Article Title: **When Technology Fails**

By Mike Hotka

In this continuing series of articles, I want to discuss contingency plans. When I am having trouble with my smart phone, you will often hear me say, “Technology is wonderful when it works!”. Those of us who are engineers, can make a living figuring out why specific technology is not working and getting it fixed for the end user.

When I first got started in observational astronomy, I would find the objects I wanted to observe by a method called star hopping. Star hopping is a skill of navigating the night sky to find objects by using only the stars.

Today, the amateur astronomer has several technological options available that can help them find objects in the sky. One such technology I use is called Digital Setting Circles (DSC). DSC is system that has a small computer that receives signals of where the telescope is pointing from encoder devices that are fixed to each movable axis of the telescope. After telling the DSC computer where two stars are at the beginning of the observing session (the initial alignment process), you can enter object designations, like M51 on the DSC’s display, and the DSC computer will show you how to manually more your telescope to center the object in your eyepiece. I use two different kinds of DSC, one is called the Sky Commander™ and the other is called the Argo Navis™.

I have my observing lists for the outing loaded into my Standard Edition of SkyTools 4 (ST4) (SkyTools 4 Standard Edition (skyhound.com)).

I am set for an evening of observing.

If all this technology works all night, I can view and record many objects on my observing list(s). But as useful as this combination of technology is to help me observe, it any one component of it fails, then what do you do? If this happens, there are choices that determine what you do next:

1. waste valuable observing time troubleshooting the problem in the dark with a red flashlight if you are not observing alone,
2. pack up your gear and go home,
3. continue to observe by implementing contingency plans you pre-developed before this outing.

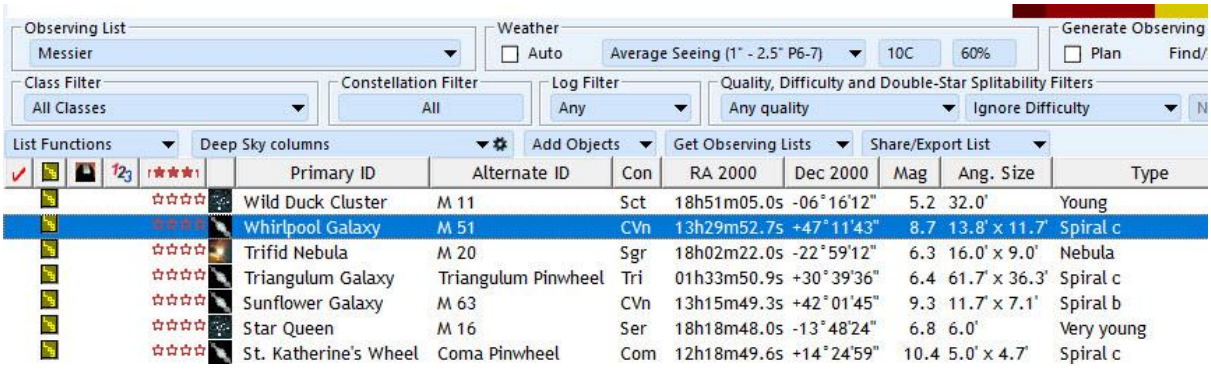
If your DSC system is failing to find objects, I immediately turn it off and back on again and do another 2-star alignment. After this alignment, I tell the DSC to find a nearby Messier objects. If the Messier objects is not in the eyepiece after moving the telescope to it, I turn off the DSC again. I unplug and plug back in the (RJ11) telephone style connector into each encoder device. This can shine up the contacts to make the signals from the encoders reach the computer. I turn on the DSC, and repeat the alignment process and try to find the nearby Messier object. If the Messier object is not in the eyepiece this third time, I turn off the DSC and star hop to the objects on my list for the rest of the night.

Star hopping is the process of moving from an easy to find bright star, through dimmer star fields until the object is reached and is in the eyepiece. Two useful pieces of equipment that I use to star hop with is a Telrad™ and an 8x50 finder scope with an illuminated cross hair reticle.

This platform is attached to the rocker box of my telescope and keeps these finder scopes at an ideal position for me to use, regardless of where the telescope is pointing in the sky.

