

Managing Your Account

Where do I purchase points to use on LightBuckets and how much do they cost?

Points are the currency used on LightBuckets. You exchange points for time on our telescopes. Each telescope has a different rate. Points can be purchased in the Account section of LightBuckets once you have registered as a customer. You will also be notified if more points are required to be purchased before submitting your imaging plan to the observatory. You may have any quantity of points in your account that you wish. Points will expire 2 years from the date of purchase. You are welcome to share your points with other LightBuckets customers as part of a group. We will issue payment refunds upon written request within 30 days of your point purchase. If you have multiple point purchases (at various costs per point) we will use the average cost of your points in determining your refund amount. A \$10.00 processing fee will apply for all payment refund transactions. Please contact a representative at sales@lightbuckets.com to request a point or payment refund.

Can you take me through the LightBuckets pricing?

Joining LightBuckets is absolutely free - you don't have to purchase anything up front. When you are ready to use one of our telescopes, you can find the most recent prices on the Learn More page by going to the observatory browser on the bottom right corner of the page. If you view our Quick Tour video, you will see exactly where this is.

Our prices for Full Control Imaging as of today (subject to change) are:

LB-0001 - 24" RC - Rodeo, NM - 175 points per hour
LB-0005 - 20" RC - Mayhill, NM - 150 points per hour
LB-0004 - 14.5" RC - Pingelly, Western Australia - 125 points per hour

Our prices for Easy Imaging in color as of today (subject to change) are:

Level 1 - 20 minutes of imaging time - 20 points
Level 2 - 32 minutes of imaging time - 40 points
Level 3 - 40 minutes of imaging time - 60 points
Level 4 - 50 minutes of imaging time - 83 points
Level 5 - 60 minutes of imaging time - 113 points
Level 6 - 70 minutes of imaging time - 148 points
Level 7 - 80 minutes of imaging time - 155 points
Level 8 - 90 minutes of imaging time - 181 points
Level 9 - 100 minutes of imaging time - 210 points

Level 10 - 120 minutes of imaging time - 260 points

A point costs \$1.00 (US). You can receive a discount on points by purchasing them in bulk. This means that your effective cost would be less than \$1.00 (US) per point. Here is the breakdown of bulk point discounts:

LightBuckets Point Purchase Discounts

Points	Discount	Price	Cost Per Point
25	0%	\$25	\$1.00
50	0%	\$50	\$1.00
100	6%	\$94	\$0.94
250	6%	\$235	\$0.94
500	8%	\$460	\$0.92
750	8%	\$690	\$0.92
1000	10%	\$900	\$0.90
3000	10%	\$2,700	\$0.90
5000	10%	\$4,500	\$0.90

To encourage customers to continue to image while the Moon is visible, we offer Moon discounts whenever the Moon is more than 25% illuminated. Moon discounts are automatically calculated for you, so you don't have to even think about it....if the Moon is visible while you're imaging, you get our Moon discount. The discount amount is calculated by taking the percentage of the Moon that is illuminated multiplied by 25%.

You can also receive an additional schedule discount if you chose Schedule for Later (5% discount) or Best Available (10% discount). The reason why we give customers these discounts is that Schedule for Later allows us to have better visibility into the flow of our business, which is worth something to us. Scheduling with Best Available allows us to pick the telescope and the time for your imaging run, meaning that we can fill unused "inventory" with these runs, which is also valuable to us.

So, to net it out, it is free to sign up for LightBuckets. Once you do that, you can go all the way through to getting ready to submit your imaging plan to an observatory without paying anything. Hopefully this

will help answer any pricing questions you might have...but let us know if you have more by posting in the forums.

How does LightBuckets come up with the hourly point values for the telescopes?

Each telescope in the LightBuckets Telescope Network has a different point cost per hour. We calculate these rates based on the telescope's aperture, optics, camera, and location. For example, it is much more expensive to operate an observatory in the southern hemisphere. Even though the aperture on the telescope may not be as large as others in our network, it may have the same or higher point cost than a larger aperture telescope in the northern hemisphere.

