

ARCS PROCEDURE	SETTING UP WSI	PRO(WSI)-005.001
Author: J. Shields		17 April 2002 Page 1 of 21

Setting Up WSI

I. Purpose:

The Whole Sky Imager (WSI), for transport, normally ships in 5 reusable wooden shipping crates. The crates were designed around a fork liftable reusable pallet with hard and/or soft foam incorporated to absorb shock and high frequency vibrations. Floating decks with vibration isolators are used in the larger crates. The crates conveniently unpack with the removal of the hex head bolts that hold the top and sides of the crate together. It is recommended that one use a Makita cordless power drill (or other power driver) and a 7/16" drive socket to facilitate in the removal of the bolts. (The large crates use T-nuts and bolts on the tops and sides, and lag bolts at the base; the boxes use T-nuts and bolts for the lid.) Generally it is easiest to first remove the top of the crate then the sides. The crates contain the following items:

1. Blue Box computer rack (requires indoor environment location)
2. WSI White Box environmental housing (located outside)
3. WSI Camera Housing (goes in environmental housing)
4. Occultor (goes on environmental housing)
5. Cabling and miscellaneous

II. Cautions and Hazards:

None.

III. Requirements:

None.

IV. Procedure:

A. Placing Crates at ARCS Site

1. Before placing the crates containing the white and blue boxes, one should determine how the boxes will be lifted from the pallets. A forklift may be used to lift the white box crate onto its platform, or the system can be unpacked and lifted up. A small crane can be used, using the eyebolts on the top of the blue and white boxes, and using two people to balance the boxes. The boxes can be roped to 2 x 4's and 4 people can lift the ends of the 2 x 4's. The blue box has wheels, and can be rolled on a strong nearly level ramp. The choice of method affects the choice of placement of the crates, e.g. next to the platform or on the platform.

<p>ARCS PROCEDURE</p> <p>Author: J. Shields</p>	<p>SETTING UP WSI</p>	<p>PRO(WSI)-005.001</p> <p>17 April 2002</p> <p>Page 2 of 21</p>
---	-----------------------	--

2. The Blue Box crate (33" X 36" X 64") contains the computer rack, which will be located and operated in a temperature-controlled indoor environment. It should be placed near or in the room or trailer.
3. The White Box crate should be placed on or near the platform which will be used for the WSI. The platform should be close enough to the blue box location to allow connection of the white box to the blue box via a pre-assembled 100-foot cable bundle. The platform should be high enough to be above any standing water or waves. Water from rain or sprinklers may be allowed to penetrate from below, but the system is not designed to be submerged.
4. The other crates should be placed near the white box crate.

B. Unpacking White Box

1. Using a forklift, small crane, or four people, place the White Box crate on a stable platform.
2. Remove the White Box crate top and sides. Store the bolts in a baggie labeled "Crate 2."
3. There may be 4 eyebolts in the upper corners; if not, find them inside the crate or in the spares box in the cables crate and install them if needed in the next step for lifting.
4. Briefly lift the white box from its pallet and pull the pallet out from under the white box. Turn the white box so that the side of the box labeled "North" is pointed toward North, and the box approximately aligned along a North-South line.
5. Inspect the white box for damage during shipping. Verify that parts appear to be secure.
6. Remove the black sunshade plate from the top of the housing. Secure the bolts in a ziplock baggie for use in Step C.
7. If there are one or more small round pieces of insulation, set them aside for use in Step E (installing the camera in the white box).

C. Mounting Occultor Assembly on Environmental Housing (White Box)

1. Verify that the insulating foam and 4 nylon stand off blocks on top of the white box are positioned such that the hold down bolts line up with the top plate of the White Box.
2. Remove the top of the occultor shipping box and remove extra packing material, carefully saving both the bolts and packing material.
3. Remove the cord (if any) which holds down the occultor arc. Remove the lag bolts which hold the occultor on the box support. (Or, if occultor is secured in a different manner, remove fasteners holding occultor in box). Leave in the packing which holds the arcs in their set position.

<p>ARCS PROCEDURE</p> <p>Author: J. Shields</p>	<p>SETTING UP WSI</p>	<p>PRO(WSI)-005.001</p> <p>17 April 2002 Page 3 of 21</p>
---	-----------------------	---

4. Lift the occulter by the large horizontal support plate, (or use the rigid mounts at each end of the occulter assembly) while gently supporting the arc. DO NOT lift it by the arc or motor assemblies or brake.
5. Place the circular occulter base plate on top of the nylon blocks with the end extensions orientated north and south, and the end marked "North" to the north.
6. Optional: Temporarily place the bolts removed in Step B into the bolt holes to hold the occulter in place.
7. If the occulter arc shade is not already attached to the arc, attach it. Its center screws should be aligned at the 91° position if fielded at Christmas Island. The 91° position is .42" to the South of the center of the arc. If desired, the shade can be set for the Albuquerque test site. The shade site is not designed for this latitude, however reasonable positions are with the center 5.5" to the N of center in summer, 13.5" S of center in winter and 4.0" S of center in spring and fall.
8. Inspect the occulter for damage during shipping. Verify that all screws and other hardware is in place. If any screws are loose, use lock-tite and tighten them. This step is important because even if installed initially with lock-tite, it is possible for screws to work loose during shipment, jamming the movement of the arc drive on startup.
9. Replace the baggie and packing materials in the occulter box.