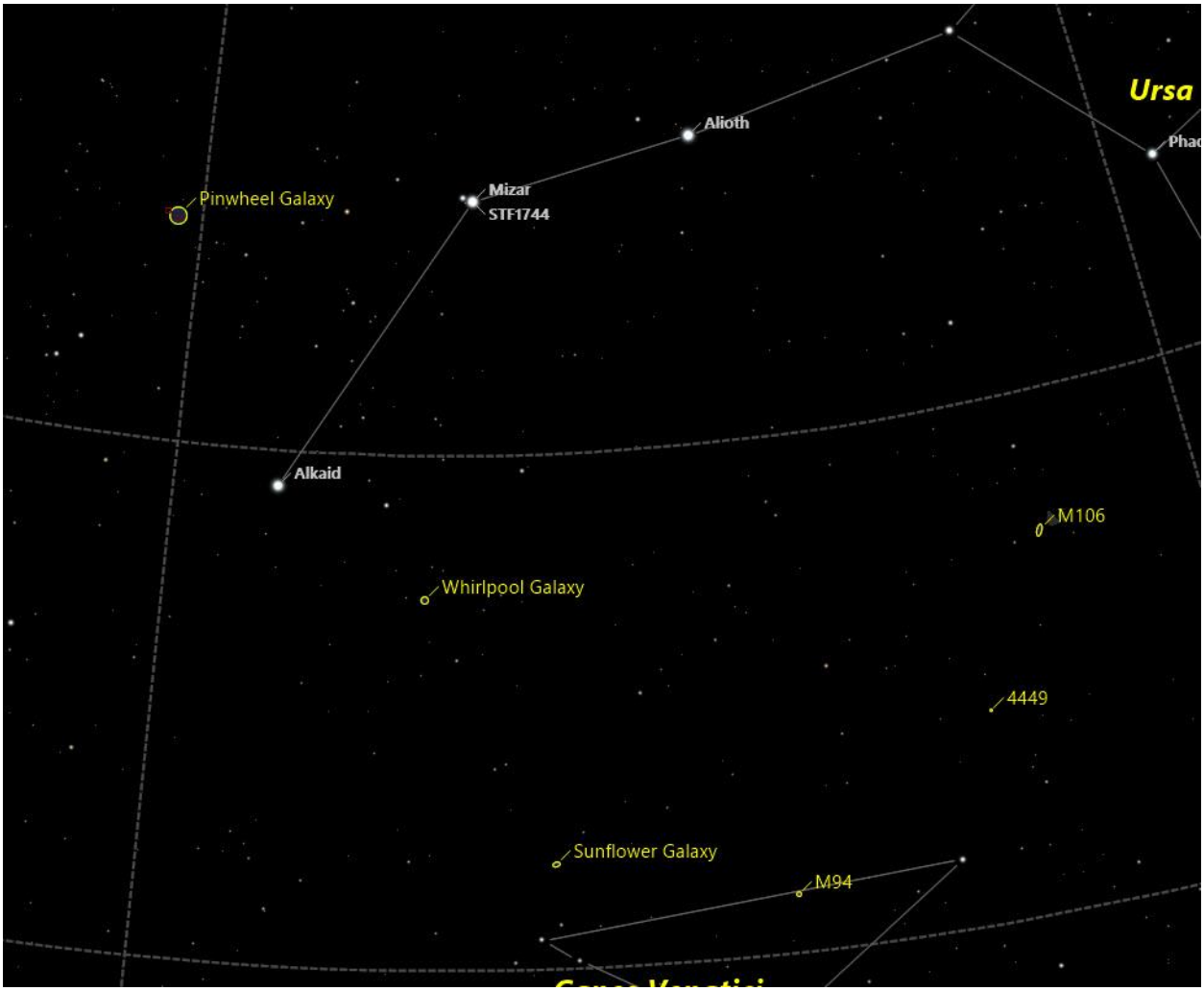
I start each observing session by aligning the Telrad™ and the finder scope with the optical axis of my telescope. That means when you look at a bright star that is centered in the Telrad™, it will also be centered in the finder scope and the eyepiece of your telescope. Then I can do the 2-star alignment of my DSC.

To star hop to M51, I would highlight M51 on my ST4 display and hit the 'A' character.



