Operating Manuals

- Obsession 18UC telescope
- ArgoNavis and ServoCAT telescope controls
- MallinCam video camera
- Video display—recording systems

Preface

On receiving my Obsession 18UC (#10), I began putting together operating manuals and equipment specifications to help me when I get stuck, and Dave Kriege suggested sharing it with other UC owners. I wrote the manual to refresh my memory of facts and specifications, of various procedures and the steps that are required for setup and use of 18UC, ArgoNavis and ServoCAT, and my video imaging equipment. When everything was new—the scope, the navigation, the video—all of the steps could get overwhelming, and the manuals helped me get past that. I use my18UC a lot in combination with video display for public education. All of the photos included here show what can be seen from my light polluted back yard in northern Virginia with a MallinCam video camera attached to my 18UC (there are two exceptions, M51 and M101, which are from a dark sky site near Cherry Springs, PA). The pictures demonstrate pretty accurately what can be seen live on a TV monitor next to the scope. I hope the manuals will help others with all the various steps: setting up and collimating the 18UC, setting the AN/SC navigation system, employing video imaging systems, among other matters.

As an amateur I ground and figured 8 and 16 inch mirrors and did visual observing with home built telescopes without motorization for many years. Now I use an 18UC with AN/SC and find that the whole system demands a lot more attention. My astronomy experience and work with light microscopes in biomedical imaging have been useful, but having equipment specifications at hand and instructions to refer to has given me the confidence to freely use the equipment, rather than being intimidated and putting things off. I hope the manuals will give readers a boost as well.

Feel free to write me about errors and omissions so I can keep the manuals correct and up to date.

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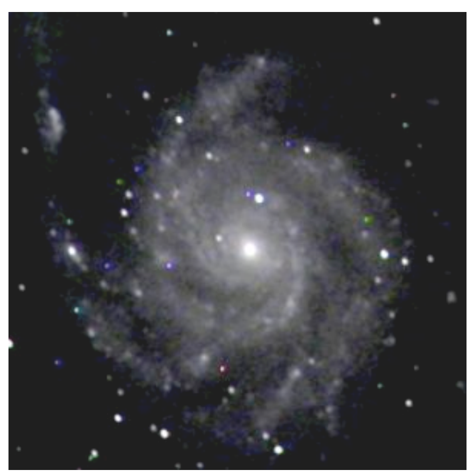
OBSESSION TELESCOPES 18" f/4.2 UC



Obsession 18 inch Ultra Compact Telescope (18UC)

Checklist Startup/Shutdown of 18UC
(Lithium batteries in SC handset are OK)
Wheelbarrow handles off first
Release elastic straps!
ALT Wire in position and free in channel—Check this!
Mirror sling positioned, centered, secured—Check this!
Poles and UTA mounted and tight—Check this!
Keep mirror covered until all is assembled—Remember this!
DewGuard plugged into 9V battery
Counterweight and eyepiece in place for balance! otherwise ALT drive not work well
ALT Encoder attached, jig-centered, and cable plugged in at encoder
SC remote receiver attached and plugged in
Daytime encoder check with AN—Check this!
Car battery hooked to 18UC via power cord
Battery/inverter switch on for accessories
2 SC toggle switches on
Collimation
Shroud, Baffles, dew shield mounted
Gears engaged and SC function checked using remote hand-pad. GO!

Detailed steps for setup
wheelbarrow handles removed
straps undone
truss poles with plastic trash bag over head ends
attach bottom ends of poles to virtual mirror box (VMB) by simply holding the bunch of poles together in your arms begin and fastening screws (do the short rear one first), then remove bag,
attach UTA at upper end, stand at focuser, grip UTA handle and attach rear screw to left, then screw by focuser, finally screw opposite
Check tightness of screws, esp. as temp drops and metal contracts (must be tight before AN and 2 star align)
Attach encoder tighten arm loosely, and use encoder jig to center:
scope at 45°, tighten lower nut; scope at zenith, tighten upper nut; plug in com cable tighten screw that fastens bracket to encoder arm; bottom 2 screws are loose;
<u>see Steve Robinson's instructions for using jig to center encoder on following pages</u>
Remove mirror cover, stow mirror towel in plastic bag, cord used for AN cables
slip on shroud, bottom of shroud is left loose until after collimation, twist remaining in the plastic hoop will go away; insert stick-rod for shroud in rear truss pole attachment
mirror's light baffle mounted; make sure sun cannot reflect off mirror
UTA light baffle attached
attach quilted reflective plastic dew shield (auto windshield sun deflector from Advanced Auto Parts), secure with elastic ribbon

AN computer mounted on truss pole; AN cables attached at base at the protection circuit terminal, gray connector to gray socket, others plug in by default.
SC remote receiver mounted and antenna pulled out, switch is flipped in direction towards tip of antenna for control by the hand-held remote
counterweight or MallinCam (just one) added to UTA
Attach 10x50 finder scope to UTA (replaces Telrad)
Remove sock from secondary
Check for tightness of truss pole mounting screws
loosen ALT, AZ drives
Mount reticule eyepiece with 2 inch adapter, and align finder on moon or a bright star, or distant object; object should be in center of crosshairs of eyepiece, then adjust position of finder

Collimation: quick review
Use centered alignment for collimation, using center dot on the secondary and primary mirrors. See refs, Vic Maynard and Nils Olof Carlin. Doing this keeps the tube axis superimposed on the optic axis and avoids an alignment error of up to 12'. (Important for GO-TO accuracy using camera with narrow FOV. Although it is centered alignment is not in favor, it doesn't seem to impact the video images any.)
Preadjustment: Mount the sighting tube and adjust the secondary so that crosshairs line up on dot on the secondary mirror and the secondary's perimeter is round.
Astrosystems II laser-collimator mounted, so head of collimator remains inside focuser collar and scope aimed at 60-70° Alt
adjust secondary mirror screws so laser spot hits the center of mirror inside the red triangle sticker
attach collimator's flat phosphor screen or else Glatter's Blug and align primary mirror's 3 adjustment screws to center dark circular image from primary on the laser exit hole on phosphor screen, repeat until return beam goes in laser's exit hole
With OMI mirror you see 4 diffraction spikes on face of collimator from the small x engraved on the center of the mirror. Note: if using video, be sure to advance the primary's adjustment screws to their extended positions (near maximally advanced) This is required so the focal plane reaches out to faceplate of MallinCam camera

Encoder test
SC drives disengaged and scope freely moving
Before testing, walk scope around in a circle, especially important if scope is on a lawn or field. The scope must have a solid footing before aligning, TPAS and GO-TO's are done. Assure the feet (bolt contacts) make firm contact with the ground, otherwise alignment and pointing accuracy won't work well.
Point scope to zenith, select /Mode Encoders on AN, and hit enter; move scope in altitude down to 20° and back up to zenith
Then focus on distant object in a reticle eyepiece, walk scope around 360° in azimuth. Make sure Az values return to zero when original ref points are seen in the eyepiece.

Instructions, Steve Robinson's jig
for encoder placement on 18UC

Jig instruction sheet:

Note the following jig features: the encoder shaft hole at one end, the hook at the other,
the serial number.

A note about the altitude bearing. This is the part of the telescope that rides on the teflon
bearing. It is the piece that rotates as the telescope is raised and lowers. It forms a part
of a circle. The procedure below fixes the encoder shaft at the center of the circle formed
by the altitude bearing surface. That is the point of minimum lateral motion for the encoder.

1) assemble the telescope without the encoder hardware.
2) bolt the encoder bar onto the Alt Bearing. very gently tighten the two wing nuts. I will refer to these wing nets as the lower and the upper.
3) Rotate the telescope until the scope is at 45 degrees to the horizon.
4) loosen the encoder nut so the encoder can slip on the encoder bar.
5) fit the jig shaft hole over the silver encoder shaft such that the serial number is on the same side as the encoder shaft.
6) fit the hook onto the alt bearing as close to the encoder bar as is possible. Note that in doing this, the encoder will probably move up or down the shaft slot on the encoder bar.
7) tighten the encoder nut onto the bar at the place it is positioned by the jig.
8) Now tighten the lower wing nut holding the encoder bar to the alt bearing.
9) remove the jig
10) point the telescope straight up
11) fit the jig shaft hole over the encoder shaft with the serial number away from you (same as before, but this time the jig hook is placed at the alt bearing joint on the right side of the altitude bearing.
12) gently push the jig until the hook touches the alt bearing.
13) tighten the upper wing nut holding the encoder bar.
14) remove the jig and store in a safe spot.

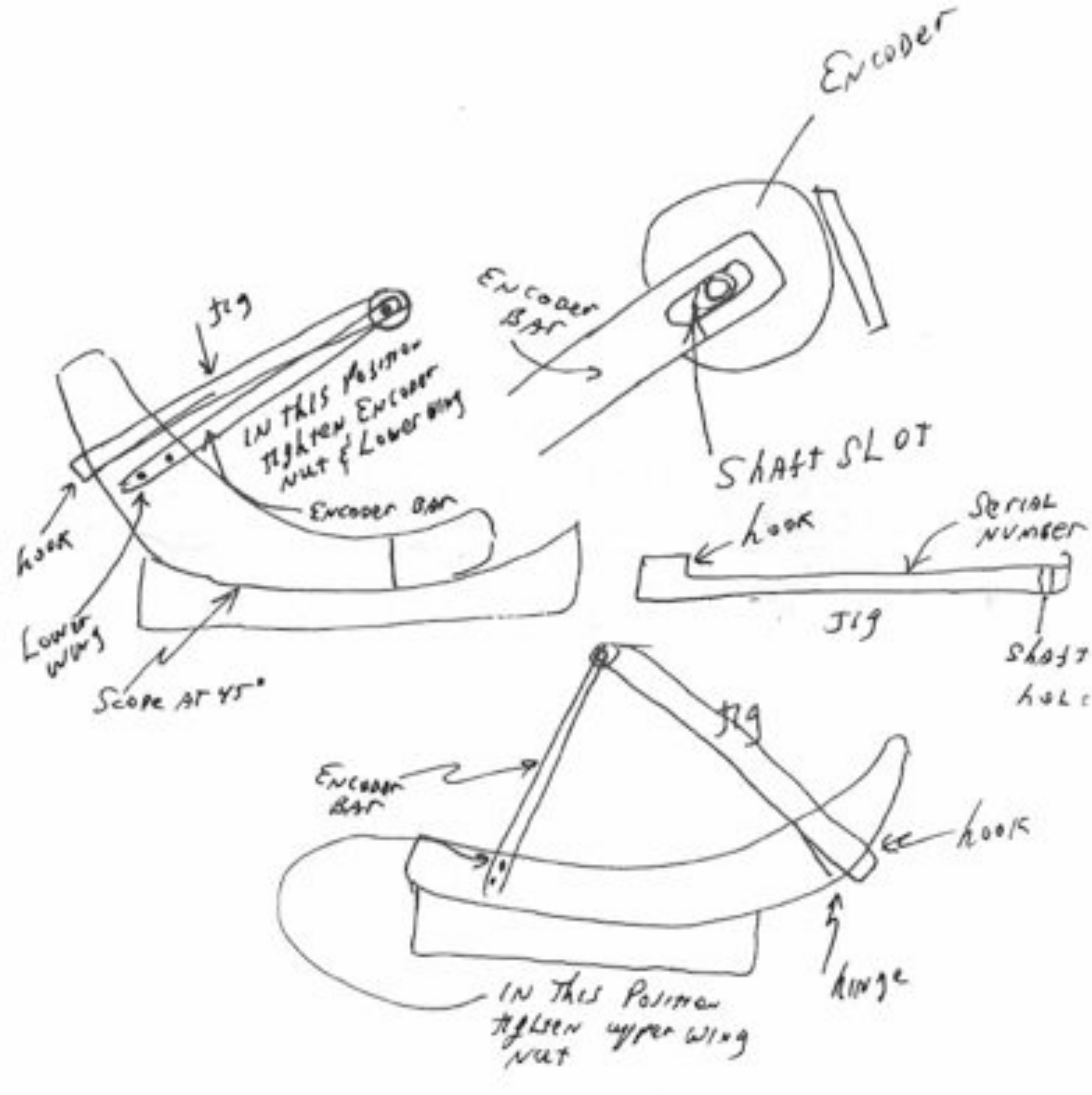
The encoder is now fixed at the center of rotation of the alt bearing.

now fit the double slotted side of the encoder arm onto the bolts below the alt bearing.

