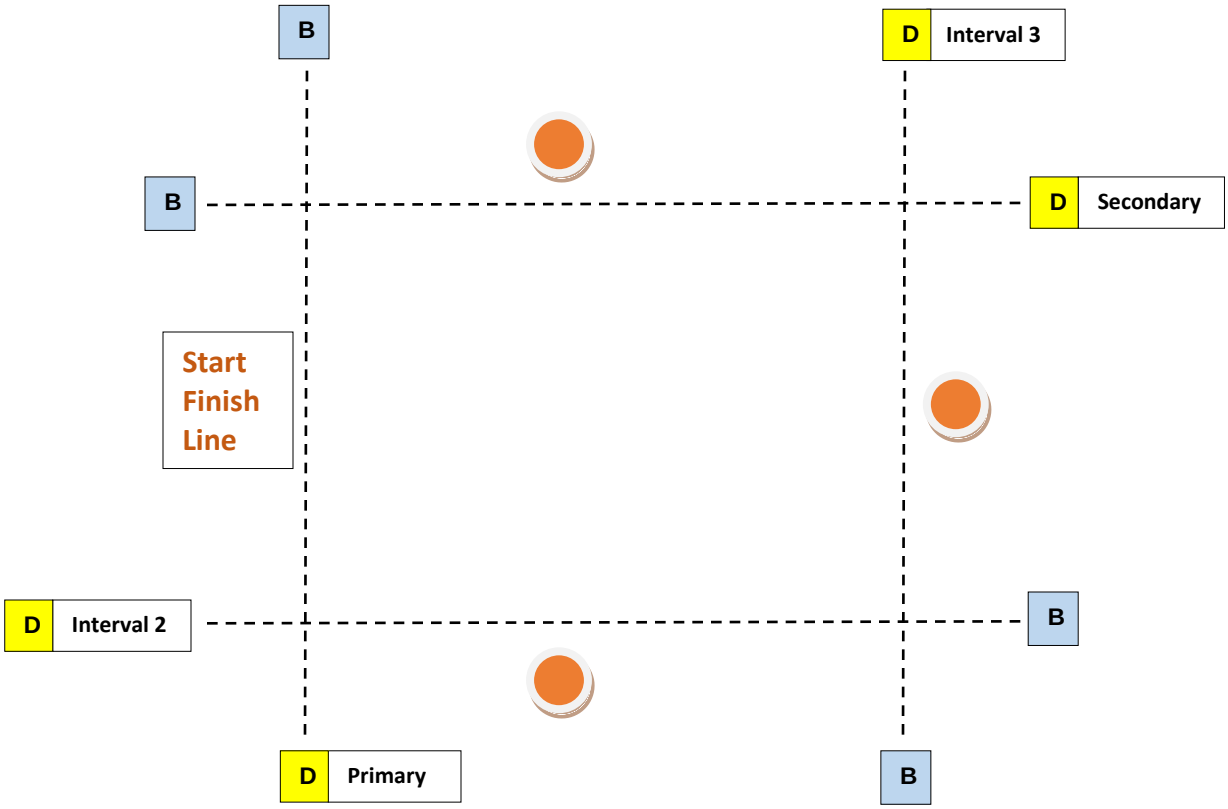

Figure 12: Barrel Racing Beacon and Detector Setup

4.6 USB serial interface unit

When using the professional unit that has USB serial interface unit, connect a USB cable between the mini-USB connector and one of your PC's USB interface plugs. **ENSURE THE USB PORT PROVIDES SUFFICIENT CURRENT (at least 100mA).** The LEDs will indicate status as shown on the next page:

LED Color/Activity	Meaning / Action (USB Serial Interface)
All LEDs are lit	Unit is powering-up, running diagnostics, and initializing operation
Blinking green	Unit is operating properly but not connected to primary detector/time; ensure primary detector/timer is running and operating properly first
Solid green	Unit is operating properly and connected to primary timing unit
Pulsing yellow	Yellow LED blinks when unit is communicating with the primary or secondary or supplemental/interval detector/timers
Solid red (yellow+green off)	Radio failure detected with USB serial interface unit that requires returning for repair or replacement (section **Error! Reference source not found.**).
Solid red and yellow (green off)	General hardware failure detected with USB serial interface unit that requires returning for repair or replacement (section **Error! Reference source not found.**)

Table 5: USB serial interface LED indicators

5.0 Lightning AccuTimers Operation

In this section, the operation of the **Lightning AccuTimers** Arena Timer is described. All operation described here is controlled by the handheld keypad or 3-button console units. An overview of all operations is shown in the table below.

State	Red button "Stop/Pwr" on keypad	Green button "Go/Arm" on keypad	Black Button "0/Menu" on keypad
Idle	No action	Arm unit	Enter menu
Armed (Ready)	Return to Idle unless is auto re-armed	Force run to start now	Enter menu
Timing a Penning Run	Stops the run immediately returning to Armed or Idle	Counts up number of stock penned	Registers penalty for run (cumulative)
Timing a Sorting Run	Stops the run immediately returning to Armed or Idle	Counts down number of stock left to sort	Registers penalty for run (cumulative)
Timing a Relay Run	Stops the run immediately returning to Armed or Idle	Stop time on next beam break	Registers penalty for run (cumulative)
Timing a Run (other events)	Stops the run immediately returning to Armed or Idle	No action	Registers penalty for run (cumulative)

Table 6: Button Usage on Handheld and Console

In addition, whenever any key is pressed, the LCD backlight will turn on (if enabled). More details regarding each operation is described in the following sections.

5.1 Status display on handheld and console units

The status of the primary connected is always shown on the main display. In addition, the status display mode will show the status of all connected detectors.

Detector Status	Handheld	Console
No primary detector found		
Detector found/active, but it is not aligned		
Detector found/active and aligned and idle Trip-beam breaks are IGNORED		
Detector found/active and aligned and armed Trip-beam break will start timing		Go!
Detector connected, timer running, trip beam ignored	I	I

Table 7: Status display on handheld and console

5.2 Starting a timing run

For most events, a timing run entails crossing the primary trip-beam, performing some activity such as racing around barrels, and then crossing back over the primary trip-beam (in the opposite direction). By default, breaking the trip-beam will start a timing run (called auto-armed). However, there can be a lot of activity in an arena that could inadvertently start a run. As such, another mode called "manually arming" is also offered. You can change this to require "arming" the timer manually before each run or switch it back quickly using the handheld or console menu or via the Windows PC program.

State	Main Detector LED	Changing States	Handheld/Console
Idle	Alternating red and green	Press GRN to arm timer	No extra indicators
Armed	Solid green	Press GRN to force run now	▶ on handheld "Go!" on console
Running	Blinking green	Press RED to terminate the run	Timer counting; "Stp" lower right
Stopping	Solid red momentarily then changes state to Idle or Armed	n/a	Timer stops counting
Ignoring trip beam	Green or Blinking green	n/a	**I** on handheld and console

Table 8: Timing Run States

If not already armed (by default), pressing the green button will arm the timer as indicated in Table 8: Timing Run States. When the system is "Armed", it means that the timer will start the next time the trip-beam is triggered. After the timer is armed, pressing the green button again will force the timer to start immediately and not wait for a trip-beam break. (Note that if the timer is already armed, pressing the green button **forces** the run timer to start immediately.)

The default factory setting on the **Lightning AccuTimers** Arena Timer is to automatically arm the timer after power-up/connecting and also to re-arm the timer after the end of the each timing run.

NOTE: When the system is not armed, any trip-beam breaks will be ignored.

When there is more than one handheld present or a handheld and a console, the system treats all units with equal priority. That means any unit can arm, start, or stop a run.