Primary ID	Alternate ID	Con	RA 2000	Dec 2000	Mag	Ang. Size	Type
Wild Duck Cluster	M 11	Sct	18h51m05.0s	-06°16'12"	5.2	32.0'	Young
Whirlpool Galaxy	M 51	CVn	13h29m52.7s	+47°11'43"	8.7	13.8' x 11.7'	Spiral c
Trifid Nebula	M 20	Sgr	18h02m22.0s	-22°59'12"	6.3	16.0' x 9.0'	Nebula
Triangulum Galaxy	Triangulum Pinwheel	Tri	01h33m50.9s	+30°39'36"	6.4	61.7' x 36.3'	Spiral c
Sunflower Galaxy	M 63	CVn	13h15m49.3s	+42°01'45"	9.3	11.7' x 7.1'	Spiral b
Star Queen	M 16	Ser	18h18m48.0s	-13°48'24"	6.8	6.0'	Very young
St. Katherine's Wheel	Coma Pinwheel	Com	12h18m49.6s	+14°24'59"	10.4	5.0' x 4.7'	Spiral c

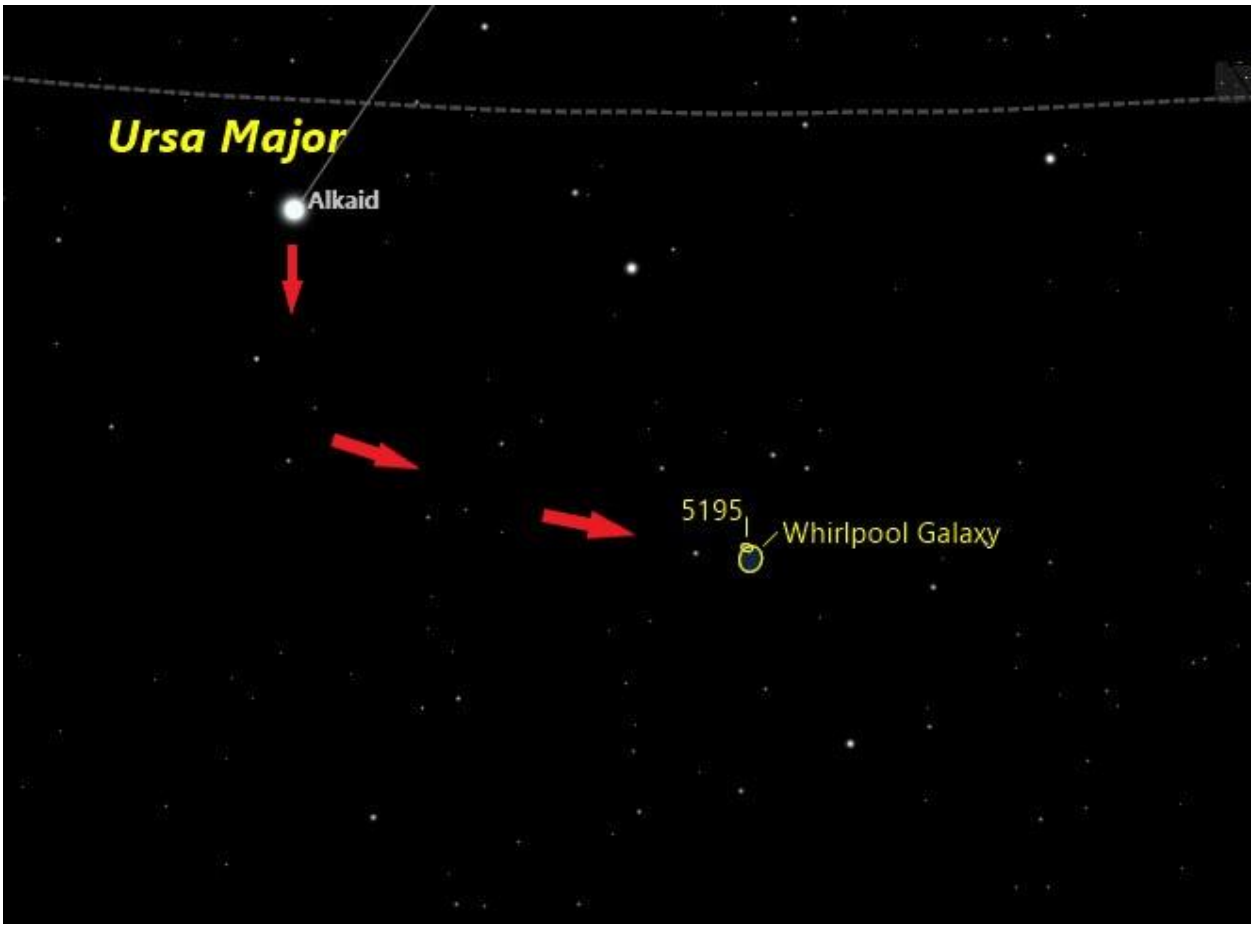
This brings up an all sky display.