D. Installing Occulter Arc Drive

Procedure used for units with Extended (19.5") Arc Drive

1. Verify that the packing material is still in place, supporting the arcs near a 10° position.
2. Find the arc drive, which will be shipped separately. The arc drive is on a plate (called the arc drive adaptor plate), and it has a rounded cover. Remove the 8 screws holding on the cover, and remove the cover.
3. On the occulter, note the plate at the S end. This is called the arc drive baseplate. Note the gray arc shaft retainer block, which is screwed to the arc drive baseplate and supports the end of the arc shaft.
4. In the next steps, you will be inserting the arc drive onto the arc drive baseplate. It is important to keep the arc supported and avoid tilting the arc shaft to avoid damaging the arc shaft bearing. This step is easier with two people, one to help support the arc shaft and one to install the drive.
5. While supporting the arc shaft, remove the 4 screws holding on the arc shaft retainer block. Carefully remove this block.

<p>ARCS PROCEDURE</p> <p>Author: J. Shields</p>	<p>SETTING UP WSI</p>	<p>PRO(WSI)-005.001</p> <p>17 April 2002 Page 4 of 21</p>
---	-----------------------	---

6. Bring up the arc drive. Note the drive shaft clamp (which is on the driven shaft connected to the arcs). This will mate with the drive shaft connected to the arc drive subassembly. The drive shaft is keyed with the clamp to minimize backlash and slippage. The clamp and arc should both be aligned with the arcs near 10 degrees.
7. Gently slide the clamp over the drive shaft, moving the plate at the same time, until the base plate is fully up against the stand-offs and the drive shaft and clamp are fully engaged. If the clamp is too tight, one may remove the clamping screws, insert a thin shim into the clamping slot and use the clamping screws to slightly spread the clamp. If the spacing is too close to allow use of a shim, a wide screwdriver may be used to gently spread the clamp.
8. Secure the arc drive to the arc drive base plate using the four screws removed from the arc shaft retainer block. Use lock-tite when tightening these down.
9. Put RTV over the screwheads. Also put RTV in the 4 holes on the back side of the baseplate.
10. Tighten the clamp using the 3 8-32 cap screws and lock-tite.
11. Remove any remaining packing material in the occulter.
12. Install two 1-oz desiccant packs. Be sure they don't interfere with the drivetrain or screwholes. Place one behind the motor at the bottom of the canister and tape the other to the rectangular bayside gearhead near the top of the canister.
13. Replace the cover on the arc drive.

E. Installing Camera Housing in Environmental Housing (White Box)

1. Open both doors of the environmental housing.
2. Remove the black foam holding in the lexan windows, remove the windows, and set them and the foam aside in a safe place.
3. Verify that the red rubber ring is seated on the top of the nylon support ring in the top plate of the environmental housing. If it isn't, you should find it attached to the bottom of the flange of the camera housing later in this section.
4. Remove the lid from the top of the camera-housing crate. Remove the foam, and remove the camera-housing lid.
5. Lifting the camera housing by its large support flange (not by the lid), remove the camera housing, being sure to save all bolts and packing material.

ARCS PROCEDURE	SETTING UP WSI	PRO(WSI)-005.001
Author: J. Shields		17 April 2002 Page 5 of 21

6. Inspect the camera housing for damage during shipment. Verify that the components on the bottom appear normal and verify that the lens and domes appear normal.
7. Position the camera-housing unit above the top plate of the environmental housing. This is easiest with one person lowering the camera into place and another reaching into the environmental housing to guide it into place. Rotate the camera until the North label is pointing north. In this position, the largest connector on the bottom is to the southwest, with the small white mark on top of the camera housing to the south. Lower camera unit until the camera housing is seated on the red insulation ring on the nylon support ring.
8. Partly insert the 8 screws in a baggie marked "camera housing". These are often shipped in the grey "spares" box in the cable crate, so if they are not in the camera housing box, you will need to open the cable box at this time.
9. On the top of the camera housing, there are two rings of 4-40 allen-head screws. The outer ring holds the camera housing dome plate ("lid") onto the camera housing. Remove the 12 screws in this outer ring and remove the lid.
10. Remove the foam rings that normally surround the fisheye lens, being careful not to drop dust or foam specs onto the filter changer.
11. Find the fisheye lens in its case. Remove it, being very careful of it. Try not to move the f-stop or focus. If the f-stop is still set at f/2.8, do not touch it; otherwise return it to f/2.8. Similarly, if the focus is still set at infinity, do not touch it; otherwise, return it to infinity.
12. Inside the camera housing, you should see a black box which covers the filter changer. This filter changer shroud will either be in one piece (as in Unit 6), or two (as in Unit 3).
13. If the filter changer shroud is the two piece version, it is necessary to remove the 4-40 screws around the base of the filter changer shroud, and pull it open. Remove the back lens cover from the lens and bring it down so its flange is inside the filter changer shroud. Gently turn the fisheye lens until you find the single position in which it slips into place. Seat it by turning it approximately 1/3 turn counter-clockwise. Make sure you don't change the focus or f/stop in this step. Reattach the filter changer shroud.
14. Replace the desiccant with dry desiccant. Replace the two foam rings so that their slit openings are on opposite sides (to block light).
15. Remove the top lens cap from the fisheye lens. Inspect the lens and the dome, and clean them with optical lens cleaner if necessary. Store the two lens caps in the lens case.