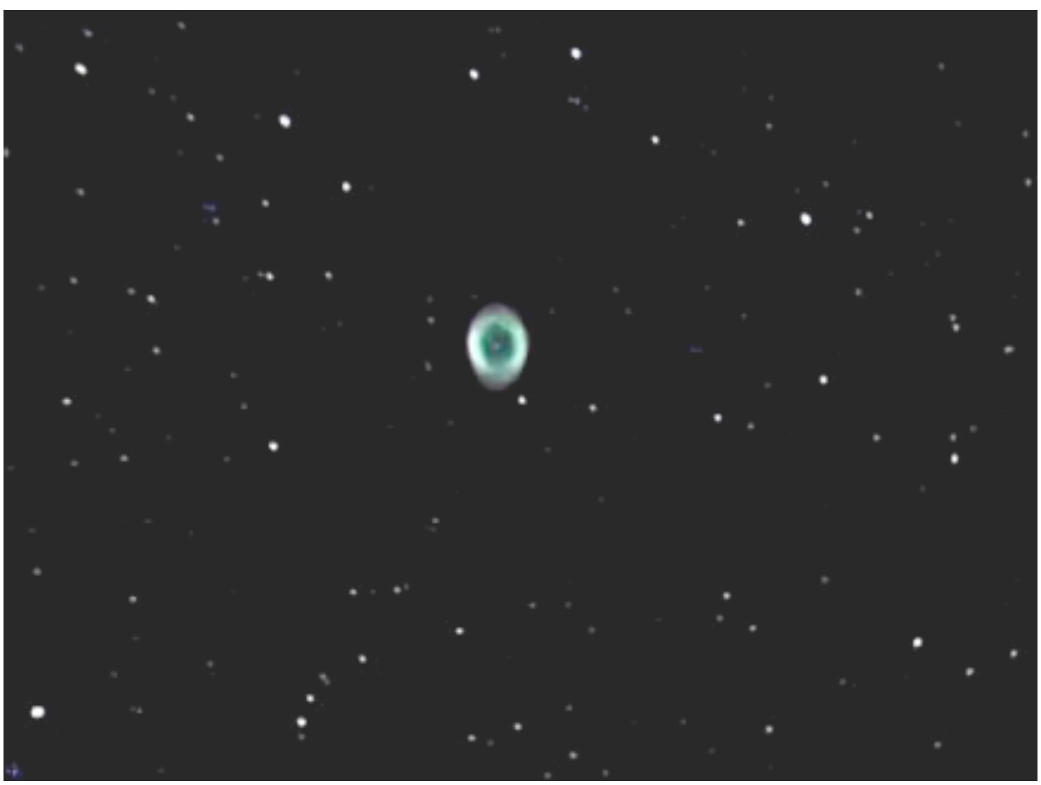
Then fit the shaft coupler onto the encoder shaft. Don't push the coupler all the way onto the encoder shaft, or it may bind. Push it on only to the point where tightening the screw on the coupler will engage the encoder shaft. Pushing it further may induce binding. If you experience binding, play around a bit with the shaft/coupler position until no binding occurs.

This procedure assumes the encoder itself is working, and the encoder bar and encoder
arm are not bent. If the above process does not result in very good encoder behavior,
1) either the coupler is pushed too far onto the encoder shaft
2) the encoder arm is bent (with the coupler)
3) the encoder bar is bent
4) the encoder is broken

The most likely problem to be encountered is probably addressed by the jig. Next is probably a slight end in the encoder arm (the metal is thin). Next is a problem with the encoder itself, followed by a bend in the encoder bar.


Encoder
Encoder Bar
Shaft SLOT
Jig
IN THIS Position tighten Encoder nut & Lower wing
Encoder Bar
Hook
Lower wing
Scope AT 45°
hook
Serial number
Jig
Shaft hole
Jig
Encoder Bar
hook
hinge
IN This Position tighten upper wing nut

Power on and start AN-SC (routine use; details on AN and SC are given below)
SC drives are disengaged and scope freely moves
Before beginning, check that 2 SC toggle switches at off position at rear of scope. (helps avoid voltage surge and popping power cable fuse)
Attach18UC power cable to cigarette lighter socket on 12V storage battery, be sure red light on the power cable's connector lights up, indicating power cord is functioning; If no red light, check the fuse in cable's plug;
Plug other end of cable into ground board at base of telescope
Now turn on SC toggle switches at rear left of scope, first the left one, then the other
Watch the LED lights at right rear of scope when turn on switches: see green light at lower right, then adjacent yellow light blinks 5 times, followed by steady green light
Now OK to switch on AN computer unit
AN display reads "Mode Fix Alt Ref", point scope to zenith, use a small bubble level to bring UTA top surface perpendicular to vertical
Also if ground has slight slope, align Alt axis perpendicular to axis of high-low gradient
AN display should read "+90°", auto adjust is "on"
press enter and see AN flash "OK" momentarily
Exit and select Mode Align Star



ArgoNavis 2 star align (details are below)
Mode align star, I first pick Polaris, center in reticle eyepiece and hit enter
Then I find another bright star so that positions of 2 stars together with the zenith point define large equilateral triangle.
Before engaging drives and proceeding in finding objects, do this alignment check: Mode Catalog, bright stars, pick Polaris again, enter, move scope back to Polaris; center in reticule eyepiece; check accuracy from readout on AN display. If alignment is off (>0.04?), go to Mode Align, enter, readout should say Polaris, then once centered, hit enter again to register the new coordinates. Do the same for the second star. the accuracy is usually very good
Engage Alt and Az drives (or wait for later if you are doing more alignments with the the quick TPAS proceedure)
Remember AN gives warning sound when selected object altitude >80° and <15°

Activate TPAS system (routine use; TPAS details are below)
This operation is optional but improves pointing accuracy 2X, important when using MallinCam video with 15 arcmin field of view; not needed for visual use of scope using eyepieces; see the TPAS section of the AN manual for full description of procedure; the following describes what must be done after a TPAS calibration run has been made on a previous occasion. The routine setup requires getting coordinates of 5 bright stars positioned around the sky between high 75° and low 30° altitudes.
SC drives are disengaged
Mode setup, setup mount errors, acquire, check that sample mode set is "on"
Go to Mode Identify, enter button through several menus
select: star, +4 mag, all constellations, 360° arc, OK
Point to a bright star in finder, AN should indicate correct star, hit enter twice until see description, toggle the center dial for "sample mount error" (display blinks), align star and hit enter, then hit exit button once to go back to Identify
Identify next new star and repeat the process for 5 stars. Can also include and reuse the 2 stars that were used for initial alignment
(optional: Return to Mode setup, Setup mount errors, review data, enter and see the raw deltas. Eliminate stars with deviations > 30 arc sec. Hit enter again to eliminate a "bad star")
Define model: Use current calculated data for IE value (typically ±2), and use NPAE preset value (-12.8 arcmin established on earlier TPAS calibration run).
Perform Compute and read out the errors on the stars if you wish. Hit enter again and check that IE=use now; NPAE=used stored value; other terms="don't use"
Exit Setup. With RMS of <7 arc min, about 50% of targets will appear in camera and virtually all will be visible in a low power eyepiece.
Check GO-TOs for a few objects or stars

Scope now ready to use.

Modifications to scope
Howie Glatter wire sling replaces Kriege's kevlar belt sling
Added Delrin spacers and longer eye-bolts to wheelbarrow handles to prevent the handles from pressing on the Alt motor mechanism
9x50 finderscope (Orion) replaces Telrad

Disassembly
It's important to learn a fixed routine and never deviate from it. There's lots to remember and the order is important. If you don't use a routine you can forget a minor step that can cause damage (broken encoders, crimped wire, popped powerline fuse, etc)

AN switched to off
SC power switches turned to off, first B then A, power wire unplugged from scope
power cord removed from battery (this reverse order avoids shorts)
AN removed and stored with cords attached
MallinCam cables removed and stored
TV and power cables packed and stored
dew shield stowed
elastic cord stowed
light baffles removed and stored
counter weight stored in box
finder scope removed, capped, and stored in box
check that Dewguard is unplugged from its 9V battery
check that laser collimator off, reticule eyepiece is off and returned to eyepiece box
bottom straps of shroud freed and shroud pulled up
Alt encoder undone and parts stored in encoder storage box
Mirror covered with microfiber towel, plastic cover and secured with elastic cord
shroud removed, twist hoop into figure 8, fold up shroud and store
UTA removed, plastic bag placed on tops of poles to prevent splaying, bottom screws to trusses removed and truss poles stored in shipping tube
straps attached tightly! Important, otherwise Alt drive wire comes loose
check that Alt disengaged and Az engaged
attach wheelbarrow handles

Telescope storage
Scope is stored disassembled in garage with wheelbarrow handles attached
rubber straps attached, in tight position, for transport, storage. If straps not tight, Alt wire jumps off bearing requiring you to remount the wire (below). Rear pair of straps on first hole, front pair of straps on second hole.
Altitude drive disengaged with strain off wire;
Azimuth motor disengaged

If Alt wire comes off track:
Lift entire virtual mirror box (VMB) off the rocker and base and place on carpet surface so not scuff up fiberglass laminate surfaces on bearings, screw in wire attachment at top of front end, wrap tightly and attach wire along the Alt bearing surface with several short pieces of blue painters tape, place back on rocker-base; check wire clearance in bearing slot by rocking the VMB back and forth and after removing the tape by sliding wire back and forth. Wire must be free.
Wrap wire twice around Alt spool or spindle, and attach remaining free end of wire at the Alt release lever. All of this can be avoided by keeping the rubber straps on tight (not snug, tight!) during transport.

Protecting mirror and scope
A microfiber towel is placed directly on mirror (under the mirror cover) to minimize dust, insect buildup. Do not rub towel on mirror, but OK to lightly drag towel over surface to remove big particles. Got the towels at Advance Auto Parts.
Pull a sock over secondary to keep dust off
pull a large plastic sheet over the scope to keep dust off

Stats: 18UC and OMI mirror
fl 75.2 inches (1905mm)
Enhanced aluminum coating 96% primary mirror from OMI; 98% multiple dielectric coating (Brilliant Diamond) on 1/10 wave secondary mirror from United Lens
OMI mirror f/4.2, 18 inches diameter, 2 inches thick
OMI operator, James Mulherin
Strehl ratio 0.98, RMS 0.022 waves at 550nm,
peak-to-valley error is ~1/15th wave
serial# 18-241-030608
Feathertouch 2-inch focuser
Telrad
Dew Guard

Quick Fringe Test Report

OPTICAL MECHANICS, INC.

PO Box 2313
Iowa City, IA 52244-2313
www.opticalmechanics.com
jcmulherin@opticalmechanics.com

Comments: Serial# 18-241-030608
Focal Length: 75.2 inches

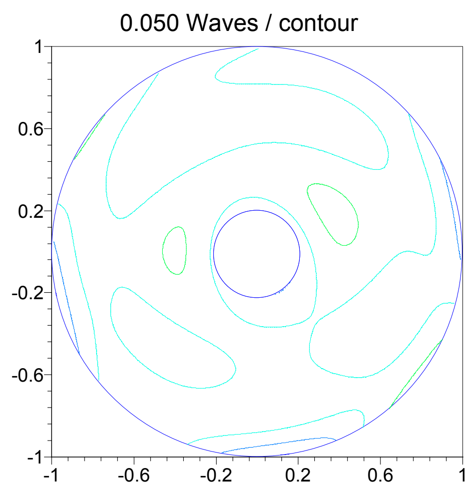
James Mulherin

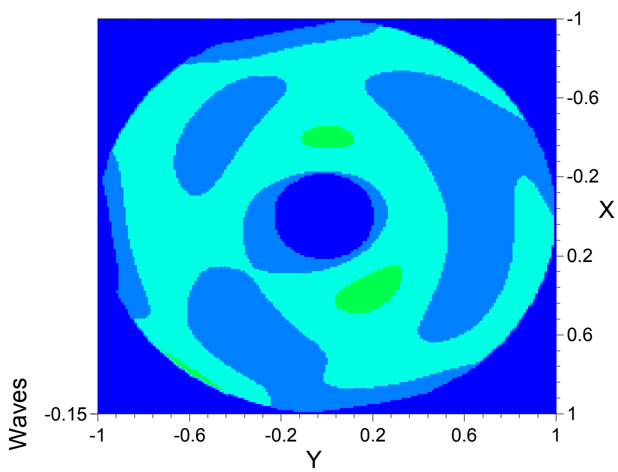
Digitally signed by James Mulherin
DN: cn=James Mulherin, o=Optical Mechanics, Inc., ou=Certification, email=jcmulherin@opticalmechanics.com, c=US
Date: 2008.04.06 11:30:25 -05'00'

Output Units: Waves

RMS	0.022
Strehl Ratio	0.98

Scale	0.50
Wavelength	550.0 nm
Description	OMI 18" F/4.2
Date Tested	March 6, 2008
Operator	James Mulherin
Comments	Serial# 18-241-030608





Eyepieces, collimation equipment
focal length of 18UC primary is 1905mm (75 in)

2-inch series

31mm Tele Vue Nagler Type 5	61X	(the pineapple)
28mm University Optics Pretoria	68X	(coma-corrected optics for f/4)
20mm Tele Vue Nagler Type 5	95X	
13mm Tele Vue Ethos	147X	

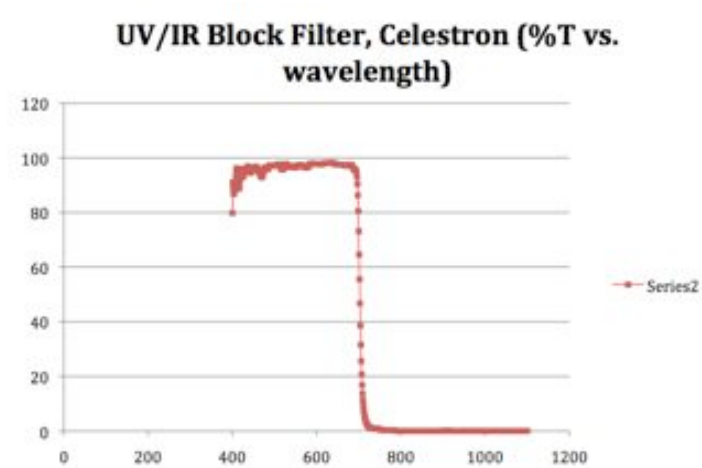
Tele Vue Paracorr parabola corrector (for coma correction)

