

# Time-Lapse Package

## User's Guide



Dual Battery Option Shown. Zoom in for details...

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## Overview

The Time-Lapse Package is a complete system for documenting construction projects, animal behavior monitoring, analyzing environmental changes, or other long-term outdoor photographic tasks.

This equipment will yield significantly higher resolution and higher quality images than can be achieved with “web camera” equipment, and is designed to be completely autonomous... no connection to AC power, computers, networks, or video recorders are needed. You own the equipment, and there are no monthly charges!

Except for a few mounting screws to suit your particular application, everything you need is included, and the system can be installed in a as little as a few minutes.

## Quick Start

1. Flip the toggle switch to the ON position. This will apply power to the camera and the controller.
2. Once the power is connected, the DigiSnap should immediately blink amber once, and then a few seconds later will quickly blink four times green.
3. Turn the camera on, using the rotating power switch on the top of the camera.
4. Press the \* button on the DigiSnap, and the camera should take a picture! This verifies that everything is connected and working properly. Each time you press the \* button, it should take a picture.
5. The DigiSnap controller is already configured at the factory to take pictures on a daily schedule. The following configuration was used for testing, and you may want to reconfigure the settings for your application.

The DigiSnap is set to take pictures starting 1 minute after the power is turned on, and every day afterwards at the same starting time. 10 Pictures will be taken per day, at an interval of 1 hour between shots.

### **Items included:**

Fiberglass Housing, glass window.  
High capacity internal battery pack.  
5 Watt Solar Panel.  
Harbortronics Solar Charger.  
Harbortronics Battery Converter.

Harbortronics DigiSnap 2100.  
Pentax K200D Digital SLR and 18-55mm Zoom lens.  
A pair of 4 GB memory cards.  
Hex wrench, cables, manuals and accessories.  
Mounting Hardware



**Here are all of the parts, before we assemble them!**

## **Configuring the DigiSnap**

Now that you've verified that things are working, you may want to configure the DigiSnap for your particular application. The first time you do this can be trying, but once you've gone through the process once, it'll be easy the next time. If you get stuck, give Mark a call!

The DigiSnap should already be configured properly for the camera. All you should need to configure are the time-lapse settings within the DigiSnap, and set up the camera for your application.

Take a look at the DigiSnap 2000 manual, which is on the CD Rom supplied with the equipment. This should help you to understand how the DigiSnap works with a terminal window, and what sort of operations the DigiSnap can perform.

### ***Connecting to a terminal***

If you have a desktop PC, you probably have a serial port on the back of your computer. Use the supplied beige cable (labeled Null-Modem), to connect the DigiSnap to your serial port.

If you have a newer laptop or a Mac, you may need to buy a USB to Serial converter, and install it's drivers. These are available at any computer store from \$15 and up.

You now need to run a program to open up a terminal window. If you are running Linux, you already know how to do this! If you have a windows PC you can use the DigiSnap\_Terminal.exe program supplied on the CD Rom.

If you are using a Mac, you can download a shareware program called ZTerm, or you may already have a terminal program installed with your particular OS. The particular COM settings needed are listed in the DigiSnap 2000 manual.

Once you have your terminal program running, and 'connected', cycle the power on the DigiSnap (flip the toggle switch off and on again), and you should see it present a menu on the screen. You can select the different menus or particular commands. Once you have configured the DigiSnap via a terminal, the settings are saved forever, or until the next time you change them using this same procedure.

If you have problems getting the 'terminal' working with the DigiSnap, please refer to the "Terminal Instructions" article on the CD-Rom. If you suspect any problem with our equipment, please call us!

### ***Configuring for Advanced Time-Lapse***

The majority of outdoor monitoring applications will use the Advanced Time-Lapse (ATL) feature of the DigiSnap controller. With ATL, the camera can be made to take pictures only at specific times of the day, such as during daylight hours. Please refer to the DigiSnap 2000 manual on the CD-Rom for specific details regarding the configuration menus.

Please note that the DigiSnap controller does not have a 'real-time' internal clock. When you power it up, so it will presume that it's midnight. This doesn't mean you can't use ATL, it just means you have to be a bit more clever. You can set up the ATL start times with an offset, anticipating what time of day you are going to start the system, or you can simply have configure the DigiSnap to start taking pictures at 00:01 (1 minute after midnight), and power up the system when you want it to start taking pictures. The DigiSnap will then start keeping time, and taking pictures on a daily schedule.

We would be happy to pre-configure the DigiSnap for your particular application, to ease your project by one more step. Also, feel free to call us at your convenience for help in configuring the time-lapse sequence. Although the process is straightforward for some people, others need a bit of hand-holding the first time... we understand this!



**Standard Configuration. Zoom in for details...**

## **System Components**

### ***Digital Camera***

While there are several camera models that could be used in the system, through much deliberation we have chosen the Pentax K200D. Prior to the K200D, we shipped hundreds of systems using the K100D series cameras. Note that some of the pictures here may show the older K100D series. Most customers prefer that we supply the camera, and this is our strong preference as well, but we can also provide the system without a camera.