ARCS PROCEDURE	SETTING UP WSI	PRO(WSI)-005.001
Author: J. Shields		17 April 2002 Page 6 of 21

16. To reattach the camera-housing lid, you should be aware that this is an o-ring joint. This means that you must not tighten the first screw down all the way. Inspect the o-ring to be sure it is clean. (If it is not, clean it with alcohol, and then add a very small amount of o-ring grease, gently pulling the o-ring through your fingers until the o-ring is slick everywhere and there are no globs of o-ring grease.) Place the lid on top, and tighten the screw part way, then tighten the screw on the other side part way. Move around the lid in a star pattern, tightening the screws part way, then repeat once or twice as necessary till all screws are snug.
17. Pressurize the camera housing to 5 psi with dry nitrogen or dry air. The desiccant should suffice to dry the air in the camera housing. However, if you have trouble with moisture after 24 hours, you may purge and pressurize the housing as documented in AV98-049t.
18. Align the camera so that the screws are in the center of the slots.
19. Once the camera housing is properly aligned with respect to the environmental housing (as a result of the above 3 steps), screw the camera housing to the nylon support ring being careful not to over tighten the screws (the nylon threads are easily stripped).
20. Place the two rings of black insulation over the camera housing flange. These are shipped in the white box and set aside in step B or are in the camera housing box.
21. Remove the 8 bolts, which secure the occulor assembly, and the 4 screw eyes on the corners of the white box, then replace the sunshade. Replace the 4 screw eyes with the low profile bolts used during shipping. Do not replace the 8 sunshade bolts yet.
22. Find the camera lid ring in the cables box, and the baggie marked "Cmg Hsg lid" in the spares box. Attach the ring to the lid using the screws on the ring, and attach the four pieces to the camera-housing lid.
23. If desired, or at the end of the day, place the camera housing lid over the camera, and hold it down with the 4 longer sunshade bolts found in the spares box. Insert the standard sunshade bolts in the remaining 4 sunshade holes. Save the remaining 4 sunshade bolts.
24. Replace the baggies and any packing materials in the box, and seal the box for storage, being sure to use all the bolts.

F. Connecting Camera Electrical and Coolant Lines

1. For the next step, protect the electronics components by using towels to catch spills.
2. Connect the two tygon tube coolant fluid lines to the two quick disconnects on the tygon tubing lines emanating from the base of the CCD camera. (These are shipped with the two disconnects on the

ARCS PROCEDURE	SETTING UP WSI	PRO(WSI)-005.001
Author: J. Shields		17 April 2002 Page 7 of 21

camera connected to each other, and the two disconnects on the coolant circulation system connected together.) Normally the female connectors are leak-proof but the male connectors are flow-through, so you will need to cover the male connector to minimize leakage.

3. Find the humidity sensor, which is a roughly 3" by 3" gray device on the wall of the inside of the housing. Verify that the humidity sensor pigtail molex is connected to the molex on the cable labeled "Humidity Sensor."
4. Find the gray camera cable which comes from the Camera Electronics Unit (CEU) and is labeled "Cable, Camera Head CH250"; this will be used in the next step. It is normally shipped attached to the CEU.
5. Remove the Camera grounding plug (Blue 37-pin connector) on the back of the CCD camera, and IMMEDIATELY attach the free end of the camera cable, being careful not to reverse the cable. Leave the grounding plug hanging from the tubing.
6. Connect the cable for the filter changer and shutter; this connector, labeled "Filter changer," should be connected to the bottom of the camera housing.
7. Connect the temperature cable connector. This is a smaller cable labeled "Camera Hsg" which connects to the bottom of the camera housing.
8. On the bottom of the camera housing, there is a small black box, which is the nitrogen pressure sensor. This has a cable coming out of it, with a connector. The cable is labeled "Pressure Sensor". Connect this to a similar cable, which is lying on the housing shelf and also labeled "Pressure Sensor."

G. Unpacking Computer Rack (Blue Box)

1. Remove the top and sides from the Blue Box computer rack crate, and remove it from its pallet.
2. Save all bolts in a baggie marked "Crate 1," and set any packing material aside temporarily.
3. Move the computer rack to its designated position in a trailer or room. The indoor location must be environmentally controlled and be able to maintain a relatively constant temperature. A cool constant room temperature and low humidity is required (i.e., a standard office environment appropriate to a PC computer).
4. Remove all packing foam from inside of the Blue Box enclosure and remove any extra packing from around the monitor (check in the back of the monitor). Set aside temporarily.

<p>ARCS PROCEDURE</p> <p>Author: J. Shields</p>	<p>SETTING UP WSI</p>	<p>PRO(WSI)-005.001</p> <p>17 April 2002 Page 8 of 21</p>
---	-----------------------	---

5. Inspect the contents for damage during shipment. Verify that the monitor and other components appear to be in the normal position and undamaged.
6. Find the keys, taped inside the back of the blue box enclosure. They are keys for: a) the front door of the blue box, b) the ACPs, c) power to the computer, and d) the SCSI rack if there is one (TWP and NSA units only). Set in a safe place.