5.3 Ending a timing run

When a timing run is in progress, if there are interval detectors attached, the intermediate times will be shown on the display for a few seconds before the timer resumes showing the current run time.

A run can end in one two ways. By default, the "natural" way to end is for the timer to stop the next time the primary trip-beam is crossed. It can also be forced to end immediately by pressing the red button.

NOTE: When a timing run is stopped via the trip-beam or manually, it cannot be resumed.

When a run is complete, your time is shown on the handheld unit. It is also stored into memory temporarily for retrieval later. Up to 30 runs can be temporarily stored for later review before the first one is overwritten.

NOTE: Timing runs are stored into temporary memory and are lost when the unit is turned off.

5.4 Events supported by Lightning AccuTimers console

Lightning AccuTimers were designed to be versatile. As of this version, a number of events are supported using the console unit. The table below describes how each event type is started, tracked, and finished. ***When the GREEN and RED buttons are mentioned, this can be on the handheld and/or console unless otherwise noted.***

Event	Time starts when	Time stops when	Comment
Barrel Racing	Primary detector beam broken or GREEN button pressed	Primary detector beam broken or RED button pressed	--
Roping	Primary detector beam broken or GREEN button pressed	RED button pressed	--
Team Roping	Primary detector beam broken or GREEN button pressed	RED button pressed	Secondary/supplemental detector and beacon used to penalize header or healer early entry
Figure 8/ Split time	Primary detector beam broken or GREEN button pressed	Primary detector beam broken third time or RED button pressed	Supports Figure 8

Event	Time starts when	Time stops when	Comment
Relay	Primary detector beam broken or GREEN button pressed	Primary detector beam broken after GREEN button pressed (again) to re-arm or RED button pressed	Secondary/supplemental beam breaks ignored; pressing BLACK button uses last intermediate time as final time
Penning	Primary detector beam broken or GREEN button pressed	RED button pressed or stock count reached or timeout reached	Press GREEN button after each stock is penned
Sorting	Primary detector beam broken or GREEN button pressed	RED button pressed or stock count reached or timeout reached	Press GREEN button after each stock is sorted
Cutting	Primary detector beam broken or GREEN button pressed	RED button pressed or timeout reached	--
Lane time	Primary detector beam broken or GREEN button pressed	Secondary/supplemental detector beam broken or RED button pressed	Requires extra detector and beacon
Lane time (reversed)	Secondary/supplemental detector beam broken or GREEN button pressed	Primary detector beam broken or RED button pressed	Requires extra detector and beacon
Rough stock	GREEN button pressed	RED button pressed	--
Rough stock with scoring	GREEN button pressed	RED button pressed	Handheld unit(s) used by judges to score rider and stock

Table 9: Button Operation for Different Events

5.5 Powering down the Lightning AccuTimers units

All of the wireless units (Detector/Timers, Handheld units, and Console) are powered down by pressing and holding down the red button for about 5 seconds. The unit is off when the LCD screen goes blank (handheld/console) or LED turns off (detector/timer). The handheld and console unit will optionally turn off all detector/timers in its group saving you time.

The beacons lack any wireless connection and, thus, cannot be turned off remotely. Each unit must have its switch manually turned off.

5.6 Auto power-down

For battery preservation, both the handheld and console units will automatically power-down afer being idle for awhile. The default is 20 minutes of inactivity, but you can change this in the

configuration menu for each respective unit. Note that shutting down a handheld or console may also turn off any detector/timers in its group if it has been enabled (remote power-down is disabled by default).

The detector/timer units and beacons intentionally do not have any automatic shutdown capability. And, whereas the detector/timer can be commanded to shut down from the console or handheld, the beacons must be manually turned off.

5.7 Menu and setup options

There are a number of view and setup options on the handheld and console units. The menu system guides you through these options and their choices. There is a built-in help system that explains the operation of the unit, especially suitable for those who never read manuals.