Zooming in on this window makes the area of the sky between the end star (Alkaid) of the handle of the Big Dipper and M51. This shows the many fainter stars in this area of the sky. These fainter stars are easily seen in my 8x50 finder scope.

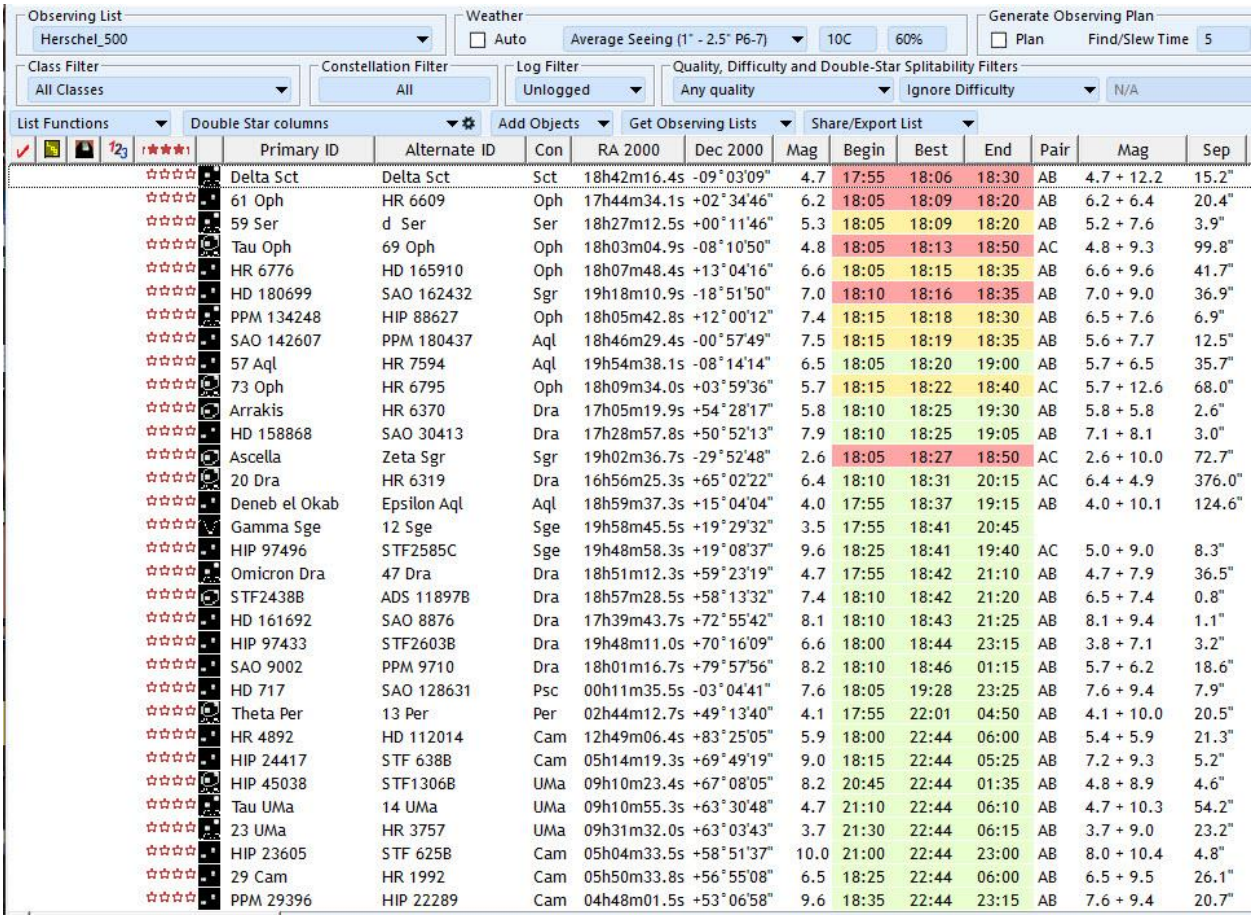
An asterism is a group of stars that forms a pattern. I look for asterisms that form a triangle or a chain of stars. These are easy to spot in the 8x50 finder scope.