H. Connecting Interior Blue Box Cabling

1. Open the cable box, saving the bolts in a baggie. Find the front door shelf, and install it on the front of the Blue Box, if desired.
2. Find the Master View CPU switch, and place it on top of the blue box.
3. Find the keyboard in the cable box, plug it in to the bottom right of the gray port on the back of the CPU Switch box, and place it on top of the computer.
4. Find the 8 tan cables and black power supply for the CPU Switch, which should penetrate through the top of the Blue Box.
5. Plug the black switch power supply cable labeled "CPU Swx Pwr" into the top left of the gray port switch on the back of the CPU switch.
6. Find the tan cable labeled "Master View Video" and plug it into the upper right of the gray port on the CPU switch.
7. Find the tan cable labeled "Masterview Mouse" and plug it into the center left of the gray port on the CPU switch.
8. Find the tan cable labeled "MV CPU2 Video" and plug it into the upper right of the CPU2 port of the CPU switch.
9. Find the tan cable labeled "MV CPU2 Mouse" and plug it into the middle left of the CPU2 port.
10. Find the tan cable labeled "MV CPU2 keyboard" and plug it into the lower left of the CPU2 port.
11. Find the tan cable labeled "MV CPU1 Video" and plug it into the upper right of the CPU1 port.
12. Find the tan cable labeled "MV CPU1 Mouse" and plug it into the middle left of the CPU1 port.
13. Find the tan cable labeled "MV CPU1 keyboard" and plug it into the lower left of the CPU1 port.
14. Find the GPS receiver, GPS antenna with antenna cable, and black GPS cable in the cable box.

<p>ARCS PROCEDURE</p> <p>Author: J. Shields</p>	<p>SETTING UP WSI</p>	<p>PRO(WSI)-005.001</p> <p>17 April 2002</p> <p>Page 9 of 21</p>
---	-----------------------	--

15. Unwrap the GPS receiver. The black GPS cable is a 3-branch cable. The branch labeled "GPS" goes into the computer slot labeled "GPS". The branch labeled "GPS receiver" goes into the GPS receiver connection labeled "PWR/RS232". And the branch with the power supply goes into an UPS. Set the GPS in the GPS holder in the back of the blue box on the left hand side. The antenna will be connected in Step M.
16. Verify that the monitor power connection labeled "Monitor Power" on the back of the monitor is solid.
17. Verify that the two connectors, which are mounted to the monitor rack and labeled "Video," are connected to each other.
18. Verify that the following connections on the computer back are good:
 - a) Switch is on "1" (i.e., "on").
 - b) Top plug under switch (power in) is seated.
 - c) Second plug under switch (power out to monitor) is seated
19. On Card 2 (NT buffer CPU), verify that the cable labeled "Buffer Video" is solid in the port labeled "Video," the cable labeled "Buffer mouse" is solid in the port labeled "Mouse," and the cable labeled "Buffer keyboard" is solid in the port labeled "keyboard."
 - a) For initial tests, verify that the Ethernet cables are not installed, and that terminating resistors are in place on the BNC connectors on the cards in slots 3 and 9.
20. Verify that the following connections on the Accessory Control Panel (ACP) backs are good:
 - a) Occultor ACP trolley ribbon cable Port 6402-02-J3 is seated in ACP receptor 6402-02-P3.
 - b) Occultor ACP arc ribbon cable 6402-02-J4 is seated in ACP receptor 6402-02-P4.
 - c) Occultor ACP power cord 6402-02-J5 is seated in ACP power receptor 6402-02-P5, and the other end labeled "OCCACP" is in the ACP strip.
 - d) Sensor ACP ribbon cable 6401-02-J3 is seated in ACP receptor 6401-02-P3.
 - e) Sensor ACP ribbon cable 6401-02-J4 is seated in ACP receptor 6401-02-P4.
 - f) Sensor ACP ribbon cable 6401-02-J5 is seated in ACP receptor 6401-02-P5. This may be found immediately below 6401-02-P3.

<p>ARCS PROCEDURE</p> <p>Author: J. Shields</p>	<p>SETTING UP WSI</p>	<p>PRO(WSI)-005.001</p> <p>17 April 2002</p> <p>Page 10 of 21</p>
---	-----------------------	---

- g) Sensor ACP power cord 6401-02-J6 is seated in ACP power receptor 6401-02-P6, and the other end labeled "Sensor ACP" is in the ACP strip.

21. Install all keys set aside in Step G. Do not turn on yet.

I. String 100-foot Cable Bundle

1. Carefully remove the 100-foot cable bundle from the cable box. One end should indicate "White Box," which will go to the environmental housing. The other end, labeled "Blue Box," will go to the computer rack.
2. Lay out the 100 foot cable bundle between the indoor computer rack and the outdoors environmental housing, with the ends laid out as noted above.

Note: The 100 foot cable bundle consists of 2 orange power cords (SJTE-A), 1 black power cord for the camera (SOW-A), 3 small 1/4" diameter gray cables for the occulter arc, arc brake, and trolley, and 3 large 1/2" diameter gray cables for the filter changer, camera, and other sensors such as temperature. The orange power cord labeled "Brake/Meters" supplies power to the brake, pump, and meters. The other orange power cord labeled "Cooler" supplies power to the cooler.