Briefly, while in the menu system, the top line shows the menu option and the bottom line displays what the green (1) and red (3) and possibly black (2) buttons will do for the console and handheld.

The type of menu options available are:

- Review temporarily stored run times; usually viewed from most recent to oldest
- Clear temporarily stored run times
- Display system info that includes the unit ID (that is also be printed on the case), battery life remaining for the unit and also for the primary detector/timer (if known)
- Switch between manual re-arm and automatic re-arm of the primary detector/timer
- Change the backlight timeout for the LCD; this can range from always off, 1-16 seconds in increments of 1 second, and finally always on. It is not recommended to leave on the backlight as battery life will be significantly reduced. (NOTE: When connected to USB, the console and handheld units obtain their power from USB so the backlight stays on.)
- Change the automatic power-down timeout; this can range from 10 to 40 minutes in increments of 5 minutes or to never automatically power down
- More advanced options are described in 7.0 Advanced Configuration and Operation

6.0 Windows PC Interface and Software

Included with the handheld or console or USB serial interface unit is a standard USB A to mini-USB cable. The software you need should be downloaded from our website and then installed

- If you own the USB serial interface unit (regardless of whether you have a console or handheld unit), download "Lightning AccuTimers Serial Utility" from http://www.microcodeconsulting.com/pub/la_sutil_setup.exe
  (Note that the Lightning AccuTimers Serial Utility setup includes the Lightning AccuTimers Console and Handheld Utility program as well, so you do not need to install both.)
- If you ONLY own a console or handheld unit (and do NOT own the USB serial interface unit), download "Lightning AccuTimers Console and Handheld Utility" from http://www.microcodeconsulting.com/pub/la_conhh_setup.exe

You will need to run one of these two install programs before any Lightning AccuTimers unit will connect to your Windows PC.

6.1 Installing the Windows driver for the Handheld/Console Unit

The **very first time** you plug in a **Lightning AccuTimers** unit into a personal computer running Windows XP, Vista, or Windows 7/8/10, a new driver might be installed.

It is important you follow the steps exactly as outlined here:

1. Install either the Lightning AccuTimers Serial Utility or the Lightning AccuTimers Console and Handheld Utility as described in 6.0 Windows PC Interface and Software.
2. (Handheld unit only) Open the battery cover and remove the battery.
3. (Handheld unit only) Within the battery compartment is a mini-USB connector. Plug in the special 90-degree mini-USB cable end into the connector.
   (Console unit only) Plug in the provided mini-USB cable into the connector on the rear of the unit.
4. Plug the USB "A" side into your Windows PC. (If the cable is not long enough, you will need to use a USB extension cable.)
5. The system should report detecting a USB Human-Interface Device. After up to several pop-up displays, Windows will report your device is ready for use. ***This should only happen once per USB port and subsequent plug-ins may not show any message.***
6. At this point, you can run the Lightning AccuTimers Console and Handheld Utility that can be used to configure your system and update the firmware. (Every option except firmware upgrades can be also be performed directly via the handheld or console unit menu system without need for a PC.)

No special driver is required for the **Lightning AccuTimers** Handheld and Console units. Windows includes all of the necessary USB HID drivers.

6.2 Installing the Windows driver for the USB Serial Interface Unit

Before you plug in the USB serial interface unit the **very first time**, the driver must be installed as follows:

1. Download the Lightning AccuTimers Serial Utility as described in 6.0 Windows PC Interface and Software.
2. Install the Lightning AccuTimers Serial Utility that will also install the required driver in addition to the diagnostic software
3. Once the driver is installed, connect the USB serial interface unit to your Windows PC.