There are a host of considerations to evaluate when choosing a camera model for time-lapse photography, particularly in the field. The ultimate goal of your project is to collect a series of images over a long period of time, regardless of the environmental conditions. Shutter life, image quality, power consumption, and of course reliability are major concerns. We have done this research for you, and believe we have found the optimum camera for the application.

As in many endeavors, "details count!". For instance: some customers have asked to use their own Nikon SLR camera. While the cameras would certainly be perfectly suited to capturing images, there are some difficulties accommodating most Nikon SLRs in

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time-lapse. Most Nikon SLR cameras have an external power connector... they are proprietary to Nikon, so we would have to buy their expensive AC adapter, simply to cut off the connector. When powered externally, we have found that Nikon SLRs never shut off the metering... the camera continues to draw some power all the time, which is a battery killer! If powered via the camera's internal battery compartment, it doesn't draw this excess power. However, getting power to the battery terminals is not easy either, and Nikon now has a proprietary battery sensor, to ensure that only their batteries are used. Shutter release is another issue. The latest small Nikon SLRs are sized perfectly for the housing, but they do not have a shutter release connection. Those that do have a shutter release jack use proprietary connectors... again, making the system more expensive. Nikon makes fine cameras, but they make it very difficult to use their cameras in this application!

We have less experience with Canon SLRs. The Digital Rebel series use an industry standard connector for the shutter release, but their 'professional' SLR cameras use a proprietary connector. Many Canon SLRs do not have an external jack for power, but most have a dummy battery pack adapter, which allows for external power, albeit at a small additional expense. If you have a camera you would like to use, we may need to borrow your camera for a day, to see if we can come up with the proper connections. The Digital Rebel series cameras would seem to be an excellent choice for a long term time-lapse camera. Unfortunately, some of our customers that have used these cameras have reported intermittent 'lockup' of the camera during long term operation. We have also heard anecdotally of other systems using the Canon Rebel series camera with the same issue. Again, we have less experience with these cameras, and the lockup issue may apply to a small percentage of cameras, but at this point, we still have some concern with the Rebel series.

Given some extra effort and cost, we may be able to use your current camera, but we'd like to very strongly recommend using suggest using our recommended camera model. These cameras use industry standard connectors, draw negligible power between pictures, and yield equivalent image quality to Nikon and Canon cameras.

### **Pentax K200D**

The standard package (as of 10/7/2008) will include the latest generation Pentax Digital SLR camera, the K200D, which use a 10 MPixel, APS sized sensor, with the standard 'kit' lens from Pentax, providing a good range of usable zoom. The lens has a focal length of 18-55mm, which is equivalent to a 27-82mm, in the old 35mm reference format. While we typically sell these cameras as part of this entire package, we can sell the K200D with lens for \$625. These are excellent cameras for 'normal' use as well!

We install a 4 GB memory card in the camera, as well as a set of AA lithium batteries. Our large battery pack will power the system, so the internal batteries are only needed to maintain the camera settings and camera clock when the external power is disconnected, such as in shipping, or storage.

A second 4 GB memory card is also included, to allow 'hot swapping' of cards during long-term applications. The card access door on the camera must be closed to operate, and the space is limited in the housing, so the camera must be pulled out to swap cards. Given our pivoting plate arrangement, this is a very easy operation, and the camera will be re-installed with an identical orientation each time. If you desire, you can attach the supplied USB cable, and leave it attached in the housing. This would allow you to download the images directly to a laptop computer, in the field, without touching the camera.

For the lowest power consumption, please configure the following camera settings. Refer to the camera manual for more details on these settings. Instant Review : Off Auto power off : 1 minute Manual focus Shake Reduction Off

As far as photographic settings are concerned, we only have basic suggestions. For most applications you may find that using the Program mode (P) is perfectly adequate. The camera will adapt the aperture and shutter speed to suit the lighting conditions. This does mean that there may be visible variations in the exposure from frame to frame. If your project requires consistent exposures from frame to frame, accurately reflecting the changing light conditions, then you may need to set the camera up for manual exposures. This could take a few days of experimenting to determine the proper settings however! There may be some advantage to setting the camera for a fixed white balance, rather than using the camera's auto white balance. We also suggest setting the ISO to the lowest setting, for the minimum noise.

Our standing recommendation is to take pictures at high resolution, and take more pictures as you think you will need. It's very easy to downsize or discard images, but you can't get more of them after the fact. Given the very high resolution of the images, you can do some very interesting post-processing, ending up with movies with in-frame pan and zoom effects.

Ideally, you will set up the system a week or two ahead of time, collect lots of test images, and adjust the exposure before the 'event' you are monitoring actually occurs. If you have this luxury, congratulate yourself for thinking ahead... you are in a minority!

### **Operating Temperature**

Note that the operating temperature of most digital SLR cameras is specified for 0C to +40C. While neither we nor the camera manufacturer can warrant operation beyond this range, you will undoubtedly find that it works just fine over much a wider range! As of spring 2009, there are several hundred systems in the field, some for about 4 years, using the Pentax K100D series camera, and we have relatively few reports from customers of camera failures. This is not a perfect failure rate, but not unexpected for commercial equipment used in harsh environments.