Does LightBuckets offer any quantity discounts?

We do offer quantity discounts when you are purchasing points. The discounts vary and will change from time to time. If you are going to be using one of our bigger telescopes or doing some long duration imaging, it is always a good idea to purchase points in the largest blocks possible to take advantage of our discounts.

Does LightBuckets offer any discounts for imaging when the Moon is up?

To encourage customers to continue to image while the Moon is visible, we offer Moon discounts whenever the Moon is more than 25% illuminated. Moon discounts are automatically calculated for you, so you don't have to even think about it...if the Moon is visible while you're imaging, you get our Moon discount. The discount amount is calculated by taking the percentage of the Moon that is illuminated multiplied by 25%.

Choosing an Observatory

Where are the LightBuckets Observatories located?

In locating our observatories, our criteria included dark skies, excellent seeing, and outstanding weather. This led us to the mountains and high deserts of New Mexico as well as the plains of Australia. These sites are all at least 150 miles from any large population centers...affording our observatories extremely dark skies where the visual magnitude at the limit of what a person can see unaided (about magnitude 7). On the Bortle Light Pollution Scale our sites would be classified as a 1-2. Seeing at our locations is typically under 1.5 arc seconds and on many nights will reach sub arc second. The weather at our New Mexico locations is clear to partly cloudy skies nine months out of the year. From July to September these sites experience the southwest monsoon season where the relative humidity changes from being less than 20% each day to being over 60% each day. Thunderstorms and high winds are an almost daily occurrence during this period.

How do I decide which observatory I want to use?

It all depends on what you're interested in imaging. The majority of our telescopes are best suited to imaging deep space objects (DSO's). If you're imaging nebula which emit or reflect light at different wavelengths than the visible spectrum, you'll want to pick an observatory that includes Hydrogen-Alpha, SII, and OIII filters. If you're imaging an extended object, be sure to select our wide field refractor telescopes.

Can I check the weather and the sky to see if it is clear at an observatory?

We maintain a complete set of instruments for monitoring the temperature, wind, rain, and clouds. To accomplish this, we have the following sensors at each location:

1. Weather station – monitors temperature, humidity, wind speed, light, and rain
2. Cloud sensor – monitors the amount of clouds in the sky by measuring the “sky temperature” vs. the ambient temperature
3. All Sky camera – monitors the night sky with an image updated every couple of minutes. You can clearly see the Milky Way and the Zodiacal Light on the images as well as any cloud cover that might be moving in.
4. Observatory camera (inside) – view inside the observatory...it's usually dark.
5. Observatory camera (outside) – view of the observatory from the outside.
6. Seeing monitor (not available in southern hemisphere) – monitors the seeing conditions by measuring the FWHM on a constant basis. Produces a chart so you can see how seeing trends during the course of an evening.

You can pull these real-time data feeds up in the observatory “panels” before you select an observatory to use. In addition to the instruments we have at our sites, we also feed local radar and satellite views into the panels. For imagery, such as the all sky view, you can click on it and get a larger view to see more details.

I’m new to remote imaging; can I physically break anything in the observatory when my plan runs?

We have gone to great lengths to ensure that your experience with LightBuckets is worry free and enjoyable. There is absolutely nothing you can do that would damage any of our equipment, software, or systems. No need to have it ever cross your mind again.

Telescope Systems

What telescopes does LightBuckets use?

LightBuckets primarily uses research-grade telescopes from RC Optical Systems. These instruments are generally regarded as the highest-quality Ritchey-Chrétien telescopes available. For our wide-field telescopes, we employ triple objective ortho apochromat refractors from Takahashi. Our goal is to provide instruments for close-in, deep space imaging as well as wide-field extended object imaging.

What cameras does LightBuckets use?

LightBuckets uses CCDs from both Apogee and Santa Barbara Instruments Group (SBIG). These cameras are regarded as the best in the industry for image quality. The SBIG STL-11000M's in use in select LightBuckets Observatories deliver a 10.7 megapixel image. Our Apogee Alta U42 on LB-0001 (our 24" Ritchey-Chrétien with ion-milled optics) boasts a quantum efficiency of over 90% at 550nm. What's that all mean? Basically, the U42 captures 9 out of 10 photons that strike it. To put that in perspective, a typical CCD captures less than 6 out 10 photons.