6.3 Installing the Lightning AccuTimers utility software

The type of software installed depends upon whether you have installed a personal or professional system. Capabilities common to both systems:

- Perform additional system diagnostics and reliability tests
- Check for updated firmware and installing it as desired for any connected units
- Toggle system between re-arming automatically or manually
- Set detector/timer default mode: informative normal status or battery-conserving power status
- Change user-defined options such as auto re-arm, backlight time and auto-shutoff

The software is simple to use and has its own documentation, so it is not described here.

7.0 Advanced Configuration and Operation

Lightning AccuTimers is a very powerful system that has considerable flexibility. The more advanced features are described in this section. **But, be careful: if you do not understand what you are doing, you might render the system inoperable.** Although this is always recoverable, it usually entails restoring factory settings and starting over.

7.1 Lightning AccuTimers wireless groups

Each **Lightning AccuTimers** wireless unit has an associated unique ID. This ID determines the wireless "group" of which this unit is a member. The primary detector/timer is the heart of the system that determines the group: the ID number of that primary detector/timer defines the start of the group. The ID numbers of the remaining group members cover ID numbers up to 7 higher than the ID number of the primary detector/timer. This allows multiple timing systems to operate in close proximity.

CAUTION: A given **Lightning AccuTimers** wireless unit will only communicate with other units that are in its specific wireless group (by default)

The numbering convention is shown below.

ID Offset from Primary Detector/Timer	Unit Types
Zero (ID Primary)	Primary detector/timer
One (ID Primary + 1)	Secondary detector 1
Two (ID Primary + 2)	Supplemental/Interval detector 2
Three (ID Primary + 3)	Supplemental/Interval detector 3
Four (ID Primary + 4)	Handheld monitor/controller 1
Five (ID Primary + 5)	Handheld monitor/controller 2
Six (ID Primary + 6)	Arena console -OR- Handheld monitor/controller 3
Seven (ID Primary + 7)	Supplemental console -OR- USB Serial Interface Unit (PC only)

Table 10: IDs of Units within a Group

7.2 Changing the RF channel for a wireless group

When the units were shipped, they are assigned a single common relatively unused frequency. However, there may be very rare situations where the channel is busy with other traffic and another channel would be better suited. For this reason, **Lightning AccuTimers** can be set to one of 63 unique channels.

Before considering a channel change, it is best to scan all available channels to understand which channel(s) are busy and which are relatively free. Use your **Lightning AccuTimers** utility software to perform this measurement using an attached handheld, console, or USB Serial Interface device. (The console and handheld can also do this stand-alone but they only suggest a channel based upon lowest activity/proximity.)

Note that changing a channel is not just a simple matter of changing a single unit. **All** units that are in a given group MUST be changed at the same time, or else the units will cease communicating with one another.

Therefore, it is strongly recommended that when you are changing the RF channel, that all wireless devices in the same group be running and connected to the control unit that is used to reset all of the RF channels. (A control unit is a handheld, console, or USB serial interface unit that is connected to all of these units.) The console, handheld, and USB serial interface units also have the ability to individually change just their own RF channel.

It is not the end of the world if one or more units are not moved to the new RF channel at the same time. However, you should keep track of what channel they are on to make moving them easier later. **Repeating: Any units that are not on the same RF channel cannot communicate with each other.**

7.3 Changing the wireless group (ID) of any unit

When the units were shipped, they were targeted to be part of a specific single group. All wireless **Lightning AccuTimers** units are assigned a unique ID. However, this can be changed as needed to replace a broken unit or to borrow another unit to enhance an existing system. **Please be aware this should be done very carefully:**

- It is recommended that changing an ID be done automatically. Both the console and handheld units have the ability to automatically find the (new/different) primary detector and find an unused address if there is one available. Before you start, the primary detector and any existing handheld/console units associated with that primary detector should be turned on first.
- When changing the ID manually, you must pick an ID that follows the guidelines in section 7.1 Lightning AccuTimers wireless groups. If you do not follow those guidelines, the unit will not work as expected.
- If you change the ID, you are responsible for ensuring that the ID is unique. If two or more units have the same ID, they **cannot** be operational in the same area at the same time. (If conflicting units are on, the units will not be damaged, but neither unit will work properly.)
- Note that any changes to a unit ID will be lost when the unit is restored to its factory configuration.