1.25 inch series
23mm StellarVue reticle eyepiece, 50° FOV, 83X
with Rigel Systems PulseGuide illuminator

32mm Vernonscope Brandon	60X
28mm Edmond's Scientific symmetrical	68X
12mm Vernonscope Brandon	159X
8mm Vernonscope Brandon	238X
6mm Vernonscope Brandon	318X

2X Dakin Barlow (Vernonscope)

Filters
1.25 inch rotatable polarizer eyepiece with 2 crossed polarizing filters for viewing moon, Venus
2 inch Lumicon UHC narrow bandpass filter 1665 #02, 97%T for 486 (H-beta), and 496, 501 nm (Oxygen III)
1.25 inch UV/IR block Celestron filter on MallinCam (graph below) shows includes 656 nm H-alpha but excludes long wavelength IR and all UV below 400nm (broad bandpass)



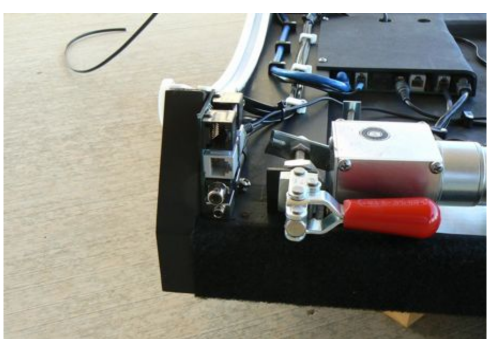
Collimation equipment
2 inch diam sighting tube, Catseye, Jim Fly
2 inch Catseye Autocollimator, Jim Fly (have not used much)
Astrosystem AstroBeam II laser autocollimator
Howie Glatter's Blug for 45° view of face of laser autocollimator

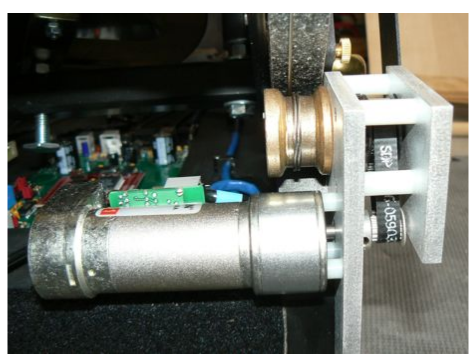
ArgoNavis and ServoCat: overviews

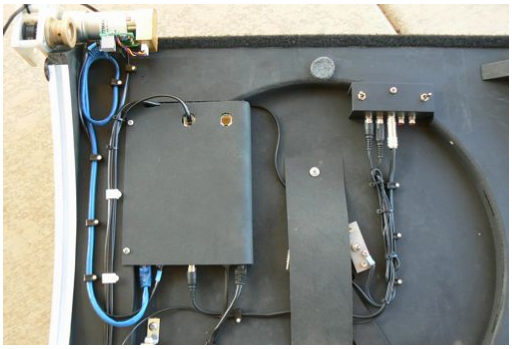
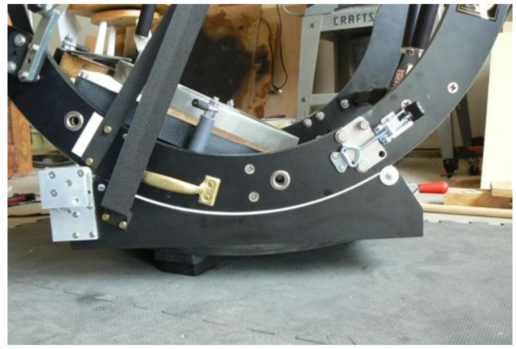
ArgoNavis (AN) is a computer module with 3 cables that connect into the safety control circuit of the SC system on the base of 18UC telescope. Select an object and AN shows degrees ±Alt and ±Az and arrows showing the directions needed to move scope to the object. The object catolog contains 30,000 objects, bright stars, planets, Messier objects, NGC and IC objects and more. Navigation can be done manually without SC or automatically under SC motorized control. There is a power cable, a serial cable that feeds info to SC from AN and an encoder cable that inputs info to AN from the encoders. AN has a detailed manual called Argoman that details AN setup, instructions for a practice run using AN attached to SC, and an important section on TPAS, a higher level precision alignment protocol. AN is made by Gary Knoff at Wildcard in NSW, Australia.

ServoCAT (SC) is a motorization system for automated telescope control for GO-TO commands and automated tracking. It consists of circuitry, mother board, on-off toggle switches, LED function lights, and interfaces with the power supply, encoders and AN, all mounted on the rocker-base of the scope. SC is essential for video-astronomy because images are each integrations lasting several seconds and accurate tracking is a must. SC is by Gary Myers at StellarCAT in Alta Vista, AZ.

There are Alt and Az encoders and servomotor systems for driving the Alt and Az directions of the telescope. The Alt movement works with a wire drive that follows along the entire Alt bearing and is wrapped by 2 turns around a motorized spindle. The Az movement works by a knurled wheel that makes firm contact with the edge of a rotating circular base. The encoders each have 10,000 divisions and provide approximately 0.02 degrees/step (2.16 arcmin/step). Tracking usually provides an accuracy of ± 1 step. For a video camera with 22 arcmin FOV on the diagonal (about 10 encoder steps) accurate tracking is required. The SC system includes a power cable that connects an external 12V battery to a powered ground board socket on the scope. The powered ground board provides power while allowing the base to rotate freely with no wire movement and foul up.





Setting up Obsession 18/UC with installed ServoCAT and ArgoNavis

1. Read and follow Dave Kriege's instruction guide first.

2. When mounting the dew heater on the back of the secondary mirror, leave space on the back for attaching the nylon safety cord. Look at Dave's sketch first. Place the mirror in the holder, fill with fluff, and insert the back plate. Open the secondary holder enough that the 4 dew warmer leads and safety twine are spaced along the edge providing enough space for you to cram the backing plate with its 3 adjustment screws into the holder so as not to abrade the wires. I just stuffed it in there fastened down the holder screws and it works. The Velcro tab at the spider is for holding the warmer's 9V battery, and you can read about positioning that. Dot the secondary using the template supplied by DK. This doesn't hurt the image and can help beginners. My secondary's center dot was off by 2mm from the laser beam from the Glattner laser collimator, but it doesn't seem to matter.

3. Place a black reinforcement ring on the primary as described. The black colored ring supplied by DK is much better than a white colored ring when using the Glattner laser collimator with the white reflective plate.

4. Mount the primary in its cell as described by Kriege. Note when you collimate with the laser eyepiece that the laser spot on the primary shifts by about 1 cm between vertical and 45° positions at first. Apparently, there are changing amounts of ft-lbs and torque on the UTA and truss poles with changing altitude and also the fact that the scope has 6 truss poles instead of 8 and is not completely rigid.

5. Collimation. To align the secondary, which you do by observing the laser spot on the primary mirror, use the laser collimator without its white magnetic face plate. You need to see the intense focused laser beam to do this. Note: the 3 adjustment screws for centering the secondary are pretty stiff to operate. To align the primary you don't need to couple a Paracorr or a Barlow lens with the laser collimator to do fine collimation. You should use Glattner's white

magnetic face plate, which has a small lens that spreads the beam perfectly so you can see a high contrast image of the black reinforcement ring on the white disk. (I have Jim Fly's red triangles for the Catseye collimators, which require you line up 4 images of triangle reflections, but I don't know if I will need this method as the laser collimator is so good.) You can adjust the position of the black ring day or night by yourself and without the bloog, but you do need the shroud to be off. Collimate first, then put on the shroud.

6. Counterweights. I used copper BB shot for air rifles, and it works well. Lead shot is pretty toxic stuff.
7. The new shroud fits snugly. I could barely get the slots in the fabric to fit over
8. the pole attachment knobs. Leave the top hem and tie string over the UTA ring.
9. The rip-stop nylon material does not seem to loosen up with wear and humidity over time.

ServoCAT details

1. Dave Kriege ships Obsession 18UC with several information sheets, CDs and DVD, cables and serial connectors from the manufacturers of ServoCAT and ArgoNavis. Don't get overwhelmed because you don't need all of this. On the other hand, there is no clear step-by-step instruction on what to do, and you have to dig some for a task that is ultimately pretty simple since the mounting has already been done.

2. Azimuth control. Before you begin hooking up and testing ServoCAT, first get familiar with the rocker base and drives, circuit locations, and placement of switches and jacks for cables. Look at the rocker platform and note the red handle—this is the azimuth engagement lever. When pushed in flush with the edge of the rocker board (it requires some force!), the bearing is disengaged, and the platform moves freely by hand. Look at the bottom of the rocker-ground board unit. As you move the lever in and out observe how a knurled metal wheel attached to the azimuth motor moves against and compresses the edge of the circular wooden disk and moves the scope in azimuth. When engaged, the lever sticks out 90°. This looks crude for a mechanism linked to a 10,000-step precision encoder, but it works very well. Don't worry about the wooden disk getting frayed or making dust that might damage the scope. <u>However, if the azimuth wheel is engaged and you see the scope is not moving, stop the movement immediately! The continued movement of the knurled wheel against the wood can rub out a notch on the board and cause the scope to be jerky when it travels through this location. It can also happen that the scope moves in some crazy uncontrolled way and wants to plow into the ground. If so, hold down any 3 buttons on the keypad to stop</u>. After a few seconds the handpad recovers and you can move the scope again. There is nothing on the StellarCAT videos you need to see about installing or connecting the azimuth drive because DK has already done the work. You also don't need to follow DK's instructions for

attaching the azimuth communication cables (bottom p 14 of his sheets) because this has already been done.

If there is no response when hitting keypad, check there is power (AN works and LED lights are on) and that the receive is plugged in right and has its toggle switch pointed in direction toward the antenna. If all OK, it could be that the lithium batteries in the handpad are dead and need replacing (see battery chart).

3. Altitude control. You do need to watch the StellarCAT video showing installation of the altitude cable along the bearing surface of the VMB. The video also shows how to double-loop the wire around the bronze roller attached to the altitude servo motor and hook it up to the tension mechanism on the bearing. Pay attention on how to move the red lever to the 90° position to disengage the motor drive for moving the scope manually. Not shown is how to release the lever by 180° to attach-detach the wire, correct for overlapping strands on the roller, or adjust the position of the wire on the roller. You need to learn how to do these things. Dave's instructions on the altitude mechanism on p14 are important. They describe attachment of the Altitude encoder arm and the associated reference arm on the Obsession VMB side bearing. All the details are there. As DK says, don't over-tighten the screws that hold the forked end of the reference arm as it needs freedom to move up and down during scope movements.

4. Notes on attaching the altitude wire on 18UC. This work involves moving the VMB on and off of the rocker platform. Since you put the VMB on the ground right on its bearing surfaces you need a carpet or pad to protect them. I would think it's a good idea to do this. I begin with the VMB resting on its pad next to the rocker. To attach the wire easily, first screw it down on the bearing's front top surface with the screw provided. You will need to position the wire in the middle of the bearing surface so you can lift the VMB and mirror with wire in place up and onto the rocker so that the wire winds up in the groove in the Teflon bearing surface. Next wrap the wire along the bearing and use strips of masking tape or blue painters tape to position and hold the wire in the middle of the bearing. Kneeling next to the VMB, lead the wire toward the rear along the outside of the bearing, lift up the VMB with the handle (easy to do one-handed) to position the wire along the length of the bearing. Tape the wire into position towards the rear end of the bearing with another wide strip of masking tape. After placing the VMB on the rocker, remove the tapes, and pull the wire back and forth to make sure it is free in the Teflon channel. The ServoCAT video shows how to do this. Then wrap the wire around the roller on the altitude motor and fasten, all as shown in the video.

   If you have the motorized 18UC the altitude drive definitely causes a storage vs. convenience-of-use dilemma. With the altitude drive wire installed, you don't really want to take it apart again to store it in the white storage box. But storage in the box is pretty dust- and humidity-proof and prevents repeated cycles of dewing of the mirror when the scope is not in use and is a very attractive option. If you leave the VMB on the rocker, which is what I chose to do, you can just wheel it around and up and down ramps etc, but I use microfiber towels and plastic sheets to protect scope an mirror from dust.

5. Note that the Alt encoder has a computer board and receptacle for the 4-conductor cable. This is a fragile area. I broke mine the first time out when the receptacle got caught on the inside of the shroud while moving the scope. After repairing the broken board, I reinforced the area with a layer of 5 min epoxy and a metal strip, which should help prevent damage in the future.