J. Connecting Cable Bundle at Blue Box

1. Route all of the cable bundle except the power cable under the sandwich port provided below the rear door of the Blue Box.
2. Connect Occulter cable 6402-02-J1 to port 6402-02-P1 on the Occ ACP.
3. Connect Occulter cable 6402-02-J2 to port 6402-02-P2 on the Occ ACP.
4. Connect Occulter brake cable 6402-02-J6 to port 6402-02-P6 on the OccACP.
5. Connect Sensor cable 6401-02-J1 to port 6401-02-P1 on the Sensor ACP.
6. Connect Sensor cable 6401-02-J2 to port 6401-02-P2 on the Sensor ACP.
7. Connect Sensor cable 6401-02-J7 to port 6401-02-P7 on the Sensor ACP. (Unit 6 only).
8. Connect the camera cable, labeled "connect to interface card" to the upper port of the card in slot 10 (far right) in back of the computer (labeled "Photometrics").
9. Ignore the two orange power cords; they will be connected at a later step.

<p>ARCS PROCEDURE</p> <p>Author: J. Shields</p>	<p>SETTING UP WSI</p>	<p>PRO(WSI)-005.001</p> <p>17 April 2002</p> <p>Page 11 of 21</p>
---	-----------------------	---

K. Connecting Cable Bundle to Environmental Housing

1. Open both doors of White Box.
2. Remove the black foam holding in the lexan window, remove the window, and set it and the foam aside in a safe place.
3. Feed the cable bundle through the side-cut holes located at the base of the housing on the East side, and then feed all of them through the bottom plate.
4. Plug the black power cord labeled "Cooler" into the power cord labeled "Cooler AC."
5. Plug the following into the 3 plugs of the other orange power cord: the black plug labeled "Meter AC," the black plug labeled "Brake AC", and the black plug labeled "Pump AC."
6. Plug the black plug labeled "Camera AC" into the black power cord labeled "Camera AC."
7. Verify that the cable labeled "shutter" is connected to the CEU phone jack labeled "shutter."
8. Verify that the cable labeled "CEU Temp" is connected to the CEU BNC Connector labeled "remote temperature."
9. The camera cable labeled "Cable, integ cntrlr CE200a" snakes up to the upper housing chamber and connects to the bottom port of the camera electronics unit (gray box); the port is labeled "Controller."
10. Connect the large gray Sensor ACP cable 6501-03-J1 to port 6501-03-P1 on the environmental housing bulkhead (in the lower env hsg chamber).
11. Connect the large gray Filter cable 6501-03-J2 to port 6501-03-P2 on the environmental housing bulkhead.
12. Connect the small gray cable 6501-03-J3 to port 6501-03-P3 on the environmental housing bulkhead.
13. Port 6501-03-P4 on the environmental housing bulkhead is not used.
14. Connect the small gray cable 6501-03-J5 to port 6501-03-P5 on the environmental housing bulkhead.
15. Coil up the cable end labeled "Spare" and store it behind the bulkhead. It is included only as a spare.

L. Connecting Cables to Occultor

1. On South side, connect cable labeled "Arc Drive" to the upper connector plug labeled "Arc Drive" on the back of the occultor arc drive housing.
2. Find the short limit switch cable.

ARCS PROCEDURE Author: J. Shields	SETTING UP WSI	PRO(WSI)-005.001 17 April 2002 Page 12 of 21
---	-----------------------	---

3. On South side, connect the end of this cable labeled "Limit On/off" to the lower connector plug labeled "Limit On/Off" on the back of the occulter arc drive housing.
4. On South side, connect the end of this cable labeled "Limit switch" to the connector plug labeled "Limit Switch" on the limit switch housing which is in- board of the arc drive mount.
5. On the North side, connect cable labeled "Brake" to the connector plug on the bottom of the round brake housing labeled "Brake."

M. Setting Up GPS Antenna

1. Find the GPS antenna in the cable box. This can be mounted on a 1" diameter pole at a location convenient to the sponsor, such that it has a reasonably clear view of the sky.
2. Run the cable in to the blue box, and hook it up to the connector plug marked "antenna" on the GPS.

N. Preparing Housing Coolant

1. Verify that the coolant path is complete, from reservoir out to reservoir in.
2. Unscrew the cap from the reservoir fill tube on top of the environmental housing. You will need to remove the sunshade to do this; the sunshade may be left off until step Q.
3. Fill coolant reservoir with a mixture of 70% Prestone "Silver" 5150 anti-freeze¹ and 30% distilled water (mixing ratio is approximate). This is easiest using the supplied funnel. Do not fill over the top of the fill line in reservoir.
4. Place the saddle to hold the desiccant on top of the camera electronics unit (shipped in the cable box).
5. Place the desiccant (shipped in the cable box) in the desiccant saddle. If necessary, you can remove the brake power supply from its velcro mounts on the wall temporarily.
6. Verify that the brake power supply setting is unchanged (about 54, ref. AV99-036t).
7. Replace the lexan on both sides of the housing, replacing the black foam, and being sure that the foam is not in the "keep unobscured" region.
8. Shut both doors to the housing.