Start by using the Telrad™ and centering Alkaid in the eyepiece's field of view. Then move to the 8x50 finder scope with the illuminated reticle on. Move the scope down and center the crosshairs of the finder scope in the center of the triangle of stars below Alkaid. Next, move the telescope to have the crosshairs centered on the larger triangle of stars to the right of the current asterism. Then move the telescope more to the right of the brighter star seen to the left of M51. Returning to the eyepiece, M51 should now be somewhere in the field of view.



If you laptop computer fails, I always have a printed list of the objects I plan to observe with me. I screen capture all the pages of the object list(s) I plan to observe from the main ST4 display screen. I print them out on 8 x 11 inch paper. This is my backup list in case this condition occurs.

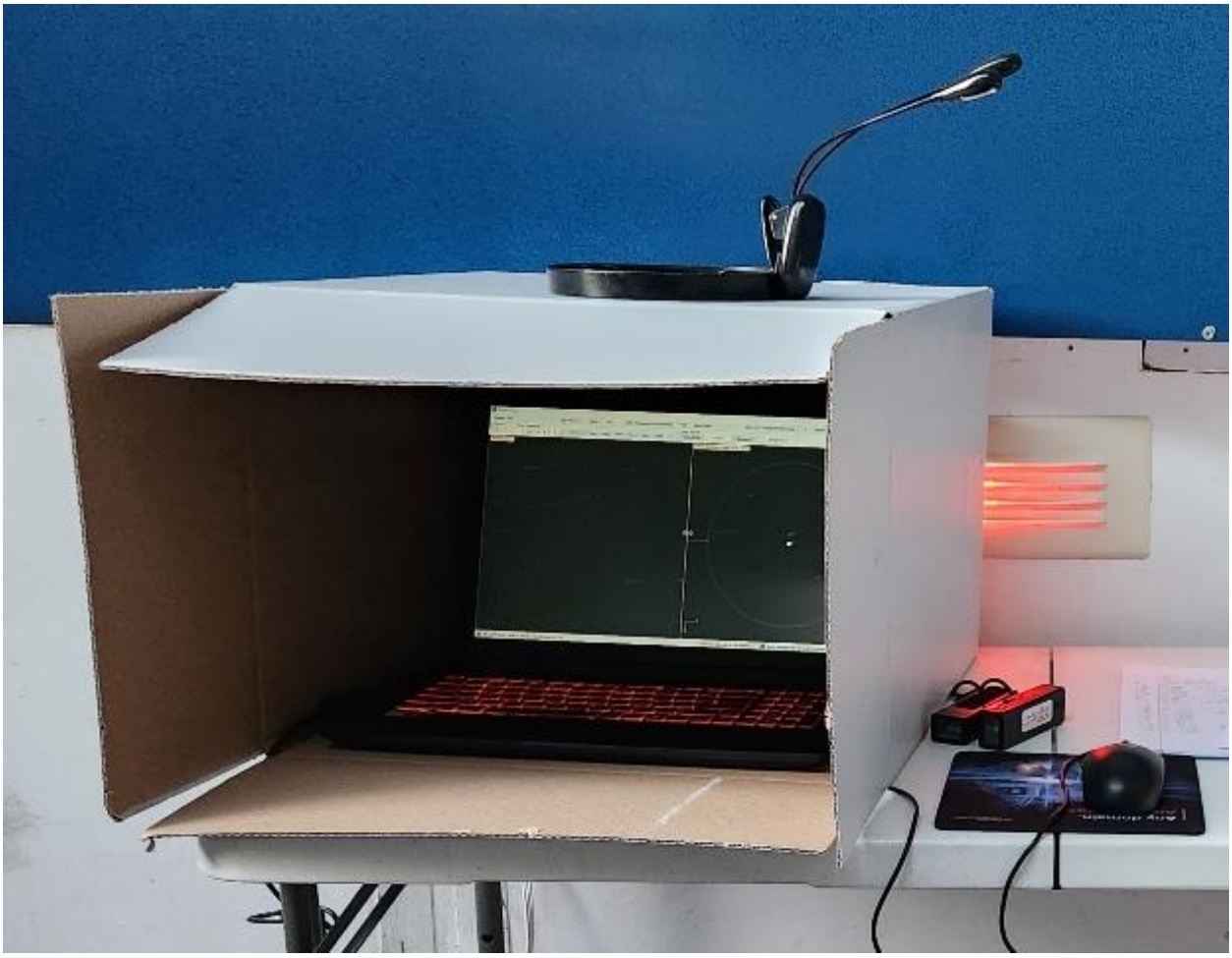
The printed page(s) will resemble (following image) the ST4 display screen for the observing list being displayed.