6. Attachment of communications cables to ports on the rocker platform. Next to the azimuth engagement lever at left rear corner of the rocker is a small 2" computer board mounted edgewise, the **"protection board",** with 4 cable receptacles arranged vertically in a row. This is the main input-output site for cable attachment to the scope. The board protects ServoCAT's main computer board should there be a problem with electrical connections to the scope. From top to bottom, the 4 receptacles are:

   i. Black receptacle for 6 conductor cable for ArgoNavis serial port #1
   ii. Gray receptacle for 9 conductor cable for the ArgoNavis encoder port
   iii. Connector for other accessory, like optional ArgoNavis power cord or fan
   iv. Bottom connector for ServoCAT control pod (both the wired or the wireless version)

7. The ServoCAT's powered ground board has a special socket at the very end of one of the 3 legs for attaching the power cord. The cord has a cigarette lighter plug on its other end for connecting to a battery. The floor mat used for moving the VMB is also useful for coving the cable running from the ground board to the battery and keeps people from tripping on the cord.

8. The ServoCAT remote receiver (has an antenna) and remote hand-held transmitter-controller both need to be modified by you in order to work. (There are FAA rules requiring you, not Kriege or Myers, to do the soldering if you use the remote feature.) Inside the receiver is a plastic wrapper with 2 small boards for the 2 units. You need a precision soldering gun (or ask a friend to do it like I did). The instructions for doing the soldering are included in Gary Myers' instruction sheets included with Dave's shipment. One board is for the receiver, and the other is for the remote controller hand pad with the yellow direction buttons. The soldering goes quickly and the units are strong and work well. Be sure to remove the paper tab that insulates the battery. If you use the wired hand pad, you use the 9' long cable to connect it to the bottom-most connector near the protection board and no modification is required at all. If you use the remote receiver, plug it into the same socket with its short pigtail wire. You can use a Velcro tab provided by DK to attach the receiver to the bottom Velcro'd edge of the rocker platform. Gary Myers has a video piece on the DVD showing

how the buttons on the hand pad work. Watch it. Check that the up button moves the telescope tube up and that the down button moves it down and that the clockwise and counterclockwise buttons also work.

9. Hook up the cables between Obsession and on the Argo pod as stated above. Now you're about done and ready to go.

10. Additional equipment. You need a good battery, and a good heavy duty solution is a 20 amp-hr power pack (12 A, 12 V peak power) with cigarette lighter socket. This would provide 4 nights of observing power before needing recharging.
Door mat covering power cable, to keep from tripping
Spare 10A 3AG fuse (fast burn glass fuse) for the cord to the powered ground board
A few ¼" push nuts for holding pole ends together—these might come off
Spare AA batteries (Argo) and 9V batteries (dew warmer)

11. My take on the following sheets about ServoCAT:
"ServoCAT startup and usage notes": some interesting points on use and operation,
"ArgoNavis/ServoCAT initial setup": The setup of AN for ServoCAT begins on p2 but is not the complete. You really need the AN manual. The section called "First setup after initial test" is helpful.
"Thanks for your purchase of a ServoCAT and GOTO system": the section on "connections" point 2 and "For UC owners" is helpful
"ServoCAT manual" from 2006: I did not use this yet; listened to DVD instead

ArgoNavis details

1. Gary Kopff has written a clear, thorough manual for the use of AN. The first 35 pages are a must. You can't use AN on your scope until after you have programmed it. The initial setup procedure takes just a few minutes and is described clearly on pages 11-23. Before you do this, you need your precise latitude and longitude. You can get it off the web at http://www.lat-long.com. I didn't have any trouble with this, and learning AN goes quickly.

2. To use Argo's Go-To command or identify modes, you first need to do a star alignment. This works well at night, but if you've set up indoors, you'll find you can fake the star align. It's fun to practice AN/SC functions indoors. Once done, the accuracy is amazing and ServoCAT moves the scope precisely.
Procedure indoors: Attach laser pointer to counter weight tube and turn on Mode fix alt ref and enter zenith position. Then turn on Mode Encoders. Lower tube until Alt reads 39° or whatever. Mark wall where laser hits (this will be Polaris). With the pointer on Polaris go to /Mode Align Star, dial in Polaris, and hit enter. In Stellarium software on a computer check out current the sky and pick a second favorable star, which together with Polaris and the Zenith forms a broad equilateral triangle. Get info for the star, which shows its Az and

Alt. On AN go to /Mode Align star /Bright star, dial up that star, and hit enter and mark its position on the wall with a piece of tape. You can now go to /Mode Catalogue, /Bright star, and hit GO-TO any star above horizon, except within forbidden zones you have set in AN. Southern hemisphere users will have to modify the procedure.

3. You can run the ArgoNavis computer pod on 4 AA batteries, but it is much more convenient to run a power line from the Argo computer down to the cable attachment area, namely, the second jack from the bottom on the rocker platform near the protection card. You can order the special Argo power cable from Gary Myers at StellarCAT.

4. As DK the the two Garys advise, it's important to test the encoders for proper connection and slippage before doing a star align on Argo and to do this even when you know the scope well. Move the scope to the zenith and do a /Mode Fix Alt Ref and then a /Mode Encoders command. Move the scope from the zenith at +90° down to 45° and back again while checking the altitude readout on Argo to make sure it doesn't slip. Sometimes the slippage is only in one direction. If the altitude encoder slips, check the set screw on the encoder arm. Otherwise check the centration of the Altitude encoder hub. Check out the azimuth too. I can usually rotate 360° and return to an object in the eyepiece to within 1 encoder click.

Telescope pointing analysis system (TPAS)
This is a function of AN for improving the pointing accuracy of the telescope during GO-TO commands. Ref: p 115 of the AN manual (pdf document)

TPAS procedure—Doug Murphy's notes for Obsession 18UC—10/23/09

Fix alt ref and 2-star align as per usual

A TPAS run is involved but significantly improves the pointing accuracy of the scope. You will need to read Gary Kopff's manual to understand the details. You begin by acquiring position data on 20-30 stars. You will use /Mode Setup, /Setup mount errors for this, which has 5 submenus (Acquire, Define, Compute, Review, Set error values). You will need all of these menus. A good 10 x 50 finder scope and illuminated reticle eyepiece are helpful.

Go to /Mode Setup, /Setup Mount Errors, /Acquire and put "sample mode set" to "on". Then go to /Define and set IE to "compute", set NPAE, ECEC, ECES, CA to "don't use" using AN's dial to toggle between the two choices. These are the 5 terms that can be used for altazimuth mounts like 18UC. Depending on your star data you will eventually decide to use none, one, two, or up to 5 of the terms in a pointing model. On my 18UC I wound up using only IE and NPAE, and ignored the others. The criteria for deciding which terms to pick are given below. You first collect data on 20-30 stars before calculating the terms. Then you let AN compute values for different combinations of terms, decide which is best, store and use some of the 5 terms, and then do your observing. Some terms (IE, CA) must be determined by measuring positions of 5-8 stars each time you set up the scope; others (ECEC, ECES, NPAE) are considered permanent, get stored by you in nonvolatile RAM of AN after the initial 30 star run, and get automatically used every time you power on AN. The procedure takes a whole evening and needs sustained battery power, so don't use AA batteries for AN, use a good power source. You might wind up doing this on a few evenings until you are comfortable and confident in your numbers and in what you're doing.

Collect the star data. Go to /Mode Identify, aim at a star, click the enter button through several menus: select "star", +4 mag limit, all constellations, and 360° arc. Disengage the StellarCat drives for this so the scope moves freely by hand. The name of the star will show, you click enter twice until you see "description". At that point move the dial one click to "sample mount error" (display blinks) and with the star centered well, click enter. Read the AN manual p129 about the meaning of the errors etc. that are displayed. That's your first star. Neither of your 2 alignment stars counts in any of this, but you can revisit and re-enter them again for TPAS under "sample mount error" if you wish. To bag the next star, click the exit button once and re-aim at a new target. New star names show as you move the scope across the sky. Click the enter button twice, AN should now show "sample mount error", align the star precisely, and click enter to grab that star's position. There, that's the second star. Repeat for 20-30 stars. /Mode identify is very accurate but sometimes it screws up, so always be careful the star and corresponds to the name. If there are mistakes there is a way to delete bad measurements (see below).

If this is your first time, settle for just 10 stars so you can see what the method feels like. If you're like me you will need 2-3 nights until you get good. I use a 10x50 finder telescope with crosshairs to align on target stars. I pulled off the Telrad and replaced it with the 10x50 finder. The Telrad didn't have the precision required to get the star into the FOV of the 23mm eyepiece quickly. The eyepiece I use is a 23mm Stellarvue reticule eyepiece that cost $120, with the red LED crosshairs illuminator. This combo works great. If you get this system order up a bunch of batteries from a photography shop or a website like Digikey.com. See battery list.

Now review the star data to throw out some bad apples before running some calculations. Go to /Setup, /Setup mount errors, **/Review data**, enter, and you can rotate the dial to see your stars and their position errors shown as Δ. If you have a star with crazy data with something like >1° push enter and enter again to delete. I have not accepted stars with errors greater than 30 arcmin. Picking a rejection limit is a tough call because some areas of the sky going to be off more than some others. On my 18UC the errors are typically 10-20 arcmin (5-10 arcmin with stabilizer bars), with some less and some greater than this range. I draw the line at 30 arcmin which is 2-3 times the typical error. Read the manual to see more on the /Review data command.

Time now to write down numbers calculated by AN. A headlamp is helpful here. Go to /Setup, /Setup mount errors, /**Define** and hit enter and for starters select "compute" for just the IE term and set the other terms to "don't use". Then under /Setup mount errors, go to /**Compute** and hit enter to initiate calculations, and you will see numbers scroll across the screen, rotate the dial by hand to read and record each term. For the IE-only-model you see values for RMS, PSD, and IE. Write down all of the numbers and read the manual about this. Now go back to /Define again and select "compute" for additional combinations of terms you want to use. Generally, always include IE in the models. Then do a /Calculate action for each combination and write down these values too. Leave all the equipment on (if you turn AN off at this point you will lose all of the sampling data!!!), go in the house and look things over, take your time even if it's for an hour with AN running, and decide on what to use in a model. The highest priority is to use a minimal combination that significantly reduces RMS and PSD. Recording and reviewing your numbers and thinking about things takes about half the time of the whole TPAS run. Don't rush it. You will probably wind up contacting Gary Kopff and review info on the websites to decide if the values are significant enough to include. Here's a set of numbers from my first TPAS run for my 18UC. I recorded about 18 stars.

IE
RMS 6.2' (was 15.1')
PSD 7.1' (was 15.1')
IE 13.8 ±1.5

IE + NPAE
RMS 5.7 15.1
PSD 6.8 15.1
IE 13.9 ±1.4
NPAE -15.3 ±8.8

IE +ECEC
RMS 6.2 15.1
PSD 7.4 15.1
ECEC -5.9 ±19.0
IE 17.8 ±12.9

IE +ECES
RMS 6.2 15.1
PSD 7.4 15.1
ECES 6.1 ±20.9
IE 9.4 ±15.4

IE+ECES+ECEC
RMS 6.2 15.1
PSD 7.7 15.1
ECEC (forgot to note) ± (forgot)
ECES -26.0 ±174.2
IE -29.3 ±157.8

IE +CA forgot to do this one

IE +CA +ECES
RMS 5.7 15.1
PSD 7.1 15.1
CA 20.1 ±11.8
IE 9.5 ±14.2
ECES 59 ±19.4

IE+CA+NPAE
RMS 5.7 15.1
PSD 7.1 15.1
CA 111.6 ±213.7
IE 13.9 ±1.4
NPAE -90.5 ±159.5

IE +NPAE +ECEC +ECES
RMS 5.7 15.1
PSD 7.4 15.1
ECEC -28.6 ±145.5
ECES -25.4 ±160.5
IE 51.7 ±215.0
NPAE -15.3 ±8.8

From this and 2 other runs, I eventually decided to use a model for my scope based only on IE + NPAE. In this particular run adding IE did the most good, adding NPAE didn't add that much more, but it did help on later runs, so that's what I do now. Read the manual to decide what terms to use or not use.

Now to activate these terms and do some stargazing. Dial up /**Define** and select "**compute**" for IE and NPAE and set the rest to "don't use". Go to /**Calculate**, enter, and see the numbers come up as before. But **now hit enter again**, and by rotating the dial see three choices to: "use now", "use now and save", and "don't use". For **NPAE use "use now and save"—**the value goes into permanent RAM of AN. for **IE pick "use now"—**the value will be used during this evening but won't be saved when you turn off AN. Read the manual on this point. Now hit escape button, go back to Mode Catalogue and enjoy looking at some DSOs. Setup mount errors has another menu called /Set error values which is for removing and entering numbers into the permanent RAM by hand. You can read about that in the manual.

The good news is you now have a value for NPAE for your scope that you can use in the future. On your next outing you would turn on AN, do the usual /Mode fix alt ref, use /Mode star align to do the normal 2 star align. Then do these extra steps to use added accuracy of TPAS. Remember you're going to acquire star data and calculate a new IE and use the old NPAE (or whatever other values you decide on). Go to /Mode identify just as you did before and enter fresh positions for 5-8 stars. Check the /Define menu and make sure you have IE at "compute" and NPAE at "fixed value" and put the other terms to "don't use", go to /Calculate and press enter (this step's important as it generates a new IE value for that evening's setup of the scope). Press enter again and make sure you have "use now" selected for both IE and NPAE and that's it. Then go to /Mode catalogue and enjoy looking at stars.