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The University of Alaska very generously offered to test one system at low temperatures in their facilities. The system worked all the way down to the lowest tested temperature, -60C. However, at -40C and below, some pictures were missing from the sequence. Some of the pictures were dark, others half light / half dark, suggesting that the mechanical items in the camera, the shutter and the mirror assemblies may have been sticking at times, or otherwise slowed. The timing never varied, suggesting that all of the electronics worked at all temperatures.

Subsequent to the low temp testing, we operated the very same system at high temperatures in our facilities. We cycled the temperature from room temperature up to a maximum of +80C, performing several cycles over several days, and never found any issues. All pictures were taken, and the timing remained perfect for the duration of the tests.

We are compelled however to say that the excellent performance of our test system does not mean that we guarantee operation of all or any particular system to these temperature extremes. Note that the results above were using the K110D camera, but thus far we have had excellent performance from the K200D as well.

### **Enclosure**

We use a very strong molded fiberglass housing. Gaskets make the unit airtight and water tight, and stainless steel hardware further eliminate any concern for corrosion. The door is hinged, and quickly removable. The housing is a perfect size to accommodate digital cameras, including many SLRs. Unlike plastic units, you can successfully paint this enclosure if you want to camouflage it in the field.

Triangular headed plastic screws, and a matching key are used to 'lock' the door. While not completely theft-proof, we've found that even with tools, it's awfully difficult to open the door without the key!

Some customers have purchased the housing alone, to package their own equipment.

We can provide the enclosure with door locks and a key, for \$200.



### **Mount Assembly**

Thick aluminum brackets were developed for mounting the housing and attaching the solar panel. The brackets can be attached to the housing in horizontal or vertical orientation for flexibility. We also include a 'ball head' mount for the brackets, which can be quickly adjusted for direction and tilt.

The brackets and supplied U-bolts can be also used with 'U-Bolts' to directly attach the housing to a standard size chain link fence pipe (up to 1.67" diameter pipe). You will find that the housing can be attached to larger sizes of pipe with minimal modification to the brackets, if you purchase larger U-bolts.





**Ball-Head Mount Example**



**Pipe Mount Example**



### **Camera Mount**

We have developed a robust method of allowing the camera to be removed from the housing for service or configuration, and replaced at exactly the same orientation each time.

The pivoting plates firmly snap into position using detents and strong magnets. To pivot the camera free of the housing, grasp the lens, and pull straight forward. When replacing the camera, wiggle the plates until you feel the two detents snap into position.

You may loosen the camera mounting screw from underneath to slide the camera forward and back, as well as change the orientation from right to left.



### **Mechanical Package**

We can also provide an enclosure with camera mount and external mounting hardware. This package includes the external mounting brackets, ball head mount, U-bolts, as well as a the pivoting camera mounting system, desiccant pack, black felt and hex tool, fully assembled, for \$586.50.



### **Battery Pack Assembly**

The standard Time-Lapse Package includes a single high capacity Lithium-Ion Polymer (LiPoly) rechargeable battery pack, having a nominal voltage of 11.1V, and 9AH capacity. A UL approved 'universal AC' battery charger is included. The housing is pre-wired to accept dual battery packs, for greater capacity. An additional or replacement battery pack is priced at \$250. Like all rechargeable batteries, the effective capacity will gradually decline over time and use. We anticipate that the battery should give good service for about 3 years in constant use.

If dual battery packs are installed, please make sure that the voltages on the battery packs are within 0.25 volts of each other when installing. Otherwise one pack will try to charge the other, with a rather high current. If both packs are fully charged using the AC charger before installation, this will prevent this possible problem.

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The most common battery chemistry for long term, remote applications is lead-acid. Unfortunately, lead-acid batteries have a number of drawbacks. An equivalent capacity lead acid battery would add about 8 pounds to the system, and would be almost as large as the housing itself. ALL Lead acid batteries (even the sealed ones) can vent gases during charge and discharge, making them inadvisable to install within a sealed housing. Most other secondary (rechargeable) battery chemistries have high self-discharge, meaning that they won't work well in a long term application. LiPoly batteries however, have low self-discharge, are very light-weight, and quite compact. Good stuff, but not cheap!

The advantages of the LiPoly battery pack for this application outweigh the significantly higher price, and allow the high capacity battery to reside inside the housing, making the entire unit quite portable.

In order to save some money, one customer ordered the housing without the internal battery, for connection to a large, less expensive battery outside the housing (i.e. motorcycle battery). We have a report that this worked well, up until the time that arctic foxes chewed through the cable! Another time, their external lead-acid batteries actually froze, while the Li-Poly battery continued to work.

Actually we've heard from a number of researchers over the years that electrical cables are a big attraction to a variety of wild animals. If you really want to hike in a big heavy lead-acid battery, that's fine, but you may want to also bring some armoring for the cable!



### Solar Panel

The fully charged LiPoly battery pack has enough capacity for about 2 months of operation between charges, depending on the details of the application. Most photographers prefer to augment the battery with a solar panel, reducing worry about the battery status.