What mounts does LightBuckets use?

Our telescopes have two different mounts. Because the 24" RC Optical Systems telescope is so large and heavy, our "standard" mount will not support it. The 24" uses an equatorial fork mount from RC Optical Systems. The mount used with the rest of our facilities is the Paramount ME from Software Bisque. This is a German Equatorial design that is not only a work of engineering art but the most accurate mount in its class. Both mounts employ the Software Bisque MKS-4000 control system.

I've read that many of your Ritchey-Chrétien's feature ion-milled optics, what the heck is that?

Ion-milling is a process where the telescope mirror is placed in a sealed chamber. Then argon gas ions are projected onto the mirror's surface removing material a molecule at a time. This process yields a final figure to the mirror that is higher than any other process currently available. Ritchey-Chrétien's are known for producing a coma-free, flat field. With ion-milling the telescope also delivers a much higher contrast image.

Scheduling Your Imaging Run

What is the best time to run my imaging plan?

There isn't an easy answer to this question but there are some rules of thumb. In particular, you should try to image your targets when they are at least 20-25 degrees above the horizon. Even though LightBuckets observatories can image the sky down to 5, 10 or 15 degrees above the horizon at many of our locations, we set a soft limit of at least 20 degrees just to ensure that your imaging run does not have to contend with the poor seeing conditions at lower elevations. Otherwise, you will be imaging through a lot of atmosphere which will greatly affect the seeing. And, speaking of seeing, it changes throughout the night. We provide seeing monitors at some of our observatories so you can track how the seeing changes. If you check in with us frequently, you can probably start to see some trends in the seeing. Some locations might have terrific seeing as soon as the lights go down, while others may experience best seeing after 1am. Also, imaging when the Moon is not visible is desirable. That said, you can certainly image quite successfully with the Moon up, and you'll receive a Moon discount so it'll cost you less at LightBuckets during this time.

What's the difference between Schedule for Now, Best Available, and Later?

We've created three different scheduling options to give you complete control over your imaging run. Our scheduling options also give you the opportunity to save money on your imaging plan depending on your urgency. If you're not in a hurry to get your imaging data, use the Schedule for Best Available option. LightBuckets will run your imaging plan when there is an open time slot in the schedule. We will also try to start your imaging run when your target is in the optimum position in the sky (preferably within 20 degrees of the meridian). Keep in mind that it could take up to a few days, depending on how busy our telescopes are, before you receive your image data. You will receive the greatest discount on your imaging plan by selecting this option. If you want more control over when your imaging run takes place, select Schedule for Later. With this option, you will have complete say over when your imaging run takes place, your imaging run cannot be bumped, and we'll still give you a discount. For imaging plans that you just have to run now, choose Schedule for Now. You'll get immediate access to the observatory (as long as it is available) and you'll be able to hold it as long as you like.

Selecting a Target

What can I image with LightBuckets?

The LightBuckets Ritchey-Chrétien's are especially good at imaging Deep Space Objects (DSOs). They will provide stunning views of nebula, globular clusters, galaxies, and many other targets. Our wide-field telescopes allow you to capture extended objects that would require a mosaic of images from the Ritchey-Chrétien's.

How do I find out what objects are in the sky for imaging?

The best way to see what objects are visible in the sky is to purchase a product such as TheSky or Starry Nights. These desktop planetariums can give you a terrific sense of the myriad objects to image. These products can also be used in conjunction with the ACP Planner to automatically generate imaging plans that you can upload to LightBuckets. There are also a number of free online sky charting products. Visit Astronomy Magazine at www.astronomy.com or Sky & Telescope Magazine at www.skyandtelescope.com to use their online tools.

I have ACP Planner and TheSky, can I create a plan using those tools and upload it to LightBuckets?

Absolutely. We want to make it as easy as possible for you to take your images. If using ACP Planner and TheSky (or Starry Nights) is your preferred way to set up your plans, no worries, just upload the plan file and you're ready to go.