Here's the improvement: from the data in the list above (IE + NPAE model) the RMS is 5.7' radius, or 11.4' diameter. This size of FOV is the relative pointing error (root mean square of the error) or 1 standard deviation, the area within which 68% of objects would appear in the eyepiece. 2 s.d. or an area 22.8' in diameter, would include 95% of objects; and 3s.d. or 34.2' diameter would include 99% of your go-to targets. Notice that the 5.1' fitted value for radius is about 3 times smaller than the 15.1' raw value. So the improvement in pointing accuracy is about 3 times. In the reticle eyepiece with 23mm focal length and 40' diameter FOV, virtually all objects would come into view. Using TPAS is definitely worth it for me. But the FOV of my camera is only 16 x 20 arcmin, so I would still like to improve the pointing accuracy. We'll see. By the way, the FOV in arcminutes of your eyepiece is (apparent angular FOV for the eyepiece/mag) * 60 arcmin/degree. There are fancier formulas, but this will do.

TPAS is definitely one of the more detailed aspects of running the scope that I've run into and maybe only worth doing if you need that extra level of pointing accuracy.

You should definitely read Gary Kopff's manual on TPAS p 115 while you're doing this, but the notes here will help get you going.

Procedure for running AN/SC with TPAS

/Mode Fix Alt Ref and /Mode Align Star for two star alignment as usual
SCmotors are disengaged
Check: /Mode setup, /Setup Mount Errors, /**Acquire data** is set to "on"
sample 5 to 8 stars using /Mode Identify, and use an illuminated reticle eyepiece to center stars
Under /Mode Identify "find star", faintest mag +4, any constellation, within 360° arc enter twice, rotate to "sample mount error", position star, and enter
Then push exit button once, position on a new star, enter and see "sample mnt error" again, enter to capture coordinates. Repeat...

/Mode Setup, /Setup Mount Errors, /**Define model**, enter
set IE=compute, NPAE=fixed value (-12.7 for 18UC), set other terms =not use. IE is not stored in memory and must be calculated each time you use scope; NPAE can be stored in memory and is reused by AN
/Mode setup, /Setup mount errors, /**Compute**, enter, see numbers read out
Move dial, read outputs for: RMS, PSD, IE, NPAE
RMS and PSD should both be about 5-7'; IE and NPAE RMS values should be (ideally) 2-3X larger than their s.d.'s, and the s.d.'s should be small
Enter again while still in /Compute, select "use now" for both IE and NPAE. This sets the terms to be used in a pointing model.
/Mode setup, /Setup mount errors, /**Review data**, enter
"Start of Data", and enter, to delete all the sample data
"End of Data", and enter, toggle to see the raw and fitted deltas (RMS values), or rotate dial to see sample # and delta value for each star used in sample.
Rotate dial to a sample star and hit enter to get option to delete that star.

The RMS is the root mean square, the mean deviation of the pointing error, and also represents the radius of a circle within which 1 s.d. (68%) of star targets will be found when the telescope is directed by AN on a go-to command. A circle of radius of 2 s.d. (2X RMS value) includes 95% of the stars; 3 s.d. (3X RMS value) includes 99% of stars. For my 18UC the average fitted RMS is 7.5' radius (15' diameter). The average raw RMS without statistical correction is 17.3'. Since the FOV of the MallinCam camera on 18UC is 16 x 20', this means that a little bit more than 1 s.d. of star targets will fall within the camera's FOV. Without TPAS the pointing accuracy is only about 25%. So TPAS definitely helps when using the small CCD sensor of the video camera.

Note to the forum on pointing accuracy

Hi Bob, I too have an 18UC with AN/SC. As Gary knows, I have worked hard to improve my pointing accuracy bit by bit over the past 2 years. I use a MallinCam video cam with a 21 arcmin field of view with focal reducer (along the diagonal), so pointing accuracy is important.

- I tighten and retighten the truss poles.
- I AutoArmor the bearings.
- I bought the Robinson jig for setting the alt encoder perfectly.
- I do the encoder check to be sure there is no slippage.
- Also, I center-spotted the secondary and set collimation using the center dots on both mirrors which superimiposes the optic axis on the geometric axis, which helps me alot with pointing.
- When setting AN I usually pick Polaris and another star so that the 2 stars and the overhead mark define a broad equilateral triangle. This has helped greatly.
- I then do a 5 star TPAS run using a fixed NPAE value from an earlier calibration run.
- I use a 20mm reticule eyepiece for positioning stars.

My fitted RMS error after all this is 7.5 arcmin; the raw value is 17.3. This means that about 2/3 of my targets fall within 7.5 arcmin of the center crosshairs and that works out to be about right. Targets are always visible in my 23mm finder reticule eyepiece which I sometimes must use to center for the camera. So my 18UC works well for me even though it is a portable ultra-compact Newtonian. Tell me if I can help out with any of this. Good luck! Doug Murphy, Leesburg, VA

MallinCam HP (MallinCam HyperPlus color video camera)

The MallinCam HP color video camera (green light version) is a great device for looking at details of dark sky objects (DSO's) on a color TV monitor or for demonstrating objects to the public at public outreach events. The camera has color video output in S-VHS or composite mode; the communication is NTSC video so 525 vertical TV lines of which 480 lines are used for image display on the TV monitor, the rest are used for blanking and registration. There are 60 frames (30 interlaced fields) per second. The camera can regulate exposures electronically down to 1/12,000th sec or can integrate numbers of video frames up to 7, 14, 28 or 56 sec. The TV video display is always 30 frames/sec, so the image is only semi-live, but the refresh after these intervals is frequent enough that you can see image movement, telescope drift, satellites and meteors so that the experience feels like real time, so the public senses that this is something that is really happening and not simply images downloaded from the web.

To make images brighter, you can integrate longer (best) or use automatic gain control (AGC), or increase the brightness (gain) on the monitor. It takes some practice to get used to balancing these variables on the camera-monitor system, but once things are familiar, things go quickly.

There are some accessories to the imaging system, like a focal reducer to get a smaller focal ratio, a personal media player recorders, digital video enhancer, frame grabber, that throw some confusion in the mix, but the benefit of having recorded digital sequences for showing people afterwards is well worth it. Frames can then be extracted, processed and displayed on computer or iPod. Remember the purpose of video is real time viewing on a TV, not high quality digital imaging.

Re: Mallincam resolving power and scope size. [Re: mistyridge]
#3932519 - 07/20/10 12:55 AM

Edit | Reply | Quote | Quick Reply

I agree with Chris. Resolving power turns out to be less important than other factors. For typical personal scopes (not sure what "typical" is, but let's just say up to 24 inches), the MallinCAM gives you views of objects about two to three times what you would expect from your aperture. In terms of color-grab, the multiplication factor is higher. In LP conditions, the multiplication factor is higher. Resolving limitations are rarely reached before some other factor is preventing a good view. And, resolving power with video is in different terms: pixilation. If your screen size is too big, the pixilation is more prominent. In terms of magnitude or surface brightness reaching power, the MC permits you to go several times further than your aperture would permit with an eyepiece. Another measure is structure of the object. In particular, the position, shape, and density of nebula or galaxy arms. Again, the MC does not change the physics of your scope, but it does permit you to see several times more structure detail by getting your eye out of the way and letting your eyes (both) see the enhanced image on a screen. The net effect is quite amazing. Hope this helps.

Operating procedures
First study the guidelines given below for viewing a DSO. After GO-TO, Sense-Up at 128 and Hyper switches off (2 sec integration) and focus on a star. On my 18UC, the camera' s position with 20mm extender and MFR3 is all the way in with only 2-3mm to spare. The Speco monitor also needs adjusting for max brightness/gain and offset turned to make background gray not black. At focus faint stars become visible. This takes some practice over a few months to make go fast. Then lengthen integration to 7 sec and make monitor adjustments, working towards optimum exposure. For convenience when beginning, keep exposures to 14 sec or less.

The hardest thing is getting objects in the FOV and getting and keeping them centered. If no object, remove camera and replace with reticule eyepiece. Then use the SC handpad to center objects. This is the hardest thing. If looking in Eastern sky and tube was moving in an upwards direction to reach object on a go-to, there is no slack in Alt wire and the fine movement up is immediately active with the handpad. But if tube was moving downwards to reach and eastern object, and the correction requires an upward movement, there is a refractory period, a hysteresis, before the wire is taught and active. Az movements are no problem. Reposition the camera, focus once again, and do further fine-tuning. This takes some experience, skill, and practice.

MallinCam Hyper Plus (MCHP) notes 1-29-09

For HYPER mode, SENSE UP must be set at 128X (128 frames/60 fps video frame rate = 2.1 s). Other possible integrations are 7, 14, 28 and 56 sec. 56 is the limit.
ALC/ELC
- Automatic level control (ALC)
  - planets, moon; auto adjusts for sky backgd
  - level command not work without connecting an electronic shutter

use for HYPER mode, **SHUTTER to off, level full right**

Electronic level control (ELC)

In HYPER mode, ELC needs SENS UP at 128X

Movement to left reduces brightness

AGC to off for planets, moon

Manual position for DSOs. HYPER requires MAN position, slider in middle

OFF planets, moon

ON daytime viewing

OPTION, PRIORITY select ACG or **SENS**

OPTION, APC automatic pixel control for sharpening + blooming

Normal is slider at midrange position (V and H) or **1 click from bottom**

EXIT, SAVE press middle button

Tips

- When the camera is in the ALC mode, it automatically adjusts the output for variations in sky brightness and background lighting levels.
- When using the HYPER Mode, ALC/ELC must be set to ALC, the SHUTTER must be OFF, and the LEVEL function must be set to FULL RIGHT
- ELC should only be used on a MallinCam HYPER when observing and imaging up to the 2.1 second maximum exposure time. Do not use ELC when 6 or 12 second exposure times are to be used on a MallinCam HYPER.
- In deep sky observing, many favor the gain set to the max to obtain the maximum power available from the CCD sensor. This setting is for live viewing only of faint objects.
- When using the HYPER Mode, the AGC must be set to MAN for use of the 6 or 12 second exposure limits. It is recommended that the LEVEL be set 1/3 to ½ from the Left initially and then adjusted to suit the sky conditions and the telescope being used.
- APC sliders (horizontal and vertical) to center position – OPTIONS sub-menu
- For Color camera, set W/B to MANUAL with BLUE +1 from the Middle Position and RED 1 or 2 from the Left
- LUNAR/PLANETARY VIEWING: TEC in OFF position

Note on gain adjustment (from Rock Mallin)

When the AGC is adjusted, the shutter is affected. The SENS mode reverts to zero and it takes about 3 minutes to built up the image and stabilize the AGC without going to overload. Every 2.1 second refresh is registered by the video processor where the image is build up to avoid sudden CCD sensor amplifier overload. This is a safety feature built into the camera and is normal for its operation. Therefore, it is important to run the camera <u>for several minutes in 2.1 second mode</u> after adjusting the AGC (Gain).

HYPER Startup Procedures

- TEC Switch to OFF position
- HYPER 6/12 Switch to OFF (Center) position

- Hook up all cables to camera – hook power cable last
- Apply camera power – green light should be on
- Depress the Center button of the On Screen Display
- Make the following Menu adjustments
- SENSE to 128X
- ALC/ELC to ALC with shutter OFF and slider to full right position
- AGC to MANUAL with slider 1/3 to ½ from the left
- APC sliders (horizontal and vertical) to center position – OPTIONS sub-menu
- For Color camera, set W/B to MANUAL with BLUE +1 from the Middle Position and RED 1 or 2 from the Left
- SAVE and wait 2-3 minutes for full image integration
- TEC ON
- Center object and focus
- Select 6 or 12 second mode for HYPER
- Observe

HYPER Shutdown Procedures

- Return HYPER switch to OFF (Central) position
- Turn OFF TEC
- Wait 2-3 minutes
- Disconnect camera power cable
- Remove remaining camera cables

Additional Notes

APC

- APC sliders to full LEFT disables DSP
- DSP OFF – no anti-blooming or sharpening, camera acts like a CCD imager
- DSP ON – anti-blooming and sharpening

COLOR

- Sky – black to light brown
- Test on Globular – soft yellow to white stars
- Test on M57 – Red outer and Blue/Green inner

TEC

- 2 Second Mode – Leave OFF normally, place ON to control warm pixels
- 6/12 Second Mode – Leave ON

LUNAR/PLANETARY VIEWING

- TEC in OFF position

MOON	
TITLE	OFF
SENSE UP	OFF
ALC/ELC	ALC 1000 to 6000
BLC	OFF
AGC	OFF
W/B *	ATW
SYNC	INT
OPTION	SET
ZOOM	OFF
EXIT	SAVE

PLANETS	
TITLE	OFF
SENSE UP	OFF
ALC/ELC	ALC 3000 T0 12000
BLC	OFF
AGC	OFF
W/B *	ATW
SYNC	INT
OPTION	SET
ZOOM	OFF
EXIT	SAVE