A high quality 5 watt solar panel is a standard feature with the Time-Lapse Package. This is sufficient to keep the battery charged in many installations. If your installation site does not get frequent full sun exposure, or you have other power concerns, please contact us. We can supply long cables to re-locate the solar panel, or work with you to develop other options, such as external AC or DC power.

Custom aluminum brackets are used to mount the solar panel to the housing. The brackets may be further formed by hand to suit your particular needs. You may want to consider a couple of things when orienting the panel. If the panel is located over the housing, it can serve as a shade to the housing, reducing the internal temperature when in the sun. The panel can also serve as a rain shield to minimize drops on the front window of the housing.



A high quality 'gland' is used to pass the solar panel cable into the housing, maintaining the watertight integrity of the housing. The price for the solar panel assembly (which requires the solar charger circuit) is \$210.

Please note that the 5W solar panel may not provide enough power to keep the internal battery pack charged under all circumstances. If your system only takes a few shots a day, and you get a reasonable amount of full sunshine, then it should keep the battery charged. If on the other hand, you are taking hundreds of shots per day, or do not get frequent sunshine, then the battery voltage will fall, albeit more slowly than if there were no solar panel. It's very difficult to estimate the maximum number of shots that can be taken while keeping the battery fully charged!

## Circuitry Panel

All of the electronics and wiring are attached to an aluminum plate, which are held in place with two screws for easy access or replacement. The cables that connect the components have unique connectors, so you won't have to worry about identifying cables.

### Time-Lapse Controller

The 'brains' of the time-lapse system is the venerable DigiSnap 2100. This device, designed and produced at Harbortronics, is a digital camera controller, developed to work with a variety of digital camera models. The DigiSnap can be configured to take pictures at any interval desired, or to operate on a daily clock.

The DigiSnap series of controllers have been in continuous production since 1999, and many thousands of units are in use around the world.

The DigiSnap 2100 is attached to the front of the panel using a 'velcro' like material. You can remove the DigiSnap and power it via a AAA cell battery, for configuration at your office, for example. The settings will be retained with or without power.



### Solar Charger

While many solar panels can be connected directly to Lead Acid batteries, LiPoly batteries must be charged carefully, monitoring the voltage and temperature.

Harbortronics has developed a custom charger to adapt the solar panel to the LiPoly battery pack. This device is installed between the solar panel and the battery, and also provides connections for the battery converter. Other external power sources can be used in place of the solar panel, as long as the voltage is between 12 and 20V.

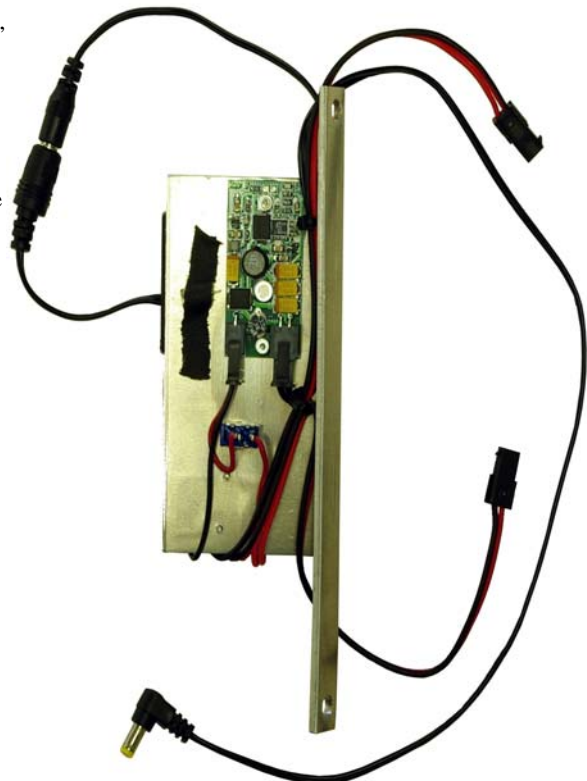
For instance, if you would prefer installation using an AC powered source, you may replace the solar panel connection with that of the AC charger included with the battery pack. We can provide a long custom DC power cable for this scenario, so that you can place the AC charger near an AC outlet.

The Solar Charger circuit is attached to the front of the aluminum plate, and does not contain any serviceable parts.

### Battery Converter

While the battery pack provides from 10 – 12.6 volts, the DigiSnap controllers operate from 5 volts, and the Pentax K200D requires 6.5V. Harbortronics designed and produces a device to efficiently convert the higher battery voltage to those required by the DigiSnap and the digital camera. If a different model camera is going to be installed, we can adjust the voltage accordingly.

The Battery Converter circuit is attached to the back of the aluminum plate. There is a fuse in the circuit which protects the circuits in case power is applied backwards. The connectors are clearly keyed, but that doesn't seem to stop some installers! A spare fuse is taped next to the circuit.