To change the ID manually, the easiest way is to use the Windows PC Lightning AccuTimers utility. However, one can also use the handheld or the console to do this either automatically (recommended) or manually; you need to use the "Other" menu on the handheld or console and "Visitor" sub-menu item to make the change.

8.0 Troubleshooting and Precautions

So, the unit does not work. Below is a trouble-shooting guide which should resolve nearly any issue you will encounter. As a last resort, contact MICROCode Consulting for assistance.

8.1 Beacon Troubleshooting

The beacon is a simple unit and, as such, if it is not working, there are only a few things to check before it should be sent in for service.

Symptom	**Action**
LED does not light up – ever	• Replace the batteries with a fresh set. Ensure the polarity is proper upon installation. • If the batteries are good, but the unit fails to turn on, you will need to contact us to return the unit for repair. • NOTE: If the unit stopped working due to improper battery insertion (wrong polarity), this may affect the unit lifetime.
LED does not stop blinking	• Turn unit power off and back on again • Wait up to 10 seconds for LED to turn off • Otherwise, contact us to return the unit for repair.
Beacon does not appear to be broadcasting	• The only way to confirm a beacon is not broadcasting is to use a known good detector. Hold a detector at least 10 feet away from the beacon (in lowest power setting level) and then turn on the detector. If the LED turns green after a couple seconds, the beacon is working fine. If it stays red, the beacon is not operating. Contact us to return the unit for repair
Beacon is blinking 5 or more times; pauses; repeats	• When this occurs, beacon has failed internal diagnostics. • Try turning the unit off and back on to see if the problem corrects itself. • If not, try removing the battery and replacing it with a fresh one. • Otherwise, contact us to return the unit for repair.

8.2 Detector/Timer Troubleshooting

Symptom	**Action**
LED does not light up – ever	• Replace the battery with a new on. Ensure the polarity is correct. • If the battery is good, check the handheld/console/USB serial interface to see if a connection can be made to the unit. If so, the LED is defective. The unit is usable but if you want a working LED, send unit in for repair. • If the battery is good, but the unit fails to turn on, you will need to contact us to return the unit for repair.
Detector does not see beacon	• Ensure beacon is operational (see 8.1 Beacon Troubleshooting) • Point face of detector towards beacon at a distance of at least 10 feet • If detector does not see beacon, contact us to return the unit for repair.

Detector does not connect to handheld, console or USB interface	• Ensure the detector is working and LED is operational (symptoms 1 and 2 on prior page do not apply) • Examine the ID of the detector and the handheld, console, or USB interface: these units **must** be in the same group (see 7.1 Lightning AccuTimers wireless groups) • If in a different wireless group, see 7.3 Changing the wireless group (ID) of any unit, for reconfiguration or contact MICROCode Consulting • If in the same wireless group, examine the RF channel being used by every device in the group. If they are not all on the same channel, the unit will not operate. See 7.2 Changing the RF channel for a wireless group, for reconfiguration or contact MICROCode Consulting
Beacon is blinking a sequence of five red and/or green blinks; pauses; repeats	• When this occurs, detector/timer has failed internal diagnostics. • Try turning the unit off and back on to see if the problem corrects itself. • If not, try removing the battery and replacing it with a fresh one. • Otherwise, contact us to return the unit for repair.

8.3 General Beam Alignment and Break Troubleshooting

If you are having challenges either getting your beam aligned or to break properly, there are a number of things you can do.

For beam alignment, it is easiest to keep the beacon mounted/stationary at the desired position and hold the detector by hand to perform testing.