DEEP SKY - 2 SECOND MODE	
TITLE	OFF
SENSE UP	128X
ALC/ELC	ALC, SHUTTER OFF, SLIDER FULL RIGHT
BLC	OFF
AGC	MAN, SLIDER SET 1/3 TO 1/2 FROM LEFT
W/B *	ATW
SYNC	INT
OPTION	SET
ZOOM	OFF
EXIT	SAVE

DEEP SKY - 6 OR 12 SECOND MODE	
TITLE	OFF
SENSE UP	128X
ALC/ELC	ALC, SHUTTER OFF, SLIDER FULL RIGHT
BLC	OFF
AGC	MAN, SLIDER SET 1/3 TO 1/2 FROM LEFT
W/B *	MAN
SYNC	INT
OPTION	SET
ZOOM	OFF
EXIT	SAVE

* WITH THE COLOR HYPER START WITH W/B SET TO MAN, BLUE +1 FROM THE MIDDLE, AND RED 1 OR 2 FROM THE LEFT

MallinCam COLOR HYPER PLUS Specifications

POWER SUPPLY	12 VOLT DC Regulated at 435ma with Peltier Cooler
OPERATIONAL TEMPERATURE	-31 C to 52 C (-23 F to 125 F)
OPERATIONAL HUMIDITY	<90% RH
GAMMA CORRECTION	0.45 AND 1.0 Adjustable by OSD
VIDEO OUTPUT	1.1 Volt, P-P at 75 Ohms
ELECTRONIC SHUTTER	1/60th to 1/12,000 Second
S/N RATIO	62 dB with AGC OFF
GAIN CONTROL	0 to 20 DB (AGC)
RESOLUTION	570 Lines (Tested at 660 Lines)
SCANNING SYSTEM	525 Lines, 60 fields per second
CCD SENSOR SPECIFICATIONS	ICX 418 AKL-AB (Astronomical Grade Class 1-2) Col
CCD SENSOR TYPE	CCD with MicroLens Pixel Technology
IMAGE SIZE TYPE	1/2 Inch
SYSTEM	NTSC or PAL (ICX 419 AKL)
TOTAL PIXELS	811H X 508V (410K Pixels)
EFFECTIVE PIXELS	768H X 494V (380K Pixels)
SENSITIVITY	1,300 mV (Tested at Shutter Speed of 1/250th Secon
UNIT CELL SIZE	8.4 µm H x 9.8 µm V
CHIP SIZE	7.40mm H X 5.95mm V

Adjusting Obsession 18UC to work with MallinCam (a note to the forums)

Wanted to tell all how I adapted my Obsession 18UC to work well with MallinCam. This scope by Dave Kriege was meant to be a visual, ultracompact, portable scope with f/4.2 mirror. My initial problem using MallinCam was pointing accuracy with AN/SC, so that targets would fall within (on my scope at f/2.8) the small 16 x 20 arcmin area of MallinCam's FOV. I did experiments and made fixes to address that point. Pointing is important in video imaging, because my primary solution is to remove the camera, locate and center the object with an eyepiece, and remount and refocus the camera. If you do public outreach you can't have too many of those. As it stands presently, the f/ratio with MFR3 reducer and 10mm spacer is f/2.8 and the width of the camera's FOV is about 15 arcmin, about half a moon diameter. For 2/3 of my objects, the pointing error is 7.5 arcmin, meaning about this same proportion falls in the FOV of the camera on a GO-TO command. I can generally slew the scope some and fish in many more, leaving just a few where I have to mount the eyepiece etc. Here's what I did:

- Replaced Telrad with a 9x50 finderscope (Orion)
- Use 23mm eyepiece with illuminated reticle (Sellarvue). Important for accurate positioning of targets during setup.
- Front extended light baffle and dew shield using a windshield solar shade
- Howie Glatter's cable sling installed for supporting the primary mirror, gives quick faithful positioning
- I tighten and retighten the truss poles multiple times and collimate just before imaging. The falling temp makes the metal contract and loosens the fasteners. This includes the clamp screw on the Alt encoder.
- I wipe the bearing surfaces with Armor-All to eliminate "sticktion".
- I bought Steve Robinson's jig for setting the alt encoder of 18UC perfectly.
- I do the encoder check to be sure there is no slippage of the encoders.
- Also, I center-spotted the secondary and collimate using the center dots on both mirrors, which superimposes the optic axis on the geometric axis and helps increase pointing accuracy.
- To increase the in-focus distance for MallinCam, I advanced the primary in its cell by turning the bolts to their max. For a focal ratio of f/2.8 I did not have to shorten the truss poles.
- For the initial 2-star align on ArgoNavis I usually pick Polaris and another star so that the 2 stars and the overhead mark define a broad equilateral triangle. This has helped me greatly.
- I follow up with a 5 star TPAS run on AN, using a fixed value for NPAE from an earlier calibration run and a new computed value for IE. The average fitted and raw RMS values are 7.5 and 17 arcmin, a 2-fold difference and a 4-fold reduction in the area of the pointing field. TPAS is therefore essential to give acceptable pointing accuracy.

With about 2/3 of my targets falling within 6 arcmin of the center crosshairs, this corresponds to about ¼ of the diameter of the FOV of the reticle eyepiece and that works out to be about right. So targets are generally always visible in the eyepiece and about 2/3 of them are visible after GOTO on the MallinCam. The 18UC works well even though it is a portable visual scope. If I reduce the f/ratio it will help me even more. See recent photos posted under my name in the Photos section.
Doug Murphy, Leesburg, VA

Focal Reducer
MFR-3, a 0.5X focal reducer from MallinCam.

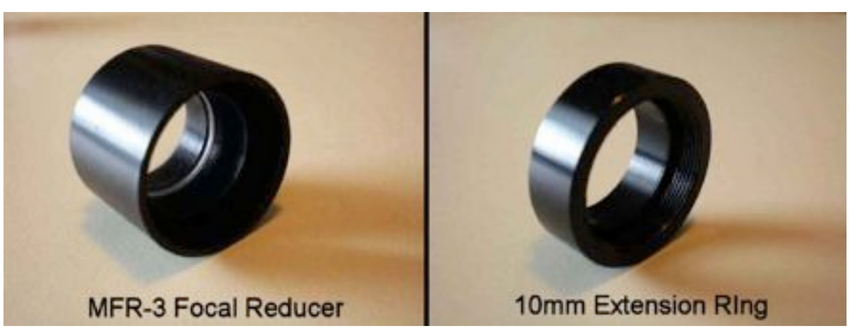
There are other reducers, like MFR5, from MallinCam and reducers from other companies like Meade and Orion, but these are generally for SCT telescopes. SCTs have long focal ratios like f/10 so to do photography with them you need shorter faster focal ratios from these reducers. For MallinCam a f/ratio of ~2 is ideal so a focal reducer is essential. At present with the MFR3 and a 10mm extender, I get conversion to f/2.8 which is OK.

In the future additional focal extenders could be added to the 10mm already in place. This would require using an alternate mounting bracket for the Feathertouch focuser to move the camera in towards the primary mirror more. I had this bracket custom made. Another approach is to use an MFR5 reducer (?).

The original MFR-3 was design for newtonian type telescope with F/5 to F/4.5 type which are the most popular on the market today.

If a telescope is F/5 (newtonian), the MFR-3 focal length is 76 mm, the MallinCam Hyper PLUS Color distance to the ccd sensor and MFR-3 with NO ring is 25.9 mm. The final focal length is exactly F/3.3 based on the link above supplied by Bill Wallace. Add a 5 mm ring spacer the F ratio is F/3.0. Add a 10 mm ring and the F ratio is F/2.6 Add 20 mm (two 10 mm ring) and the focal ratio is now F/2.0. To push things a little add an extra 5 mm to the 20 mm for a 25 mm distance and the focal length is now F/1.7

Web calculator for MFR3 without focal extender where f.l. = 25mm; focal reduction is 0.66X. Using 20mm focal extender focal reduction is 0.4X, giving focal ratio of f/2.2. Calculator is at http://timosastro.1g.fi/tools/focalreducer.html. For questions contact tpmetsala@gmail.com.



Finally, there is also an optical window (OW-1) that can be used in place of MFR-3 focal reducer. With MFR3 removed, the camera's face plate is exposed and can get dewed up. The window prevents this from happening but gives f/4.2 optics inherent to the primary mirror. The window is not anti-reflection coated.

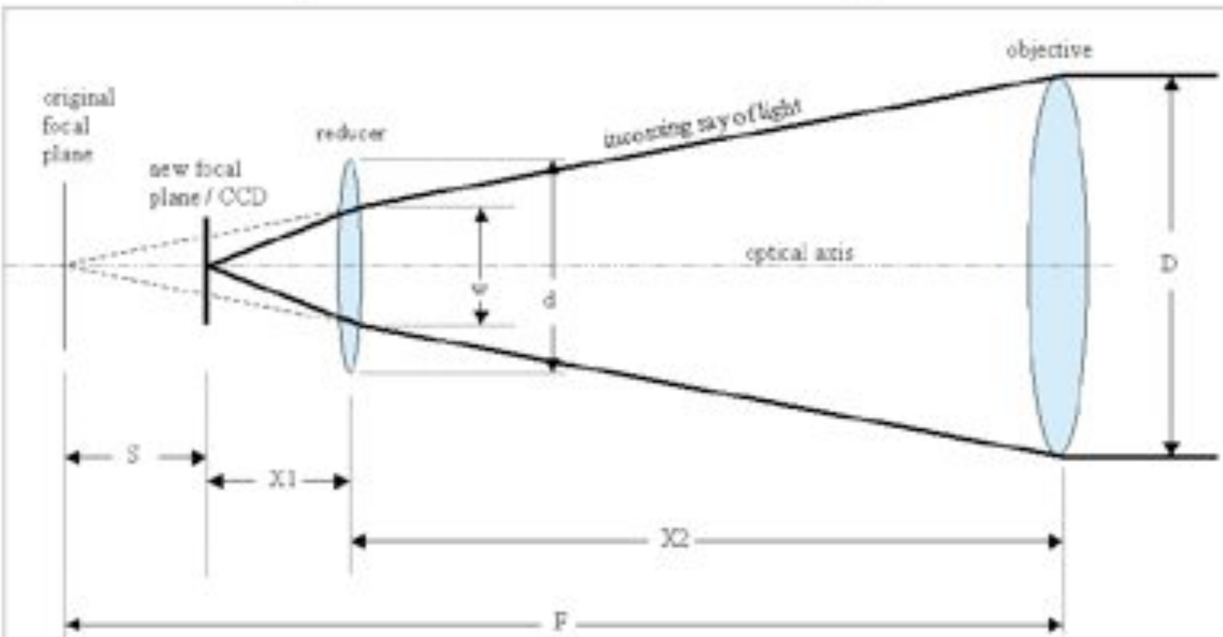
Focal Reducer Calculator

Last update: 2006-01-04

Focal reducer is a positive lens between telescope and CCD camera which shortens the focal length of the optical system. This has advantages for CCD imaging:

- short focal length means easier tracking/guiding
- faster focal ratio shortens exposure times
- larger true field of view

The disadvantages are vignetting and problems for reaching focus on some systems. This calculator can be used to calculate the effective focal length and focal ratio. The focus shift can be used to estimate the ability to reach focus with the telescope. The calculator also estimates the diameter of the imaging circle.



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Telescope [Choose a telescope or enter D and F below]

D = Diameter of the objective = 457

F = Focal length of the objective = 1905

Reducer [Choose a reducer or enter d and f below]

d = Diameter of the reducer = 21

f = Focal length of the reducer lens = 85

X1 = Reducer to CCD distance = 28

[Click to Calculate] [Reset]

Focal Reducer Calculator 7/25/10 4:21 PM

S = Focus shift with reducer =	13.8
X2 = Reducer to objective (primary) distance =	1863
System focal length with reducer =	1277
Focal ratio with reducer =	2.80
Reduction factor =	0.67
Width of the unvignetted field (imaging circle) =	10.98

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Questions, comments? Send email to:
tpmetsala@gmail-com

00010395

Focal reducer math for MFR3 (download from web)

Focal ratio

f/ratio = [1-(x/F2)] * f/ratio of scope
= .67 * 4.2 = 2.8

Focal reduction factor

Focal reduction = (F2 - x)/F2
Focal reduction = (focal length of FR - distance from sensor)/(focal length of FR)
85-28/85 = .67

Distance of focal reducer from telescope optic

D= F1- (F2 X x)/(F2-x) Note that X is multiply by

Where F1 is the focal length of the telescope optic
F2 focal length of focal reducer
x distance between focal reducer and sensor
D distance of focal reducer from telescope optic
1905-(85*28/85-28) = 1863 mm

And amount of in-focus of focal plane

plane shift inwards is = F1-(x+D)
1905-(28+1863) = 14 mm

also described as 28-[(85*28)/(85-28)] = 14 mm

Confirmed by direct measurement of camera images of M51 and M101 on 8-7-10. The sensor 's FOV calculated to by 17 x13 mm with 21mm diagonal FOV. From FOV size calculate the effective f/ratio to be 2.8, which matches the above measurements.