## Tools and Accessories

A hex key wrench, and triangular door key is provided with the Time-Lapse Package, to allow reconfiguration of the camera position, the solar panel, the mounting brackets, and to open / lock the door

A desiccant pack is included in the housing to minimize internal moisture, which can cause condensation during temperature extremes. If the crystals eventually turn pink, bake the pack in an oven at 150C / 350F for an hour or more, until they turn blue again. Be careful not to melt the package!

We also include a sheet of black felt, in case you need to absorb any other stray internal light reflections. If you are able to position the front of the lens near the inside surface of the glass, this will eliminate reflections as well.

An extra set of plastic door locks are also provided.



## Standard Package

This is the normally recommended package, comprising everything required to perform completely autonomous time-lapse photography in the field. All of the above sub-assemblies are included. The retail price for this package is US\$2500. Each system is configured and tested at our factory.



## Specifications

Standard Package [Includes all items described above, single installed battery pack]

Installed Weight	12.5 lbs
Shipping Weight	19 lbs
Housing Dimensions	8" wide, 8" tall, 7" Deep
Overall Dimensions	10" wide, 13" tall, 13" Deep
Shipping Box Dimensions	18" x 15" x 13"
Price as shown	Quantity 1: US \$2500 Quantity 2: US \$2450 Quantity 3: US \$2400 Quantity 5: US \$2350 Quantity 10+:: US \$2250

The shipping price varies from month to month, and obviously depends significantly on the destination. We normally use Federal Express (FedEx) for quick delivery or the US Postal Service for standard delivery. We can and have shipped almost everywhere in the world! For shipping in the US, the USPS charge is about \$85, and for international FedEx, it may be around \$200. These numbers will vary, so please consider the prices as estimates only.

## Service / Warranty

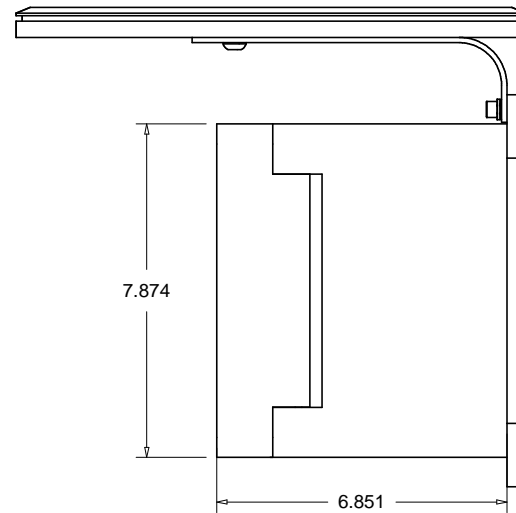
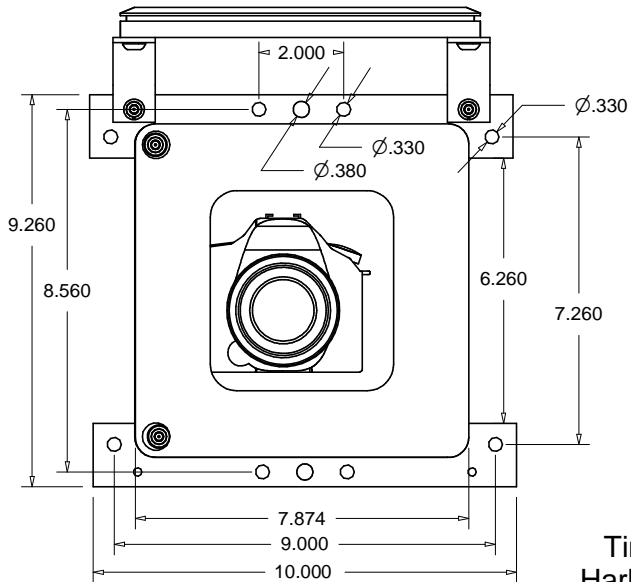
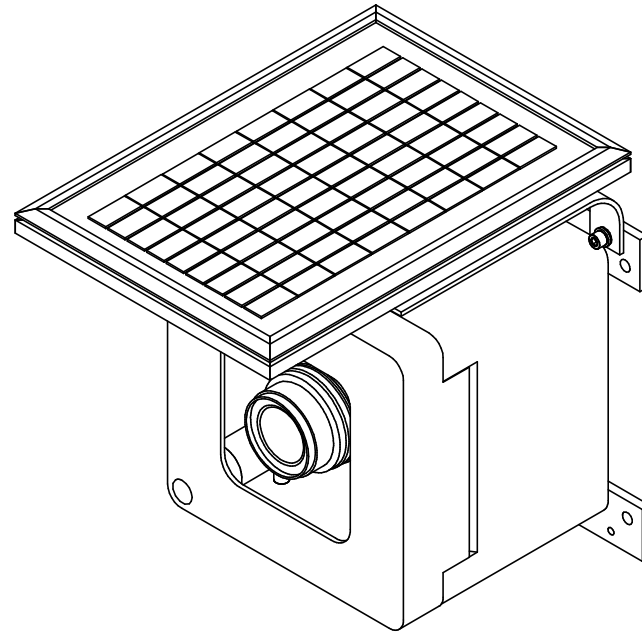
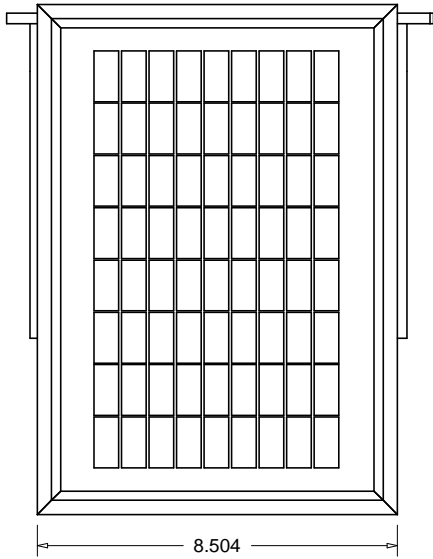
### ***Philosophy:***

