Time-Lapse Package

User’s Guide

Shown with Pentax camera and dual battery option. Zoom in for details...

Harbortronics Inc
7103 County Road 86
Fort Collins, CO 80524
970-232-9619 (Phone)
970-672-8729 (Fax)
http://www.harbortronics.com/

Sales & Service: Sales@Harbortronics.com
Technical & Customizing: Mark@Harbortronics.com
Overview................................................................................................................................................................................................ 3
Quick Start.................................................................................................................................................................................................. 3
Items included:.................................................................................................................................................................................. 3
Configuring the DigitSnap............................................................................................................................................................ 4
Connecting to a terminal................................................................................................................................................................. 4
Configuring for Advanced Time-Lapse............................................................................................................................................ 4
System Components .......................................................................................................................................................................... 5
Digital Camera................................................................................................................................................................................ 5
Enclosure........................................................................................................................................................................................ 7
Mount Assembly................................................................................................................................................................................. 7
Camera Mount.................................................................................................................................................................................. 9
Mechanical Package........................................................................................................................................................................ 9
Battery Pack Assembly.................................................................................................................................................................... 9
Solar Panel..................................................................................................................................................................................... 10
Circuitry Panel................................................................................................................................................................................ 11
Tools and Accessories.................................................................................................................................................................... 12
Standard Package............................................................................................................................................................................. 12
Specifications.................................................................................................................................................................................. 13
Service / Warranty.......................................................................................................................................................................... 13
Philosophy:.................................................................................................................................................................................... 13
Legal:........................................................................................................................................................................................... 13
Overview

The Time-Lapse Package is a complete system for documenting construction projects, animal behavior monitoring, analyzing environmental changes, and an amazing variety of 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, followed by a long green flash, and then a few moments 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 preset to take pictures starting at 7AM (Mountain Time Zone), and every day afterward 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 2700.
- Canon T5 (1200D) Digital SLR and 18-55mm Zoom lens.
- A pair of 16 GB memory cards.
- Hex wrench, cables, manuals and accessories.
- Mounting Hardware

Here are all of the parts, before we assemble them (some things have been changed)
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 2700 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 $20 and up. Please make sure to install the drives for the USB-Serial adapter on your computer. This is commonly overlooked problem. We have had excellent results using USB/Serial converters which incorporate the FTDI chipset, and strongly recommend these. We are happy to provide this cable if needed.

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 we also have an application on the CD-Rom that you may install.

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 or the Troubleshooting guide on the CD-Rom, or refer to the support page on our website. 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 at specific times of the day, such as during daylight hours. Please refer to the DigiSnap 2700 manual on the CD-Rom for specific details regarding the configuration menus.

Please note that the DigiSnap 2700 controller has a 'real-time' internal clock. This is the clock used for scheduling pictures, not the camera's internal clock. You may want to make sure the two clocks are roughly the same, so the time listed in the picture data is consistent with the DigiSnap clock. As time progresses, the clocks will drift relative to each other... this drift should be small, but is to be expected.

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!
System Components

**Digital Camera**

While there are several camera models that could be used in the system, through much deliberation we have chosen the Canon Rebel T5 (1200D). Prior to the this camera, we shipped thousands of systems using Pentax K100 and K200 series cameras, followed by the Canon 1000D, and Canon 1100D. Note that some of the pictures here may show the Pentax cameras. Most customers prefer that we supply the camera pre-installed in the system, 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 the research for you, and believe we have chosen the optimum available camera for the application. Please note that we may switch to a different camera model at any time. We are constantly evaluating new cameras for suitability, and rest assured, we have your best interest in mind!

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, we have encountered a variety of quirks and outright problems with many versions of Nikon cameras over the years, when applied to long term time-lapse. Nikon makes fine cameras, and we have nothing against Nikon as a brand, in fact we used to incorporate them in several earlier products. However, for long term time-lapse, we urge you to consider using the camera we have tested and recommend. If you would like to discuss using a particular camera model, we would be happy to discuss this further with you.

Given some extra effort and cost, we may be able to use your current camera, but we strongly recommend using our recommended camera model. These cameras use industry standard connectors, draw negligible power between pictures, have proven reliability in environments from pole to pole, and yield excellent image quality.

**Canon 1200D (Rebel T5)**

The standard package currently includes the Canon 1200D, which use an 18 MPixel, APS sized sensor, with the standard ‘kit’ lens from Canon, 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.

We have heard of anecdotal issues with older Canon Rebel cameras. Some of our, and other time-lapse equipment customers have reported lock-ups with those cameras. We specifically developed the DigiSnap 2700 address this infrequent bug in the cameras. The Canon 1100D and 1200D have not shown to exhibit this lock-up bug, at least to our knowledge.

**Camera Set-up**

Once the camera is installed, the zoom and manual focus set, please use gaffer tape, or some other low residue tape, to wrap around the lens rings, to prevent movement over the life of your project.

We install a 16 GB memory card in the camera. Our large battery pack will power the system, and no other batteries are used in the equipment. If the Time-Lapse Package power is turned off for a long period of time, the clock in the camera may reset itself, and need adjusting before use.