Speco VM905C color TV monitor

Images are displayed on a 9 inch color CRT monitor called Speco VM905C, which is a color monitor for security cameras. This monitor is from Spytown.com. There is power cord that connects to a 110V outlet like house current off an extension cord at home or from an inverter socket on a 30 Amp-Hr battery if you're out in the field away from power. This battery can run the TV for up to 3.5 hrs. A 100 Amp-Hr battery would be ideal for imaging out in the field. At home the only thing I run off the battery is the power cord going to the telescope.

There inputs for composite video (single cable with RCA jack) or S-video (2 cables bundled together with 4 pin plug) signals. S-video has better definition because color information is carried on a separate cable. Unfortunately, there is no S-video output from the Speco monitor, so it is not now possible to make monitor adjustments to brightness/contrast and output the result in S-video to a device that can make use of the higher resolution (Matrox frame grabber). When I record images, I use S-video output for the recording equipment and composite video for the monitor. Ideally I should use a powered video splitter to divide the Mallincam's S-video output into two S-video outputs.

The monitor has several useful adjustment knobs: 2^{nd} in from the left is the dark level; this is needed to reduce background towards dark gray or black. The 2^{nd} knob in from the right is the brightness/contrast knob. This is usually turned towards maximum. Other knobs are for tint and color balance. You need to balance these against the white balance control on MallinCam.

- NTSC/PAL system auto switchable
- With Y/C, composite video input
- Wide range power source (90V AC~260V AC)
- High performance
- Dual comb-filter
- Front controls hidden behind a door

Specifications

Picture Tube	9" Flat Tube
Horizontal Resolution	500 TV Lines
Power Source	90~260V AC
Power Consumption	40 Watts
Scanning System	NTSC/Pal Auto Switchable
Input Signal	(A) Composite Video 0.5~1.0V p-p Neg. Sync (IN 75)
	(B) Y/C Signal Y: 1.0V p-p W/Neg. Sync (IN 75)
Bandwidth	100 Hz~6.5MHz (-3dB)
Linear Distortion	Horizontal / Vertical 10% (Max)
Input Connector	Video BNC, Y/C 4PIN DIN JACK
Output Terminal	75 Ohm - high impedance switchable
Front Panel Controls	Contrast / Brightness / Color / Sharpness / Tint / On Off
Rear Panel Controls	V-Size, Sub-Bright, Focus, Screen, Impedance
Operation Temperature	14°F ~ 122°F
Dimensions	8.66" W x 8.78" H x 11.26" D
Net/Gross Weight	15.4 lbs. / 17.6 lbs.
Packing	2PCS / CTN / 3.20'

change

For more information contact us at:
Speco Technologies 200 New Highway, Amityville, NY 11701 Web: www.specotech.com

Rock Mallin's digital video enhancer (DVE)

The following is from a post by Rock Mallin at Yahoo/MallinCam site:
The DEV allows you to push the AGC of the camera to much higher value to increase the signal to noise ratio and especially the dynamic range. This will help immensely to have a stable image at all settings of the camera.

For example, with sever light pollution a 7 sec integration is the maximum for a 16" telescope. Increasing the AGC on the camera just picks up more background light pollution and sky glow. Using the DVE in the DARKER mode lets you darken the background while still using the high gain settings of the camera. This helps when using capture devices to computers where these devices do not have a built in AGC (Automatic Gain Control). The DVE also stabilizes the signal with a fixed value to accommodate the input of the USB2 capture device.

Also, the DVE reduces noise so that all faint background signals in the image are a lot smoother. The noise reduction also works in the NORMAL mode of the DVE. Noise reduction is always on as long the DVE is hooked up in line.

Use

The MC DVE comes with a 110V to 7.5 VDC power supply and a short RCA to RCA cable. Place the DVE in line between camera and monitor. Run either a S-Video or RCA cable from the camera to the DVE video input and either a S-video or RCA cable from the DVE to the monitor. Last connect the power supply to the DVE.

- Select appropriate output (PAL or NTSC) depending on the monitor.
- Select appropriate video input type (Composite/RCA or S-video) by pressing the button on the top of the DVE. A green LED indicates composite input; an orange LED indicates S-video input. When there is no video signal the LED flashes every 2 sec. In the presence of a video signal there is a steady glow of the green or orange LED.
- Press the mode selector button on the side repeated to cycle through the modes. There are 6 digital video modes—normal, enhanced 1, enhanced 2, darker, b/w, and a color bar.

Cowon A3 personal media player

The Cowon A3 personal media player is a recording and viewing device that accepts SVHS video output from MallinCam and records in MPEG4 video codec as .asf file format that can be played back in Quicktime with Perian. The Cowon also serves as a viewer at the eyepiece of the telescope, convenient for focusing on stars and centering objects in the camera without having to view the monitor some several feet away. The 4 inch screen has a very high resolution, max 800 x 480 @ 30 fps (NTSC), 60 GB storage.

How to use
Cowon A3 strap or connecting cables are wrapped around the focuser so unit dangles next to focuser. Connecting to the Cowon is its power cord, and a SVHS video input from the MallinCam. The power cord transformer is plugged into a light weight extension cord which goes over to plug into 110V AC power. The whole is somewhat weighty and clumsy, because bundled together with the Cowon power cord is the power cord for MallinCam. It is important to keep the bundle of wires lashed together and prevent them from getting caught during movements of the telescope.

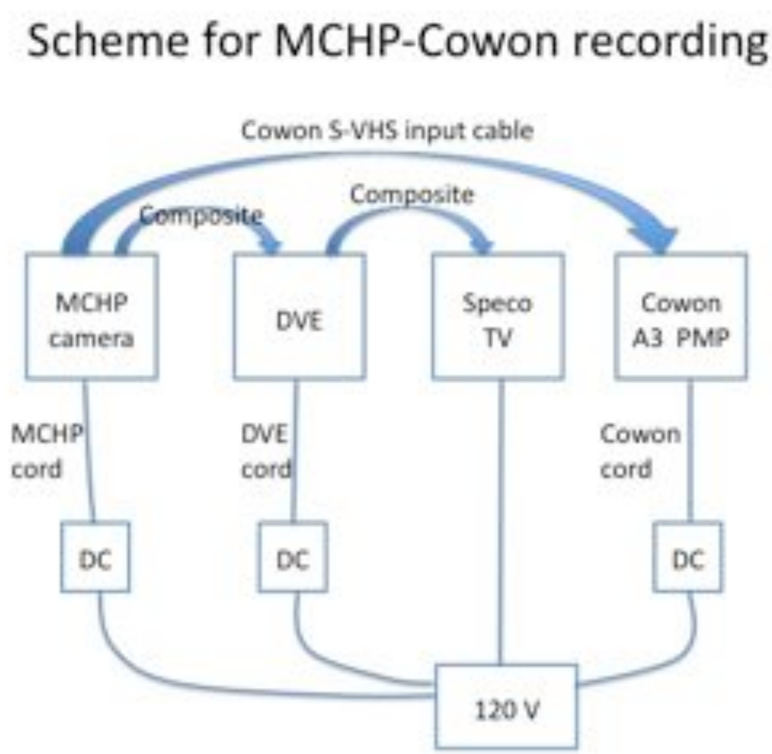
Adjusting Cowon A3 asf files for viewing on Mac and iPod

- download files to computer with Cowon USB downloader cable
- use EasyWMV software to convert asf to mp4 format for play in Quicktime
- to play .asf file in QT, Perian must be inactivated/removed from QT. Do this in System Preferences icon in the Dock; Perian is listed under Other at bottom of page

- In preparation for iMovie, use QT to covert to .mov (/file, /export)

- Import into iMovie: edit segments as follows:
- new project select aspect ratio 4:3 at this point
- new event, import .mov sequences
- select-drag event clips for project
- click each clip in project board and adjust video brightness, contrast, exposure, saturation for each clip
- make sure format is 4:3 using /Window, /Cropping, KenBurns & rotation.

- iPod is plugged into computer
- For iPod videos, export from iMovie /Share, /Export, use medium format for iPod (makes .m4v file)
- In iTunes, click Movies in left hand column, drag .m4v file onto display board
- Click murphy's iPod in left hand column, then select Movies in top menu line and make sure all videos is selected.



Matrox MXO2 mini frame grabber for Mac

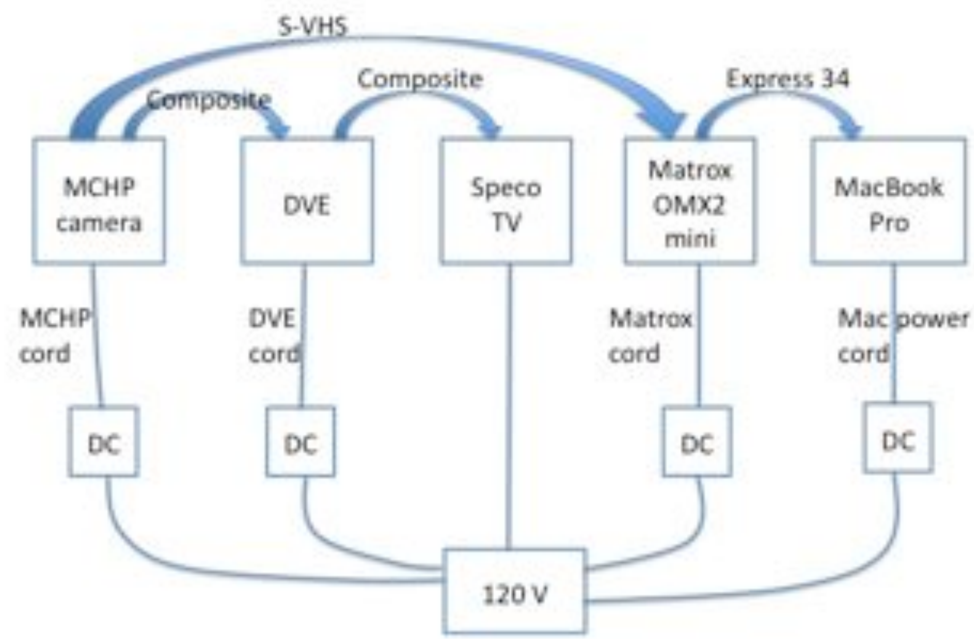
Approach

- MallinCam, NTSC color video, S-VHS output
- Matrox frame grabber: MXO2 mini with 34-expresscard adapter
  converts NTSC to up to 8 bit uncompressed color TIFF or PNG output
  (variable outputs). Also has noise suppression.
- iStopMotion software by Boinx Software on MacBook Pro computer
  captures video input, time-lapse mode (stop motion) to 8-bit tiffs
  Idea is to match capture rate of the time lapse to the integration time
  of the MallinCam to conserve hard drive space, so
  1 tiff frame per integration time of the camera
  running at 7 sec integration, gives 8 fpm (514 fph)
  x 1.14 Mbytes/frame = 586 Mbytes/hr (~0.5 GB/hr)
- Folders of tiff files can be converted later on to movie sequences for viewing in QuickTime
- CaptureFox software using FireFox browser to send screen display to
  NightSkyNetwork for web-broadcasting. Another option is
  CamTwist for Mac. Haven't gotten there yet.

Procedure at telescope

SVHS cable from MallinCam connects to the MXO2 mini. The 34-Expresscard adaptor cable connects MXO2 to the laptop. The laptop is positioned close to the monitor on a stool, so 15 ft. long SVHS cable is needed. The Expresscard cable is short. A composite RCA cable connects the MallinCam to the Speco monitor. All of the focusing done using the Speco. Once everything is OK, load the iSM software and start time-lapse acquisitions. The laptop monitor is harder to see than the Speco, but the processing later on is far better than the MPEG4 compressed images from the Cowon. There is no blocky comparison. See images acquired in March, 2010.

Scheme for MCHP-Matrox-Mac laptop recording



In iStopMotion (iSM)....

Conditions for Video recording with MallinCam and 18UC on a Mac (note to the forums)

I feel I've come a long ways in my technique for video imaging and recording. The adaptation of 18UC to MallinCam was described in an earlier post. But there is also the issue of grabbing images for processing and display, a secondary goal next to live display on a monitor and discussion with observers, but still important. Those recorded pics are my record of my experiences with MallinCam and nights under the stars.

I do a lot of MallinCam'ing from the back yard. Video provides a live feel to observing that guests and visitors get very excited about, and can be done even with extreme light pollution in suburban DC. The views here on a TV monitor match what you can see in a 50 inch under dark skies. And color adds a lot to the experience. Here are the conditions I use:

- Obsession18UC with MallinCam HP color video camera
- Mirror is moved towards the secondary in the mirror cell on its adjustment bolts
- MFR3 focal reducer and 10mm extenders gives f/2.8 effective focal ratio
- MallinCam integration generally set at 14 sec, sometimes 28 sec, usually with only 1-2 steps of gain and gamma = 1
- SVHS camera output connects to a Matrox MXO2mini frame grabber. The grabber communicates with a MacBookPro laptop via an Express card 34 slot. The frames are in uncompressed 8-bit format in R, G, B channels. iStopMotion (iSM) software puts frames in an

iSM sequence but frames can be exported as individual uncompressed 8bit color TIFF or PNG files. But this card cannot do 12bit uncompressed color. Result is no more blocky MPEG compression!