¹ Non-silicate formula of ethylene glycol

ARCS PROCEDURE Author: J. Shields	SETTING UP WSI	PRO(WSI)-005.001 17 April 2002 Page 13 of 21
--	----------------	--

O. Aligning Environmental Housing to True North

1. Remove the sun shade and camera housing cover, if it was not removed in Step N.
2. Place a level on the occulter plate, on the N side (or whichever side is opposite the side with 3 legs). *Determine whether that side of the housing is level along an E-W line.
3. Adjust the E-W level as necessary by adjusting the leveling legs in the NE and NW corner. Leveling legs are adjusted by lowering the top nut, lowering or raising the leg, and retightening the top nut. There is only about 3/4" variation. Be careful not to screw the legs out beyond this.
4. Placing a level along a N-S line, determine whether the N-S line is level.
5. Adjust the N-S level by moving the leveling leg in the CENTER of the S side of the housing.
6. Using a magnetic compass with sights on it, determine magnetic north, being sure to be far enough away from motors and large metal masses to get an accurate position.
7. The magnetic variation should be determined in advance (or MPL can supply this number). Correct the compass alignment for magnetic variation so that the sights on the compass are pointed to true north. If the variation is east, then Magnetic north is east of true north.
8. Looking through the compass sites, determine a distant object at true north. If the compass is not close to the WSI, then the compass should be placed so that it is on a N line with the WSI. In this way the distant object will also be at true north with respect to the WSI.
9. Sighting along any N-S line on the environmental housing, make a final orientation adjustment to align the housing with the distant object.
10. Once alignment is complete, readjust the 3 leveling legs as necessary.
11. When the system is fully level, snug down the leveling legs in the SW and SE corners to support the system more with stability, being careful not to change the leveling.
12. Snug the jam nuts on all 5 legs up against the white box to secure the leveling leg position.
13. True north can be verified by running Program SRCINFO, which is on the hard disk, determining the time for local apparent noon (LAN), and casting a vertical shadow at local apparent noon. (Or MPL can supply this time.) The shadow, if truly vertical, should align with true north.

* This section is written for the case in which the two legs are on the S side. If they are on another side, adjust the instructions accordingly.

ARCS PROCEDURE Author: J. Shields	SETTING UP WSI	PRO(WSI)-005.001 17 April 2002 Page 14 of 21
---	-----------------------	---

14. The sun shade may be replaced, or it may be left off until Step Q. When it is replaced, the camera lid may be left off, and the shorter bolts originally shipped with the system may be used.
15. If this was not done in Secn E, replace the four screw eyes in the corners, which were originally used to lift the White Box, with the bolts in the baggie marked "White Box corner hardware". Place the screw eyes in this baggie.
16. Install the four shorter screw eyes from the baggie into the corners of the white box, so that they protrude horizontally. Store the baggie with supplies.
17. Choose four attachment points near the corner of the platform. In the cable shipping box find the plastic-coated tie down cable, 16 or 17 wire nuts, and 4 turnbuckles.
18. Using the plastic-coated tie-down cable, connect the housing to the platform as follows. A piece of cable is connected to the housing eyebolts using one of 16 wire nuts. About halfway down, the end is cut and attached to a turnbuckle using another wire nut. Another piece is cable then attaches the turnbuckle to the platform screw eye, using 2 more wire nuts, and adjusting the tension so it doesn't sag with the turnbuckle fully extended. After doing this on each corner, tighten the turnbuckles evenly so they are taut but not tight.

P. Powering Up

1. Do a final visual inspection of the white box for abnormalities.
2. Do a final visual inspection of the blue box for abnormalities.
3. Verify that front switches are in the "off" position on both ACP's and the computer.
4. Verify that a site-supplied UPS (Uninterruptible Power Supply) is on.
5. Plug the orange power cord labeled "Cooler" into a power strip or UPS. This supplies power to the cooler. Walk out to the environmental housing and verify that the cooler is on.
6. Plug in the orange power cord labeled "Brake/Meters." This supplies power to the brake, pump, and meters. Walk out to the environmental housing and verify that the coolant is flowing and not leaking, and that the meters are on.
7. Verify that the computer is off, so you can check the ACPs before the computer takes over.
8. Plug the Blue Box power cord into the UPS.
9. Plug the GPS power into the UPS.

<p>ARCS PROCEDURE</p> <p>Author: J. Shields</p>	<p>SETTING UP WSI</p>	<p>PRO(WSI)-005.001</p> <p>17 April 2002 Page 15 of 21</p>
---	-----------------------	--