Harbortronics is a small family company, and has been in business for about 10 years, starting in a small basement office, and now operating out of a 3000 square foot facility with several employees. All of our sales have been derived from word-of-mouth and internet searches. We realized early that customer feedback, either directly to us or to other people on the internet, is stimulated by one of two reasons... either the customer is irritated by a problem, or they are excited about their experience. One of my goals as the Chief Engineer of the company is to reduce the irritations, and try to stimulate excitement!

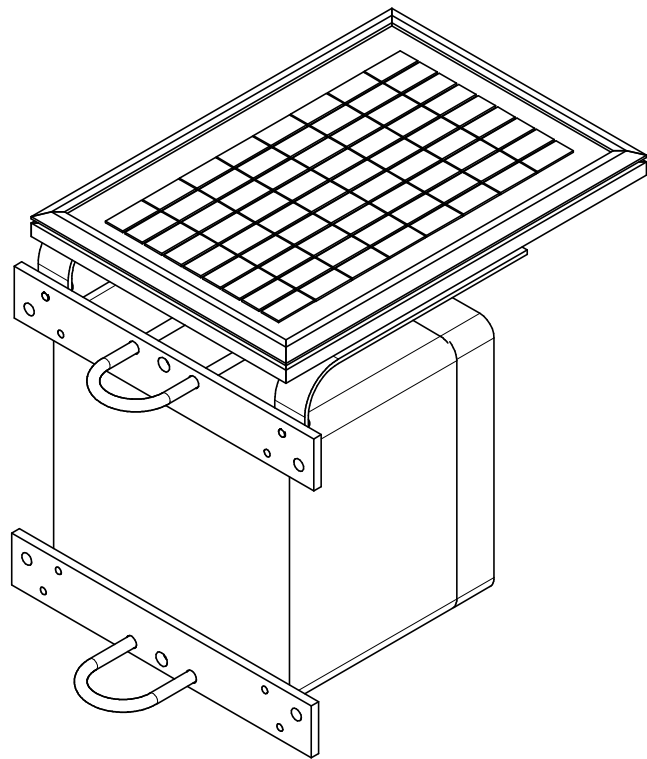
If you have a problem with our equipment, if you have difficulties getting things to work, or have any complaints about how we have treated you, my philosophy is to do my absolute best to find a way to satisfy you. That may mean going beyond the legal obligations of our warranty, suffer complete loss of profit on an occasional sale, or whatever it takes. It's been immensely satisfying to find that over the last decade, this philosophy has created such satisfaction in our customers. We take great pride that of the many hundreds of comments on the internet about Harbortronics, there are almost no negative comments! That's not to say that we haven't had our share of problems with our equipment, but again, I will do my best to make it right in the end! -Mark Roberts

### ***Legal:***

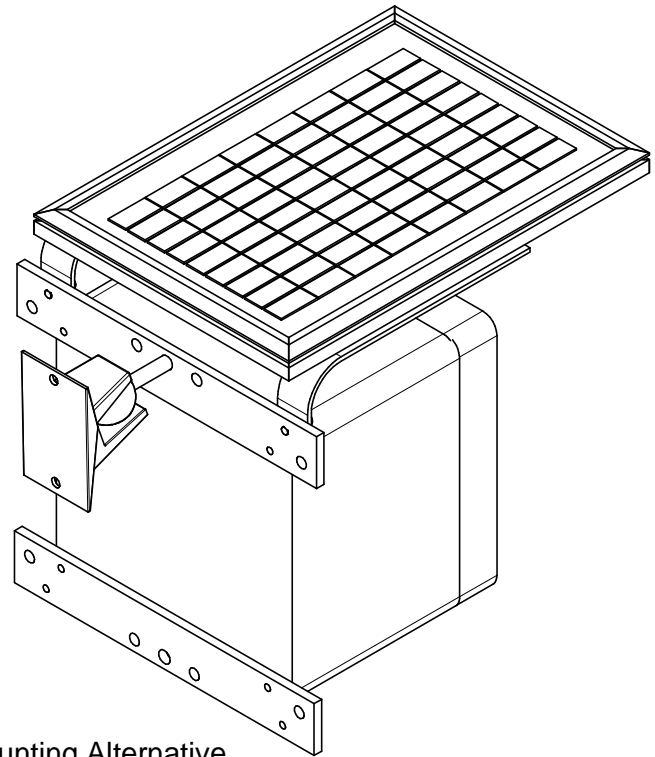
All Harbortronics products are warranted against any manufacturing defects for a period of one (1) year from the date of purchase. Defective products should be returned prepaid to Harbortronics. Harbortronics will at its discretion, repair or replace such products without charge, and will return to the customer prepaid. Except as mentioned above, no other warranty expressed or implied, applies to this Harbortronics product. All other claims, of any nature, including but not limited to camera damage are not covered. This warranty does not cover damage caused by misuse, accident, or abuse. This warranty does not cover consequential damages or other incidental damages. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above exclusions may not apply to you. Contact Harbortronics at [www.Harbortronics.com](http://www.Harbortronics.com) for service instructions.