Primary ID	Alternate ID	Con	RA 2000	Dec 2000	Mag	Begin	Best	End	Pair	Mag	Sep
Delta Sct	Delta Sct	Sct	18h42m16.4s	-09°03'09"	4.7	17:55	18:06	18:30	AB	4.7 + 12.2	15.2"
61 Oph	HR 6609	Oph	17h44m34.1s	+02°34'46"	6.2	18:05	18:09	18:20	AB	6.2 + 6.4	20.4"
59 Ser	d Ser	Ser	18h27m12.5s	+00°11'46"	5.3	18:05	18:09	18:20	AB	5.2 + 7.6	3.9"
Tau Oph	69 Oph	Oph	18h03m04.9s	-08°10'50"	4.8	18:05	18:13	18:50	AC	4.8 + 9.3	99.8"
HR 6776	HD 165910	Oph	18h07m48.4s	+13°04'16"	6.6	18:05	18:15	18:35	AB	6.6 + 9.6	41.7"
HD 180699	SAO 162432	Sgr	19h18m10.9s	-18°51'50"	7.0	18:10	18:16	18:35	AB	7.0 + 9.0	36.9"
PPM 134248	HIP 88627	Oph	18h05m42.8s	+12°00'12"	7.4	18:15	18:18	18:30	AB	6.5 + 7.6	6.9"
SAO 142607	PPM 180437	Aql	18h46m29.4s	-00°57'49"	7.5	18:15	18:19	18:35	AB	5.6 + 7.7	12.5"
57 Aql	HR 7594	Aql	19h54m38.1s	-08°14'14"	6.5	18:05	18:20	19:00	AB	5.7 + 6.5	35.7"
73 Oph	HR 6795	Oph	18h09m34.0s	+03°59'36"	5.7	18:15	18:22	18:40	AC	5.7 + 12.6	68.0"
Arrakis	HR 6370	Dra	17h05m19.9s	+54°28'17"	5.8	18:10	18:25	19:30	AB	5.8 + 5.8	2.6"
HD 158868	SAO 30413	Dra	17h28m57.8s	+50°52'13"	7.9	18:10	18:25	19:05	AB	7.1 + 8.1	3.0"
Ascella	Zeta Sgr	Sgr	19h02m36.7s	-29°52'48"	2.6	18:05	18:27	18:50	AC	2.6 + 10.0	72.7"
20 Dra	HR 6319	Dra	16h56m25.3s	+65°02'22"	6.4	18:10	18:31	20:15	AC	6.4 + 4.9	376.0"
Deneb el Okab	Epsilon Aql	Aql	18h59m37.3s	+15°04'04"	4.0	17:55	18:37	19:15	AB	4.0 + 10.1	124.6"
Gamma Sge	12 Sge	Sge	19h58m45.5s	+19°29'32"	3.5	17:55	18:41	20:45			
HIP 97496	STF2585C	Sge	19h48m58.3s	+19°08'37"	9.6	18:25	18:41	19:40	AC	5.0 + 9.0	8.3"
Omicron Dra	47 Dra	Dra	18h51m12.3s	+59°23'19"	4.7	17:55	18:42	21:10	AB	4.7 + 7.9	36.5"
STF2438B	ADS 11897B	Dra	18h57m28.5s	+58°13'32"	7.4	18:10	18:42	21:20	AB	6.5 + 7.4	0.8"
HD 161692	SAO 8876	Dra	17h39m43.7s	+72°55'42"	8.1	18:10	18:43	21:25	AB	8.1 + 9.4	1.1"
HIP 97433	STF2603B	Dra	19h48m11.0s	+70°16'09"	6.6	18:00	18:44	23:15	AB	3.8 + 7.1	3.2"
SAO 9002	PPM 9710	Dra	18h01m16.7s	+79°57'56"	8.2	18:10	18:46	01:15	AB	5.7 + 6.2	18.6"
HD 717	SAO 128631	Psc	00h11m35.5s	-03°04'41"	7.6	18:05	19:28	23:25	AB	7.6 + 9.4	7.9"
Theta Per	13 Per	Per	02h44m12.7s	+49°13'40"	4.1	17:55	22:01	04:50	AB	4.1 + 10.0	20.5"
HR 4892	HD 112014	Cam	12h49m06.4s	+83°25'05"	5.9	18:00	22:44	06:00	AB	5.4 + 5.9	21.3"
HIP 24417	STF 638B	Cam	05h14m19.3s	+69°49'19"	9.0	18:15	22:44	05:25	AB	7.2 + 9.3	5.2"
HIP 45038	STF1306B	UMa	09h10m23.4s	+67°08'05"	8.2	20:45	22:44	01:35	AB	4.8 + 8.9	4.6"
Tau UMa	14 UMa	UMa	09h10m55.3s	+63°30'48"	4.7	21:10	22:44	06:10	AB	4.7 + 10.3	54.2"
23 UMa	HR 3757	UMa	09h31m32.0s	+63°03'43"	3.7	21:30	22:44	06:15	AB	3.7 + 9.0	23.2"
HIP 23605	STF 625B	Cam	05h04m33.5s	+58°51'37"	10.0	21:00	22:44	23:00	AB	8.0 + 10.4	4.8"
29 Cam	HR 1992	Cam	05h50m33.8s	+56°55'08"	6.5	18:25	22:44	06:00	AB	6.5 + 9.5	26.1"
PPM 29396	HIP 22289	Cam	04h48m01.5s	+53°06'58"	9.6	18:35	22:44	23:15	AB	7.6 + 9.4	20.7"