10. Turn on the GPS in the back of the blue box by pressing the red button. Watch to see that the small screen display comes on.
11. Turn on the “on” button on the power strip.
12. Turn the Sensor ACP power on, and the local enable on.
13. Verify that the filter changer wheel on the Sensor ACP is operable, i.e. the LED’s change when the filter changer is pulsed.
14. Verify that the panel meters on the Sensor ACP come up. The camera CCD temperature will be near 0, because the camera is not turned on yet. **This is always the reading when the camera is turned off, and does not necessarily indicate a cooling problem.**
15. Turn the occulter ACP power on, and the local enable on. Verify that the Motor toggles are in neutral (i.e., not up or down). Then turn on the local enable key.
16. Compare the arc physical position with the ACP panel meter. In normal shipping configuration, the arc should be at 10 degrees above horizontal toward the East, and the panel meter should be near 10. (There is no trolley meter on Unit 9.)
17. If the arc position is not consistent with the ACP positions, refer to the ACP alignment procedures (to be included in the Trouble Shooting Manual). **It is important that the ACP readout matches the occulter position before the computer is turned on.** If you have been trained on the ACP, we recommend doing the calibration documented in AV99-033t.
18. Have someone change the occulter ACP switch from local to computer and back while you are at the white box, and verify that the brake is setting and releasing. It should make a sound on set and release. Note that the brake power should be plugged in, to allow the brake to release, when you move the occulter. This was done in Secn. K.
19. Verify that the arc position on the ACP can be changed by pushing the left toggle under Arc Position to “Local,” and then by pushing the center toggle (“Fwd Motor”) up to “Drive.”
20. Turn on the CPU Switch by pressing the Power button toward the “On” label (this is the small box over the monitor). The green button over the “1” should come on.
21. Turn on the computer. Verify that it comes on. If the program comes on, exit it by pressing any key during the “waiting for 1st grab” delay.
22. Press the “Select” button on the CPU Switch until the green light on “2” is on. Verify that the buffer CPU is on. Do not change anything on this CPU, and do not worry if it says to log on. This is OK. Press the “Select”

ARCS PROCEDURE Author: J. Shields	SETTING UP WSI	PRO(WSI)-005.001 17 April 2002 Page 16 of 21
--	----------------	--

button until the green light on “1” is on. At this point you are working with the WSI CPU.

23. If the program started, it will have turned on the camera. If not, turn on the camera by typing “ON” followed by the Enter key. You should see the CCD readout on the ACP go to near the temperature in the white box, and then start to drop as the CCD cooler starts cooling.
24. Change to the WSITEST CAMERA directory by entering **WSITEST\CAMERA**.
25. Run program RTGRAB by entering RTGRAB and following the instructions, using the “Autoscale” option. This program will grab images every 8 seconds when set on exposure = 100 msec, and allow you to see the images. If it is daylight, use FC values SP = 3, ND =3 (set on the ACP). If the sky is dark, use SP =2, ND =1, and longer exposures as necessary (such as 30000 msec). If the CCD is not yet cool, the corners of the image will blacken as it cools.
26. In RTGRAB, verify that images are being acquired by the camera.
27. With the Sensor ACP in local, and local enable on, change the filter positions, and verify that the image changes. The response is not instantaneous and varies from 1 to 2 times (exp + 8 sec) where exp is the exposure time. That is, if exposure = 5000 msec = 5 sec, the grab time is 5+8 = 13 sec, and it will take 13 to 26 seconds for the image to change in response to the filter selection.
28. With the occulter ACP in local, and local enable on, change the occulter position, and verify that the image changes.
29. Verify that the camera housing orientation is correct by checking whether objects to the South are at the top of the image. If not, reorient the camera (See Step E).
30. Exit form RTGRAB by pressing “x” once, then return to the RUNWSI directory by entering cd \RUNWSI.
31. Check the Sensor ACP panel readings for normal:
 - a) Camera housing less than 32, generally near 20 (degrees C) (actual temperature depends somewhat on outside conditions).
 - b) Chip temperature near -30 to -40 (degrees C) or cooling toward this temperature.
 - c) Environmental housing up to 32, generally near 16 (degrees C)
 - d) Flow rate above 0.13, generally near 0.35 (gallons/min).
 - e) N2 pressure above 2, generally near 4 (psi).
 - f) Relative Humidity below 99%.

ARCS PROCEDURE Author: J. Shields	SETTING UP WSI	PRO(WSI)-005.001 17 April 2002 Page 17 of 21
--	----------------	--

32. Return the ACP local enable to off and the local/computer switch to "computer" on both ACPs.
33. Check the input file for the correct local lat, long, and site ID, as well as the MO setting, as follows. Enter "MS RUNWSI.INP". Use the down arrow to find the appropriate input lines. If it is necessary to change them, use the right arrow to get to the right space, enter the corrected values by typing them in, and use the Del key to remove the old values. The site ID should be a 3-character entry such as NS1 for the first NSA instrument. The lines "Save Raw data to MO disk?" and "Save Processed data to MO disk?" should both be set to 0. Once all corrections are made, check them to verify that you have preserved the format. To exit, press the "F10" key, followed by "f", "q", and "y" (or use the editor of your choice.).
34. If RUNWSI did not start on initial power-up, return to root directory on c: by entering "c:" and "cd\". Edit AUTOEXEC.BAT, removing the "REM" from the line which has "REM RUNWSI". Exit the edit program, saving the change. (This step may be skipped if the Runwsi program started when the computer was turned on.)
35. Reboot the system by entering Ctrl Alt Del.
36. Verify that the WSI goes through normal start-up procedure documented in Memo AV97-038t.
37. After the user is comfortable that the system is running well, it may be networked by the sponsor. This step includes updating IP addresses in the WSIFTP.INP file, updating "Send files to Adam" from 0 to 2 in RUNWSI.INP, updating the input file in the PCTCP directory on the DOS side, updating TCPIP properties on the NT side, adding both network cables (to DOS and NT), and setting up the sponsor data system. Also remove the terminating resistors if the WSI is not at the end of the network chain. This is normally done by the system administrator. See Memo AV98-045t.