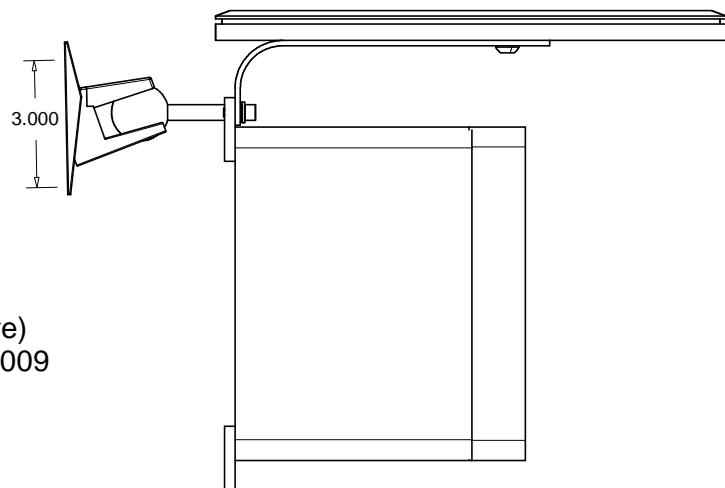
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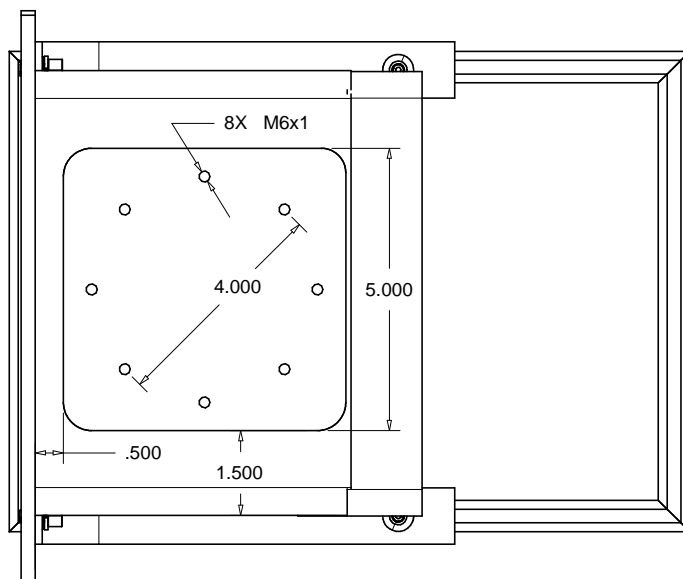
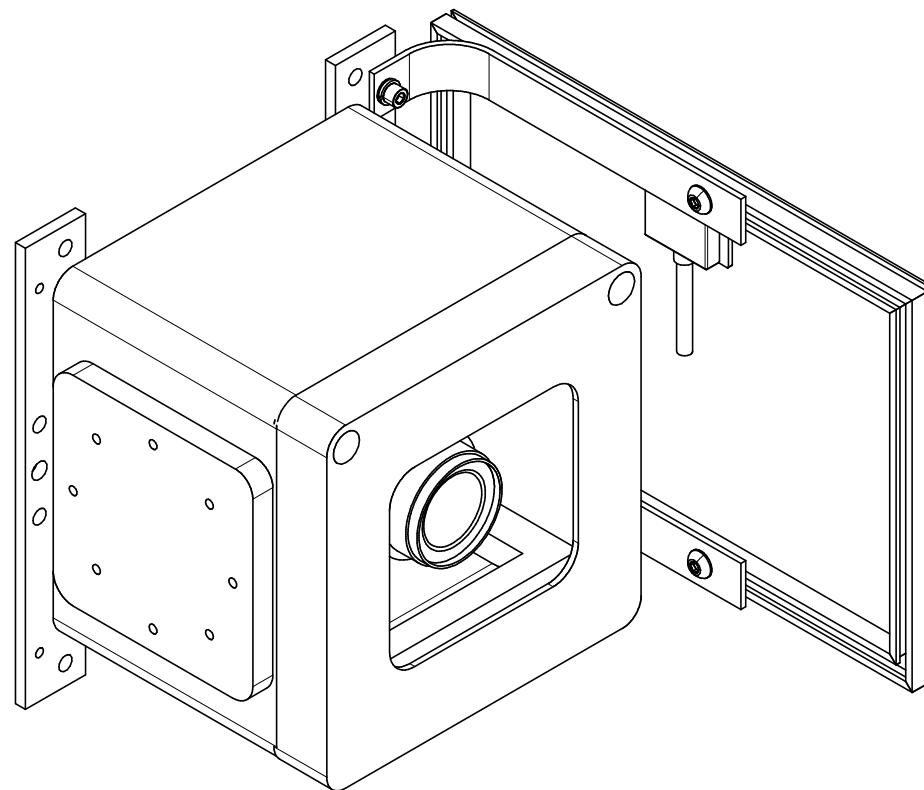
Pipe Mounting Alternative  
 Holes Drilled for 1 5/8" Fence Pipe.  
 (U-Bolts are included)