- When in a new arena, sometimes it is best to start with the detector 20-30 feet away from the beacon while holding it in your hand and then slowly back up until it is in the proper position. If it gets out of alignment, pause and see if it recovers. If not, figure out if the beacon is higher, lower, left or right of the current position and adjust accordingly.
- Due to the environment, pointing the detector directly at the beacon may not always yield the best results. Try rotating the unit left or right a little bit (as depicted below).

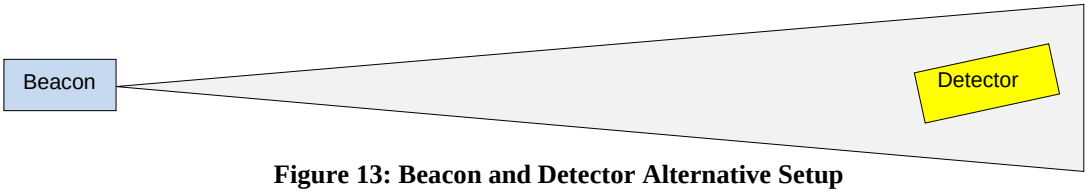

Figure 13: Beacon and Detector Alternative Setup

- Be aware that <u>at rare times,</u> where there is beacon or detector <u>movement while positioning</u>, the detector could stop seeing the beacon <u>even</u> when they are aligned -- especially if nearing the range limit for the given beacon power setting. This "*stuck at red LED*" is corrected by momentarily breaking the beam (pass your hand in front of the beacon or the detector). If it changes back to green after the beam break ends, it is aligned and range is OK. If it stays red, the range is too far or the units are misaligned. Once a given beacon-detector pair is positioned and stationary, this will no longer occur.

- If the beacon loses alignment easily, check to see if the beacon is at the correct power setting for the range, or if the batteries in either the beacon or detector need replacement.

If the beam is aligned, but you have having challenges with getting a good beam break, it is easier to test the system using a handheld or console unit.

- The console and handheld both have a test mode for the beam. To enter test mode, first ensure the console or handheld are connected to the primary detector and beacon.
- Use the menu system and select "Other > Beam Test". When in test mode, the beam status will be continually reported ("Aligned" or "Break") allowing you to adjust the beam, walk through it to test it, etc.
- Note that during test mode, each time the beam is broken, it waits a full second before checking for alignment again.
- Exit the beam test mode by pressing any key which automatically cancels test mode.

So what can affect getting a reliable beam break?

- The leading cause of intermittent beam breaks is a mismatch between the power level of the beacon and the distance to the detector for the given conditions. If the beam does not want to break at all, that is always due to a high power setting at a very short distance. Lower the power setting and/or increase the distance between the beacon and detector.
- If the distance is too high for the power setting (especially at the highest power setting), sometimes beam breaks will result in alignment not being re-established. In this case, the distance must be shortened.
- Note that the power level depends not only on distance but also the environment. Heavy dust and direct sunlight could shorten the distance by 10-15% but the units will still work.

8.4 Lightning AccuTimers Handheld and Console Troubleshooting

Symptom	**Action**
Nothing shows on the display and power-up sequence does not work	• Is the battery dead? Replace the battery with a new one. • If there is still no display, remove the battery and use the USB cable to plug into a running Windows PC. Then run the Lightning AccuTimers utility. If the unit is not detected by the Windows PC and there is no display, contact us to return the unit for repair. • If the unit is not detected by the Windows PC and the LCD display works, try unplugging, waiting for 5 seconds, and reconnecting the USB cable. Contact us to return the unit for repair if this situation persists. • If the unit is detected by the Windows PC and the display turns on, there is a problem with the battery connection. Ensure the contacts are clean and that the leads are not broken. • If the unit is detected by the Windows PC but the display remains off, there is either a problem with the display or with the display connector. If you are mechanically inclined, carefully remove the screws and gently