Can I image the Sun, Moon, and Planets?

The cameras that are used by LightBuckets are mounted at Prime Focus without any lenses in the focal plane to magnify the image. This allows our telescopes to take images of extremely faint objects but doesn't lend itself well to taking images of the Sun, Moon, or planets. What's more, the CCD's used in our cameras are extremely sensitive to light. In short, the Sun, Moon, and planets are simply too bright to be imaged with our current selection of telescopes. If we get enough requests, we may add a dedicated planetary telescope...let us know what you're looking for and how we can help!

Creating an Imaging Plan

How do I actually set up an imaging plan?

We make it really easy to set up your imaging plan. Just tell LightBuckets what target you want to image, what filters you want to use, what image duration you want to go with, and the number of exposures to take. After that, everything happens automatically in the observatory you chose at the time you selected. You can, of course, watch your plan in progress in the Account section. We'll show you the real-time telemetry from the telescope and even give you snapshots of the latest images taken. When your plan is finished, we'll show you a black and white preview if you took just a single frame image. If you took RGB or LRGB color image data, we'll automatically put together a full color preview. You'll still have complete access to the RAW image data if you want to do your own image processing.

Can I take only black and white images or can color images be taken too?

You can take both black and white and full color images with LightBuckets. A black and white image is taken by simply choosing the Luminance or Clear filter on the telescope (or for use Hydrogen-Alpha, SII, or OIII to see details not in the visible spectrum). Full color images are created by combining frames taken through Luminance, Red, Green, and Blue filters. LightBuckets has a proprietary and unique Easy Imaging system which will automatically generate a color image for you. Just tell LightBuckets what your target is, how much detail you want, and we'll do the rest. We will also, of course, give you the RAW image data if you want to do your own processing with tools such as MaxIm DL, CCDSoft, PhotoShop, or other image processing software.

What exposure durations should I use on my Luminance, Red, Green, and Blue images?

We use filters from Astrodon that are pre-color balanced so you don't need to worry about different durations for different filters. That is taken care of for you. So the real question goes back to you...how deep do you want to image? The longer the duration you use, the deeper you will peer into space and the more detail you will tease out of faint Deep Space Objects. To give you some broad guidelines however, we recommend you take multiple short duration images and combine them rather than taking one long duration image. The benefit of this is if a satellite, cosmic ray, or even an airplane crosses the field of view, you only will lose that period of time as opposed to an hour or more of imaging. This also helps eliminate the weather from ruining a long duration image. What's more, it is relatively easy through software to remove any trace of transient objects that don't appear in multiple subframes. We would recommend luminance images at 5 to 15 minutes (300 to 900 seconds), binned 1x1, and take as many images as needed to equal your total image data time. For Red, Green, and Blue filters, use 2x2 binning, and subframe exposure duration of 5 to 15 minutes. Again, take as many images as need to add up to the total time you're looking for in your final image data. If you are imaging with narrowband

filters such as Hydrogen-Alpha, SII, and OIII you can begin with subframes of 5 to 15 minutes but you should expect to achieve better results with subframe exposure times of 30 to 60 minutes.

What tools do you recommend for image processing?

There are a number of capable image processing applications available that will do the job. We primarily recommend MaxIm DL and Adobe Photoshop as the tools of choice. These two products will handle everything from subframe integration to color combining to color balancing. There are also a number of free products available that are worth mentioning including GIMP (a free Photoshop competitor) and Registax (a free image stacking application).

Does LightBuckets have master calibration files available?

To save you time and money, we have compiled a comprehensive dark frame library for each observatory in the LightBuckets Telescope Network. We provide high-quality dark frame masters (at least 10 dark frames are median combined to produce a single master) with exposures of 60, 120, 300, 600, 900, 1800, and 3600 seconds. These are available for CCD temperatures of -10C and -20C. They are provided in 1x1, 2x2, 3x3, and 4x4 binning. In total, over 3.5 days is spent every 3 months generating dark frame libraries for each observatory. You will receive a link to the master dark frame library in the Account section under your specific imaging run results.