I can now enter the object designations, via RA and Dec coordinates in most cases of the above example, into my DSC and ask the DSC to show me how to move my telescope to the object.

I many areas of our country, dew can be an issue that can stop an observing session if you are not prepared. To keep my laptop dry, I bought a medium moving box from Walmart and painted the exterior of it to help shed dew water. This keeps my laptop dry from dew.



I also have a small piece of 10 mil thick, transparent poly plastic that I can lay over my notes and papers on my observing table to keep them dry from the effects of dew. When I am ready to write an observation in my logbook or make a sketch, I can easily remove this plastic and replace it when I am done writing or sketching.

I've also invested in the Kendrick Dew Removal System (https://www.kendrickastro.com/dew_controllers.html#StandardDualChannelController). I can plug the dew controller into my 12V portable battery I take with me. Then affix the heating pads to my eyepiece, Telrad™ and 8x50 finder scope objective and eyepiece (https://www.kendrickastro.com/dew_finderheaters.html). I have a 9V secondary mirror heater to keep that mirror warm.

The third contingency plan is make sure you take enough layers of clothes with you so if the temperature does drop through the course of the night, you can put on additional clothes to remain comfortable. I learned this lesson the hard way. One night in August, I was observing at about 9,000 feet in elevation. The day time temperature was over 90^{o}. All I took with me to wear for the weekend were shorts and t-shirts. All I brought with me to stay warm at night was a light jacket. That night, the temperature plummeted to below 40^{o}. I froze that night wearing shorts, a t-shirt and the light jacket.

One time at that same location, the temperature dropped below 32^{o}. The dew that had settled on the wooden tube of my telescope was now a layer of ice. So be prepared to stay comfortable wherever you go observing.

With all the articles I have written, you now have my process to prepare, execute and complete observing outings. Next month I will start to discuss Astronomical League Observing Programs you might consider doing.