	pry off the cover – but be careful not to stress any of the cables! A ribbon cable runs from the display to the board attached via a connector; although this is lightly bonded, it may have worked itself loose due to severe impact. If so, reattach the connector and try again. If the display is now operational, re-assemble. Otherwise, there is little more you can do and the unit should be returned for repair. • If all else fails, contact us to return the unit for repair.
Display is garbled	• Remove the battery and replace it with a fresh battery. • If that does not resolve the issue, remove the battery and use the USB cable to plug into a running Windows PC. • If that does not resolve it, then run the Lightning AccuTimers utility. If the connection is successful, the display is likely damaged. Contact us to return the unit for repair. • If the Windows PC does not detect the unit or the Lightning AccuTimers utility cannot be successfully linked to the Unit, then there is a more significant problem. Contact us to return the unit for repair.
Button(s) do not work	• If only one button does not appear to operate, first ensure the unit is in a mode where multiple buttons are usable. Remove the battery and replace it. If it still persists, contact us to return the unit for repair.
Handheld or console does not connect to detector/timer unit	• Ensure the handheld is working properly otherwise (no symptoms above) • Examine the ID of the detector and the handheld or console unit: these units **must** be in the same group (see 7.1 Lightning AccuTimers wireless groups) • If in a different wireless group, see 7.3 Changing the wireless group (ID) of any unit, for reconfiguration or contact MICROCode Consulting • If in the same wireless group, examine the RF channel being used by every device in the group. If they are not all on the same channel, the unit will not operate. See 7.2 Changing the RF channel for a wireless group, for reconfiguration or contact MICROCode Consulting

8.5 USB Serial Interface Troubleshooting

The USB serial interface unit gets its power from your Windows PC serial interface which is the first place to look for issues.

Symptom	**Action**
No LEDs light up – ever	• Replace the cable between your Windows PC and USB serial interface unit • If the problem persists, there is a severe failure in the unit. Contact us to return the unit for repair.
Red LED stays on; yellow LED may be on or off	• Unplug the unit from the USB cable, wait 5 seconds, and plug the cable back in • If the red LED does not stay lit, the problem may be intermittent. Continue to use the unit. • If the status is still the same (red LED lights up and yellow either lit or

	unlit but same as prior test), then there is either a real failure in the unit or perhaps there is a problem with the RF interface connector. If you are mechanically inclined, carefully remove the screw and gently pry off the cover – but be careful not to stress the cable! A ribbon cable runs from the RF wireless unit to the board attached via a connector; although this is lightly bonded, it may have worked itself loose due to severe impact. If so, reattach the connector and try again. If the unit is now operational, re-assemble. Otherwise, there is little more you can do and the unit should be returned for repair.
USB serial interface does not connect to primary detector/timer	• Examine the ID of the serial interface compared to the primary timer/detector unit: these units **must** be in the same group (see 7.1 Lightning AccuTimers wireless groups) • If in a different wireless group, see 7.3 Changing the wireless group (ID) of any unit, for reconfiguration or contact MICROCode Consulting • If in the same wireless group, examine the RF channel being used by every device in the group. If they are not all on the same channel, the unit will not operate. See 7.2 Changing the RF channel for a wireless group, for reconfiguration or contact MICROCode Consulting

8.6 Lightning AccuTimers Unit Precautions

All of the **Lightning AccuTimers** units are designed and warrantied for use in a dry environment (indoors or outdoors). It is not warrantied for operation in rain and may not operate properly when used in adverse conditions such as severe blowing dust. Units have been dropped (resulting in chipping) and handheld units have been stepped on and were still fully operational (although no longer look as pretty), but you should still try to prevent such occurrences.

9.0 Warranty

MICROCode Consulting's **Lightning AccuTimers** units are warranted for repair or replacement for *one year* from date of purchase. The warranty is void if the unit is damaged or used in a way that is not authorized. Note that minor chipping of the plastic case is considered acceptable wear and does not void the warranty. MICROCode Consulting will be the sole party to determine whether an inoperable unit is covered under warranty.