I'm new to astrophotography, what's the easiest way for me to get an image?

The easiest way to get an image from LightBuckets is to select the Easy Imaging option when you choose Use Telescopes from the menu. With the LightBuckets Easy Imaging system, all you need to tell us is the object you want to image and the level of detail you want to capture. We'll take it from there.

LightBuckets will figure out which observatory is the best one to use, when the optimum imaging time will be, and automatically set up your imaging plan. We'll send you an email when your imaging plan is running so you can watch the results in real time. When your imaging run is done, we'll even send you a color preview image along with a link to where you can download your finished color-balanced image as well as your RAW imaging data. Astrophotography doesn't get any easier than that!

I did a 600 second exposure on LB-0001 and my stars are blooming, how do I avoid this?

LightBuckets LB-0001 (24" Ritchey-Chrétien in Rodeo, NM) uses a non-antiblooming (NABG) CCD that is extremely sensitive. The camera's quantum efficiency is greater than 90% through much of the visible spectrum. Coupled with the superb optics of the telescope, this system captures a lot of photons. Since it is a NABG CCD and it is so sensitive, stars will bloom very quickly. The best way to use this telescope and also to avoid blooming is to keep your exposures under 300 seconds and stack multiple images to give you the signal to noise you're looking to achieve. Typically exposures of 120 seconds are sufficient and may be the longest you can image a single frame without blooming. MaxIm from Cyanogen and CCDStack from CCDWare are recommended tools for professionally stacking images.

Getting Your Image Data

I want to watch my imaging plan run, where do I go to see that?

Just go to the Account section on LightBuckets. There you will see a list of all your transactions including point purchases, scheduled runs, completed runs, and more. Look for the run that you setup and click on it. It will open up to reveal information about your run in progress including the real-time telemetry from the telescope showing where the telescope is pointing, what the camera is doing, and how auto-guiding is progressing, and more. You will also see a preview of the latest image taken by the telescope which you can click on to get a larger view to make sure everything looks okay. You can also setup an alert in your Profile to have LightBuckets email you when your imaging run is taking place as well as when it has completed.

I received an email saying that my imaging plan is finished, where do I go to download my images?

Just go to the Account section on LightBuckets. There you will see a list of all your transactions including point purchases, scheduled runs, completed runs, and more. Look for the run that just completed and click on it. It will open up to reveal information about your run including the time it took, the points deducted, and the image data download links. Your image data will remain available on our servers for 3 months beginning from the time your imaging plan runs. After that time, the files will be deleted from our servers and will be unrecoverable. So, be sure you have saved your image data files on your own computer.

My imaging plan didn't go right, but I'm not sure what happened, what do I do?

There's no way to avoid it, occasionally an imaging run will not finish as planned. More often than not, the weather will be the culprit (we haven't figured out how to control it...yet!). Sometimes a component will act up to cause your image not to complete. And, the "smart" software isn't so smart at times. If your plan does not start, we will simply cancel it and refund the points to your account. All you need to do is reschedule your run for another time when your target is visible. There's no need to redo your plan however, you can always retrieve a copy of it in the Accounts section under your imaging plan history. If your plan aborts in the middle of imaging, we will simply charge your account for the time used and you can reschedule your imaging plan run for another time to finish it up. Finally, if you are unhappy with the image data from your plan run, say the auto-guider acted up on a subframe or two, let us know and we'll make the situation right. Just keep in mind, things do go wrong when trying to use all of this sophisticated hardware and software...but we will always try to make things right for you as our customer.

Who legally owns the image data from my imaging plan run?

You own the copyrights to your image data. LightBuckets respects the intellectual property rights of others. We claim no ownership rights in any image contained in any of your photo albums and will not share your images unless instructed by you or otherwise required by law or permitted under a separate agreement with you. When you share a photo album, you allow the recipients of that album to share and make that album and the photos in it available to others. Please note that under the Terms of Use, you do agree to allow LightBuckets to use your images for promotional purposes on the Site. For more information see the applicable Terms of Use.