A second 16 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 registration each time is excellent! 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 : 30 seconds  Manual focus  Image Stabilization 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 camera is installed within 50ft of the subject, the aperture-priority mode (A) may yield more consistent focus from picture to picture, as the depth of field will be fixed. We recommend against using fully manual control of the exposure, unless you are an experienced photographer, and have a scene with relatively consistent lighting. The variation in lighting in an outdoor scene is typically too extreme for any particular arrangement of exposure settings. 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 a relatively low setting, for the minimum noise. In many camera models, you can limit the ISO to some maximum value, which would be even better than using a fixed ISO setting. For most applications, you can leave the exposure up to the camera, and if absolutely needed, use post-production software to smooth out frame to frame variation.

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 (if manually set) 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 0°C to +40°C. 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 summer 2014, there are almost 3500 systems in the field, some for about 9 years, and we have relatively few reports from customers of camera failures. The failure rate is not perfect, but much better than expected for commercial equipment used in harsh environments.

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, -60°C. However, at –40°C 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 +80°C, 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 have a huge number of systems operating in the Middle-East, Arizona, the Australian Outback, Africa, etc., and have never had any problems that we know of, related to high temperatures.

We are compelled however to say that the excellent performance of our systems over the years does not mean that we guarantee operation of all or any particular system to these temperature extremes.

### Enclosure

We use a very strong molded fiberglass housing. Gaskets in the door 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 small SLRs. Unlike plastic units, you can successfully paint, modify, and repair this enclosure if you want to camouflage it in the field, or have other custom needs.

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. All of the pictures here show an older ball-head mount, which we eventually found to be poorly matched to our system. We now have a much more rigid design, and are very confident that it is suitable for all installations except where high winds are expected.

The brackets and supplied U-bolts can be also used 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.
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 aim 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 $210. Like all rechargeable batteries, the effective capacity will gradually decline over time and use. We have found that the battery will give good service for at least 3-5 years of 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.
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. car 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 at moderate temperatures between charges, taking about 10 pictures per day. The standard Time-Lapse Package charges the battery with a solar panel, essentially eliminating worry about the battery status, when taking 100 pics per day.

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. Please bend the mounting bars to orient the solar panel toward the sun.

The solar panel cable is connected to the housing using a water-tight connector on the top of the housing (see picture, page 5). For applications that require additional power, such as in the Arctic, indoor applications, etc., other cables are available to connect to external 12V batteries, AC power sources, etc.

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! Customers have reported that in excellent conditions (frequent full sun, moderate temperatures) ,
the solar panel can keep the battery charged while taking as many as 400 pictures per day. In most locations around the world, we have found that the system can reliably take 100 or more pics per day. We can also provide larger solar panels for applications that require more pics per day, or are in more challenging locations.

**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 2000 series controller, specifically the DigiSnap 2700. 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 schedule.

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 2700 is attached to the front of the panel using a ‘velcro’ like material. The settings will be retained with or without power.

**Solar Charger**

While some small solar panels can be connected directly to large 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 weatherproof DC power cable for this scenario, so that you can place the AC charger near an AC outlet, in a protected location.

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 newer SLR cameras typically require 8 volts (model dependent). Harbortronics designed and produces a device to efficiently convert the higher battery voltage to those required by the DigiSnap and digital cameras. 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 (not shown). There is a fuse in the circuit which protects the circuits in case battery 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 100°C / 220°F for an hour or more, until they turn blue again. Be careful not to melt the bag!

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 reduce 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$2700. Each system is configured and tested at our factory. Note that this picture is fairly old, but the contents will be very similar.
Specifications
Standard Package  [Includes all items described above, single installed battery pack]

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Installed Weight</td>
<td>12.5 lbs</td>
</tr>
<tr>
<td>Shipping Weight</td>
<td>17 lbs</td>
</tr>
<tr>
<td>Housing Dimensions</td>
<td>8” wide, 8” tall, 7” Deep  [Most customers are surprised at the small size!]</td>
</tr>
<tr>
<td>Overall Dimensions</td>
<td>10” wide, 13” tall, 13” Deep</td>
</tr>
<tr>
<td>Shipping Box Dimensions</td>
<td>18” x 15” x 13”</td>
</tr>
<tr>
<td>Price as shown</td>
<td></td>
</tr>
<tr>
<td>Quantity 1:</td>
<td>US $2700</td>
</tr>
<tr>
<td>Quantity 2:</td>
<td>US $2650</td>
</tr>
<tr>
<td>Quantity 3:</td>
<td>US $2600</td>
</tr>
<tr>
<td>Quantity 5:</td>
<td>US $2550</td>
</tr>
<tr>
<td>Quantity 10+:</td>
<td>US $2450</td>
</tr>
</tbody>
</table>

The shipping price varies from month to month, and obviously varies significantly with the destination. We normally use Federal Express (FedEx) for delivery. We can and have shipped almost everywhere in the world! For shipping in the US, the charge is about $85, and for international FedEx, it may be around $220. Please consider these prices as estimates only. We are happy to provide a quote upon request for the equipment and delivery.

Service / Warranty

Philosophy:
Harbortronics is a small private 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! Given the growth of the company, and high number of repeat purchases, I'm encouraged that we may be doing things fairly well.

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 for service instructions.