- Frame grabbing rate is set in software to match integration time of the camera. The appearance of recorded frames on the laptop (brightness, software, gamma) is controlled by iStopMotion (Boinx Software).
- Afterwards about 4 Tiff frames are imported into Lynkeos software on a Mac for frame averaging to remove noise and improve S/N ratio 2X.
- Averaged frames are further optimized for contrast and gamma and color balance in Photoshop. Frames are viewed in iPhoto on a Mac or on iPod Touch.

I posted some recent photos of March objects under Doug Murphy in the photos section.

Boinx' iStopMotion recording software for Matrox MXO2 mini framegrabber, EXPORT OPTIONS

ISM receives info from a Matrox OSX2 mini frame grabber with a 34 ExpressCard connector into my MacBookPro laptop computer. I want to grab 8 bit uncompressed color images from the Matrox card so I can do further post-processing of the images in Photoshop. I would like to grab the highest dynamic range, uncompressed images that I can grab.

I have DV NTSC selected for the input in ISM. The camera has a S-video output, so this corresponds to 640 x 480 pixel resolution and standard format (not HD TV). In ISM I select the signal source, recording mode = single frames, time lapse every 14 seconds to match the integration period on the camera. I click start and see newly grabbed frames every 14 sec on the laptop monitor. When done, I see the files captured into a ISM Movie Document type with the files unmarked by a file extension.

Export selections from the ISMMovieDocument as sequences or frames. If I select a single frame in the ISMMovieDocument, to get a .png file choose Export Selection, As Images, and get individual .png files. PNG is an 8 bit uncompressed data type. **OR, choose Export selection, As movie, then choose "image sequence", hit customize button and select Tiff to get tiff files.**

If I export a selected sequence of frames I get a .dv movie file that plays in QuickTime. The .dv file is 6X smaller than the ISM, so it is compressed. **OR, select the sequence of frames, "Save as" = name it, "Where" to desktop, for file type at the bottom change from DV NTSCV 4:3 to "Image sequence" then hit Customize button and select TIFF and set Options to none.**

Processing images for display on computer and iPod Touch

- Videos recorded using the Cowon A3 or Mac laptop/Matrox OSX2 can be viewed with QuickTime or frames can be selected for processing and display.
- Import about 4 Tiff frames into Lynkeos software on a Mac for frame averaging to remove noise and improve S/N ratio ~2X.
- Averaged frames are further optimized for contrast and gamma and color balance in Photoshop. Frames are viewed in iPhoto on a Mac or an iPod.

Fixing Cowon A3 asf files for viewing as video clips on Mac and iPod

- download files to computer using special USB cable
- use **EasyWMV** to convert to mp4 format (these play in Quicktime)
- to play .asf file in QT, **Perian** must be inactivated/removed from QT. This is done using System Prefs tab in the Dock. Perian is listed at the bottom of Prefs page under "Other" along with Flip-4-Mac
- In preparation for iMovie, use QT to covert to .mov (/file, /export)
- Import into iMovie: edit segments as follows:
- new project select aspect ratio 4:3 at this point
- new event, import .mov sequences
- select-drag event clips for project
- click each clip in project board and adjust video brightness, contrast, exposure, saturation for each clip
- make sure format is 4:3 using /Window, /Cropping, KenBurns & rotation.
- iPod is plugged into computer
- For iPod videos, export from iMovie /Share, /Export, use medium format for iPod (makes .m4v file)
- In iTunes, click Movies in left hand column, drag .m4v file onto display board
- Click Murphy's iPod in left hand column, then select Movies in top menu line and make sure all videos are selected.

Processing video frames

Play videos in Quicktime and select frames for averaging

Note to Dave Kriege about using MallinCam on 18UC and processing

Dave, Long time, no write! Clearly, I've been having a good time with my 18UC. As you saw from the post I do a lot of video-astro imaging with MallinCam from the back yard, but the video provides a live feel to observing that guests and visitors get excited about, and the views with extreme light pollution in suburban DC are like views you can get in a 50 inch under dark skies. And then again there's the color. It's a great way to go. Feel free to use these photos. Emphasize that they are just video frames. They match very closely what you can see live looking at the color monitor next to the scope. Here are the conditions:

18UC with MallinCam HP color video camera
Mirror is moved out, but poles not shortened (yet)

MFR3 focal reducer and extenders gives f/2.8 effective focal ratio
Camera integration generally set at 14 sec, sometimes 28 sec, only 1-2 steps of gain, gamma = 1
SVHS output to a Matrox MXO2mini frame grabber
Frame grabbing rate set to match integration time of the camera and controlled by iStopMotion (Boinx Software) on a MacBookPro laptop
Pictures are the averages of about 4 frames in Lynkeos software on a Mac
Adjusted contrast and gamma and color balance in Photoshop

So you see, I've been lovin my 18UC and having a wonderful time with the stars. My mirror is a beauty

Broadcasting on NSN (www.nightskiesnetwork.com). Note: you can also visit this site and view broadcasts without doing so yourself. It's a great way to learn!

1. Connect your video capture device . (there are many on the market that will work) ask other what works best for them
2. Take the out put feed from you video camera and connect it to the input of your capture device.
3. Take the out put feed from you capture device and connect it to your PC or Mac.
4. Make sure you have your capture device driver working already on the PC or Mac.
5. Go to your channel page for login. Before you login make sure you have the adobe flash player that is recommended. Once you have the flash player on you PC or Mac go ahead and login.
6. The channel will have a pop up ask you to allow the server to access your capture device feed. CLICK ALLOW. From this point on you should see the feed from your camera on you PC screen. Color bars on a MallinCam are a good way to test this.

NOTE: If you signed up for a channel on NSN you were sent a e-amil telling you that your channel is ready. Along with that e-mail comes a file for basic channel settings and how to's and very basic trouble shooting.

THE VERY BEST WAY TO LEARN IS ASK OTHERS WHO ARE WATCHING OR BROADCASTING THEMSELVES. ASK THEY WON'T BITE. MOST ARE HAPPY TO HELP. AFTER ALL SOMEONE HELPED THEM.

Reminder list of 20 equipment items to pack for travel

eyepiece box
AGM storage batteries (2)
lunchbox for warming eyepieces with handwarmers
encoder arm box
stabilizer bars
box of scope stuff + shroud+baffles
TV monitor
camera box
cable/cords box
step stools (2)
car ramps
carpet
mat for under scope
truss assembly
folding chairs (2)
18UC scope
lacrosse goal/wind deflector

Wind deflector

A wind deflector was made from a lacrosse goal frame and a black ripstop nylon shroud for deflecting gentle breezes from the 18UC when operating the MallinCam for video imaging.   The slightest breeze moves the telescope tube and blurs the images, limiting MallinCam use to quiet dead-still evenings. The system probably would not work with gusts and gentle breezes where visual observing can still be done.

The lacrosse goal frame was ordered from Target. The ripstop nylon fabric from Joanne's Fabric store, sewn by a seamstress at the cleaners.

Batteries and Fuses

DuraCell 600 28A-hr, Sealed lead-acid, AGM

Specifications

Product Specifications	
AC	
AC output power (max. continuous)	480 W
AC output power (peak)	600 W
AC output surge capacity (peak)	960 W
AC output voltage (nominal)	120 V
AC output frequency	60 Hz
AC output waveform	Modified sine wave
Inverter no-load current	< 0.20 amps (battery drain with no load on inverter)
Inverter low-battery alarm	11.0 V
Inverter low-battery shutdown	10.5 V
DC	
Internal battery type	Sealed lead-acid, AGM
Internal battery capacity	28 Ah, 280 CCA
Internal battery voltage	12 Vdc (nominal)
DC power socket (circuit breaker)	12 A (automatic reset)
General Specifications	
Part number	852-2007
Unit dimensions (L x W x H)	19.25 x 8.25 x 11.25" (48.9 x 21 x 28.6 cm)
Unit weight	58.2 lb (26.4 kg)
Warranty	Six months
Operating temperature	32ºF to 104ºF (0ºC to 40ºC)
Storage temperature	32ºF to 86ºF (0ºC to 30ºC)
Jump-start cables	24" (610 mm), 8 AWG
Radio	AM 526-1606 kHz / FM 82-105 MHz
Flashlight	5 W (replaceable)
Charging System	
AC charger bulk charging current	1 A (maximum)
Peak charging voltage	14.2 V (nominal)
Charge restart voltage	12.9 V (nominal)
Float charge current	1 mA (nominal)
Charger input socket current	2.5 A (maximum)

Xantrex Powerpack 400 plus, 20 A-hr sealed lead-acid AGM battery

400 Watts Portable AC Power with 250 PSI Air Compressor

Electrical Specifications

115 volt AC section		12 volt DC section	
AC output power (max. continuous)	320 W	Internal battery type	Sealed lead acid, AGM
AC output power (5 minutes)	400 W	Internal battery capacity	20 amp-hours, 200 CCA
AC surge power (peak)	640 W	Internal battery voltage	12 VDC (nominal)
AC output voltage (nominal)	115 V	DC power socket (circuit breaker)	12 amps (automatic reset)
AC output frequency	60 Hz +/-4 Hz		
AC output waveform	Modified sine wave		
Inverter no-load current	< 0.20 amps (battery drain with no load on inverter)		

Charging system		Charging time	
AC charger bulk charging current	750 mA (maximum)	From AC outlet	max. 35 hours*
Peak charging voltage	14.2 V (nominal)	From DC outlet	max. 4 hours*
Charge restart voltage	12.9 V (nominal)	*Maximum charging time occurs when battery is completely discharged.	
Float charge current 1 mA (nominal)			
Charger input socket current	2.5 amps (maximum)		

General Specifications

Air compressor	250 psi (lbs. per square inch)
Jump-start cables	24" (61 cms), 4 AWG
Built-in incandescent light	5 watt (replaceable)
Operating/storage temperature	32°F - 104°F (0°C - 40°C) / 32°F - 86°F (0°C - 30°C)
Inverter low battery alarm	11.0 volts (nominal)
Inverter low battery shutdown	10.5 volts (nominal)
Dimensions (H x W x L)	9.5 x 8.1 x 15.8" (24.2 x 20.6 x 40.2 cm)
Weight	20 lb (9.0 kg)
Warranty	6 months
Part Number	852-1900

Note: Specifications subject to change without notice.

Special Batteries

Hand-held remote, ServoCat	Lithium coin 165 mAhr 23mm	BR-2325	10 for $12.83	Digikey.com
Rigel QuikFinder for Starbuckets 8in	3V lithium coin	Energizer 2032 Duracell DL2032	$3 each	drugstore
Rigel PulseGuide illuminator for reticule eyepiece	3V lithium cylinder 1x Evergreen CR1/3N (2L76 K58L DL1/3N 5018LC) 3V Lithium Battery-Card - 5 Pieces	CR1/3N	5 for $10	mybattery mart.com
ArgoNavis internal clock battery	3V lithium	Panasonic CR-1220		Wildcard
Telrad	two AA's			
Glatter's laser collimator	two AA's			
miners's headlamp	AAA's			
DewGuard	9V battery			

Fuses

power cord, 18UC	10A fast acting	Bussman BP/AGC-10		Home Depot

Some handy formulae and principles

1. Comparison of brightness of two telescopes with same eyepiece

Brightness based on mirror and is calculated as: $radius^2 / Mag^2$
For OMI 18" f/4.2 (fl = 75in) vs my 16" f/5.8 (fl = 93.25in), with a 28 mm fl eyepiece. 60X and 75X are the respective magnifications with the 28mm lens

for 18": = 81/ 60 x 60 = 0.0225
for 16": = 64/ 75 x 75 = 0.0114
Factor improvement = 0.0225 / 0.0114 = 1.974

Reflectivity improvement:
for 18": = .95 x .98 = 0.931
for 16": = .85 x .85 = 0.7225
Ratio = 1.289

Overall improvement: 1.974 x 1.289 = 2.544

2. FOV on MallinCam Camera with MFR3 focal reducer and 10 mm extender
Works for any camera or eyepiece, just need to know diameter of camera chip or front focal plane of eyepiece. Effective size of Mallincam CCD chip: 7.4 x 5.95 mm (8mm diagonal)

FOV in arcmin = (8mm sensor x 57.3 °/radian x 60 min/°)/1280 mm efl
= 21.5' for 8mm chip (diagonal across chip) calculated FOV
width x length are 16 x 20 arcmin

The FOV in arcminutes of an eyepiece is also calculated is way. But it can also be calculated as (apparent angular FOV for the eyepiece/mag) * 60 arcmin/degree. For the 23mm reticle eyepiece, with 50° field and power of 83x this is 36 arcmin FOV.

3. Size of objects in the image plane
The linear image scale equals angular image size on the sky times the telescope focal length. So, for example the full moon is approximately ½ degree in angular extent, or 0.0087 radians. If the telescope focal length is 1000mm, then the linear size of the moon-image formed at the focus of the telescope is 1000mm x 0.0087 = 8.7mm in diameter.

4. Relationship between Strehl ratio and wavefront error

Relationship between Strehl ratio (r) and wavefront error (w) is
$r = 1 - 4 (\pi w)^2$. For Strehl ratio of 0.98, wavefront error is about 1/15 wave. So I can safely say my OMI mirror is better than 1/10 wave.