Q. Sealing and Shading Unit

1. After everything has been verified to be normal, seal the camera housing and the environmental housing for moisture, by running a bead of self-leveling RTV between the inner circumference of the white insulation ring and the outer ring of the camera housing, on top. (It is necessary to remove the sunshade and black foam insulating ring to get to this.)
2. Seal the nylon screws, which penetrate the camera housing flange with self-leveling RTV.
3. The outer circumference on the white insulation ring is normally either sealed underneath the ring at MPL, or sealed with an RTV bead on

<p>ARCS PROCEDURE</p> <p>Author: J. Shields</p>	<p>SETTING UP WSI</p>	<p>PRO(WSI)-005.001</p> <p>17 April 2002 Page 18 of 21</p>
---	-----------------------	--

installation. Verify that it has been sealed, and if not, seal it. If possible, let this dry before replacing the sunshade.

4. After replacing the sun shade, place a drop of RTV on the threads of the 8 bolts holding the sunshade, and put a bead of RTV under the head of these bolts.
5. If desired, tape the two orange power cables, to avoid leaks where the power cables plug into them. Tie them up off the floor of the housing.
6. Check all subassembly cases such as the arc drive, limit switch, and brake to verify that they appear to be sealed (See Tech Note 241, Section 4.10 for more details.) Seal with RTV if required, particularly at sites with frequent rain and/or infrequent technical support.
7. At night, check to see whether any lights are in the view of the WSI. Arrange to have them kept off if practical. Otherwise, the dome should be shaded from such lights (it was agreed originally that this would be a site responsibility). The shading can be done by making 8" round plaques, and mounting them on the edge of the platform or 3-4 feet away from the WSI so that they shade the dome without obscuring much of the field of view. There should be no "blooming" or vertical lines in the image at night when this is done. **This step is important to the night data quality.**

R. Cleaning Up

1. Tie up wires and cables neatly at the back of the gray box.
2. Tie-wrap the cable bundle neatly.
3. Check that the wiring and cabling in the environmental housing are tied up in a professional manner.
4. Put the bolts and packing materials from the two large crates in the cable shipping box, except for those used to seal the cable box.
5. Seal the cable shipping box, being sure to use all the bolts.
6. Store the 3 boxes and the sides, top, and pallets from the two larger crates in a safe location for future shipment, if desired.
7. Remove and store the keys from the ACP when the system is left in final field configuration, if desired.

S. Second Day Check

1. On the second day, go through the Maintenance procedures documented in the Preventative Maintenance Checklist to verify performance.

ARCS PROCEDURE	SETTING UP WSI	PRO(WSI)-005.001
Author: J. Shields		17 April 2002 Page 19 of 21

V. References:

1. Memo AV98-009mod.

VI. Attachments:

1. Typical Contents of Shipping Boxes

<p>ARCS PROCEDURE</p> <p>Author: J. Shields</p>	<p>SETTING UP WSI</p>	<p>PRO(WSI)-005.001</p> <p>17 April 2002 Page 20 of 21</p>
---	-----------------------	--

Attachment 1: Typical Contents of Shipping Boxes

Box 1:

- Computer rack (Blue Box) Crate
- Monitor (well blocked for shipment)
- Computer
- 2 Accessory Control Panels
- SCSI rack (if provided)
- Blue eye bolts in bottom
- Various cables pre-attached
- McLean cooler

Box 2:

- Environmental housing Crate
- Completed housing with a variety of parts pre-installed, including:
 - a) McLean cooler
 - b) Pump and coolant system
 - c) Reservoir
 - d) Temperature and flow rate sensors
 - e) Insulation and sun shield on top

Box 3:

- Camera housing Crate
- Camera housing subassembly includes sensor, lens, filters, etc.
- Camera housing lid

Box 4:

- Occultor Crate
- WSI Occultor

Box 5:

- Cable and Miscellaneous Crate
- Cable bundle
- Arc drive subassembly
- GPS receiver and power cable
- Keyboard
- Mouse
- Distilled water
- Anti-freeze
- Desiccant canister
- Spare desiccant canister
- Desiccant saddle
- Nitrogen

ARCS PROCEDURE	SETTING UP WSI	PRO(WSI)-005.001
Author: J. Shields		17 April 2002 Page 21 of 21

(Box 5 cont'd)

- Nitrogen gauges
- Tie-down cables with screw-eyes, turnbuckles, wire nuts
- GPS Antenna and cable
- Documentation and supplies kit
- Spare MO disks
- Spare Camera/Arc Drive desiccant
- Camera lens
- Masterview CPU Switch
- RTV for installation (black and clear self-leveling)
- Kimwipes

Additional equipment normally used by field team:

- Tool kit
- Spare black tie wraps
- Compass and levels
- Square for providing shadow at LAN

Additional recommended spares and parts:

- DIO 120 card
- Shutter
- Light blockers (see Setup Step Q)