Ball & Clamp Mounting Alternative  
 (Parts & screws included with housing)

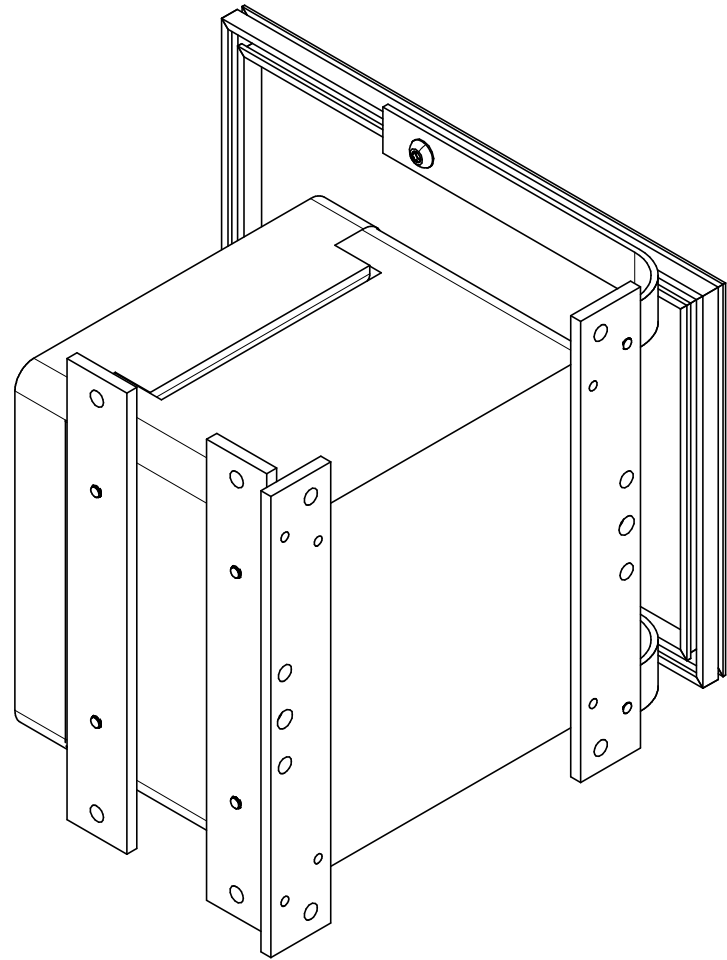
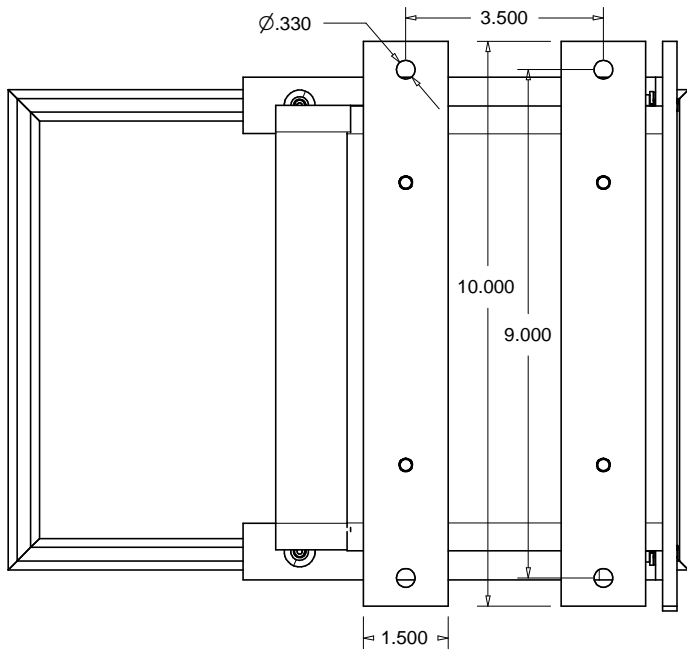


Circular Flange Option  
1/2" Aluminum plate drilled & tapped  
Bolted to bottom of housing  
(\$200 Option)





Bottom Bar Option  
Overhanging 1/4" Aluminum  
bars bolted to bottom of housing  
(\$150 option)



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Tripod Mount Option  
1/2" Aluminum bar bolted to  
bottom of housing, threaded  
for 3/8-16 Tripod thread.  
(\$100 option)