Technical Details

How are the LightBuckets telescopes polar aligned?

We go through a rigorous and time consuming multistep process to ensure accurate polar alignment which, in turn, ensures proper pointing, tracking, and guiding for your images. First, we roughly polar align the mount & telescope to the north or south celestial pole. Next we run through an iterative drift alignment process which dials-in accurate polar alignment by watching the drift of a highly magnified star in an eyepiece with crosshairs. When we have finished our drift polar alignment we will detect zero star drift in declination for at least 15 minutes whether we are pointed at the zenith or the horizon. We next undertake a TPoint Mapping run which will completely characterize the mount, telescope, and optical system at all points of the sky. We do this by pointing the telescope to at least 100 stars and sometimes more than 300 stars. We take a measurement of the difference between where the telescope “thought” it was pointing versus where it actually is pointing. Over time, and by covering the entire sphere of the sky, we build a highly accurate model of our telescope system. What this means to you is that you can be assured that your objects will end up right where you want them to be in the CCD frame and they will stay there throughout your imaging plan run.

What is auto-guiding?

Auto-guiding is an important aspect of long duration astrophotography. Basically, a single star is selected by LightBuckets to track. LightBuckets watches for any movement of the star from the center of a virtual target and automatically adjust the telescope mount to account for the motion. This insures that long duration images are sharp and accurate. Typically, our observatories will turn on auto-guiding for any single image that has a duration of 300 seconds or more. While our observatories are capable of doing longer unguided images, we’ve found this to be the best solution overall.

How does LightBuckets focus?

The telescopes in the LightBuckets Telescope Network all automatically focus through a combination of sophisticated software and hardware. Our autofocus routine first selects a suitable star to test. Next, LightBuckets measures the star’s brightness and roundness at various levels of focus. From this process, our technology automatically decides on the optimal setting. What it means for you is that your images are always razor sharp.

What is a calibration library?

A calibration library is used to remove “impurities” from your image data. These impurities can be the result of noise in the CCD chip or imperfections in the optical system. These are dealt with through bias frames, dark frames, and light flats. A dark frame is subtracted from the image to remove electronic noise generated by the CCD. A single dark frame is not adequate to capture the full range of noise in the CCD so we create master dark frames consisting of anywhere from 10 to 25 individual dark frames that have been combined. These master dark frames are available on the LightBuckets server. You will receive a link to them in the Account section under your specific imaging run results. To remove the optical imperfections, including issues such as dust motes (those little donut looking “ghosts” you might see in some images), a light flat is applied to the image. To take a light flat, the telescope is pointed at a smooth light source, such as the sky at dawn or dusk, and very short image is taken. This captures an image of the optical system which is then applied to an already dark calibrated image. Since light flats need to be a picture of the optical system exactly the way it was for your images, which could have been rotated in any of 360 degrees, we have to automatically take them for you. Light flats are automatically generated for your run by LightBuckets at either dawn the morning after your run or at dusk the evening after your run. These files will be available in the Account section under your imaging run information. We do not charge you points for taking light flats, it’s on the house!

Contact and Support

What are the hours of operation for Lightbuckets?

LightBuckets is open for business on the web, 24 hours a day, 7 days a week, 365 days of the year. We are available through email (support@lightbuckets.com) and Skype instant messaging (lightbuckets) much of the day and evening...weekends too. Our company phone system will attempt to find us but you should expect to have to leave a voicemail and we will get back to via email or Skype as soon as possible. Our support phone number is 800-277-5794 extension 704.

I have a few questions before I purchase points and try out LightBuckets, how do I reach someone?

The best way to reach us is via email at support@lightbuckets.com. We are constantly monitoring our email and we are able to respond day or night no matter where we might be at the time. We can also communicate in more real time via Skype. Our username is lightbuckets. If you wish to talk to us on Skype but don't see LightBuckets online, send us an email and if we're around we'll sign in so you can reach us. You can also call us at 800-277-5794 extension 704. Our phone system will attempt to find us but more often than not you will go to voicemail. Please leave us a detailed message along with your email address and we will respond as soon as we possibly can.