ASH-DOME MAINTENANCE & OPERATING INSTRUCTIONS

1) Apply a good grade of all weather 'Lithium' grease to the shutter drive gear teeth and worm gear. The top edge and sides of the shutter drive rack must also be greased at regular intervals. (6 months)

2) Apply a coating of dry type spray-on silicone lubricant to the neoprene weather seals on either side of the viewing aperture. (6 months)

3) All electrically operated Ash-Domes shutter control drum switches are fitted with a slide type locking system on the switch body. This slide lock must be moved manually from side-to-side to allow the operator to change the direction of the shutter. The forced delay is necessary to prevent fast change of shutter direction which would not allow the motor to come to a complete stop before changing directions. This brief stop of the shutter motor is necessary to give the magnets in the shutter motor time to switch. This also lets the limit switch operate properly so the shutter stops automatically when fully open or closed. If the shutter switch is not fitted with this locking system the operator should always allow the shutter to stop completely before changing direction.

NEVER walk away from the observatory dome while the unit is in operation. NEVER operate with guards off.

4) The rack and gear azimuth system is adjusted so the gear engages the azimuth track and just presses against the track. The azimuth drive is spring loaded and the gear wants to more or less float in the gear rack. Over tightening of the gear into the azimuth drive track will promote excessive wear on the punched track.

5) The oil levels in the electric drive motor gear boxes should be checked annually, adding any oil necessary to maintain proper oil levels. Should the gear case oil stiffen during periods of extreme cold, it is suggested that a lighter grade of oil be used. The oil in the hydraulic system in the larger domes must also be checked regularly.

6) Should your Ash-Dome unit be fitted with a type 'B' drop-out shutter section, the drop-out section must be tightly closed before the main shutter section can be fully closed. Severe damage to the shutter system may result if this is not practiced. Do not attempt to open the lower door section with the upper door section in the closed position. Any slack in the operating cable will cause server damage.

7) When your Ash-Dome is not in use, it is suggested that the shutter be positioned in the quadrant which faces the prevailing winds. This practice minimizes the possibility of blowing snow or rain from penetrating into the interior of the dome.

8) If you feel that painting is necessary the Ash-Dome should first be cleaned with a mild detergent to remove all oil or grease residues. A prime coat of zinc chromate may be applied, after which any good grade exterior paint can be applied.

9) While all surfaces of the Ash-Dome are either aluminized, galvalume or galvanized steel, to prevent the possibility of corrosive actions at locations where spot welds are located, it may be necessary to touch up these spots. Also corners of the shutter sections should be inspected on a regular schedule.

10) Should any unusual conditions be noticed which appear to be beyond the capabilities of local mechanics to correct, it is suggested that you contact this company at the following:

ASH MANUFACTURING COMPANY
P.O. Box 312
Plainfield, IL U.S.A.
(815) 436 9403 : FAX (815) 436 1032

OWNERS RESPONSIBILITY :

As the owner, you are responsible for maintaining your Ash-Dome. Do not let unqualified personel operate this equipment, this is a major cause of any type equipment failure. Repairs required as a result of failure to properly maintain this equipment are the owners responsibility.

ASH-DOME ASSEMBLY INSTRUCTIONS

GENERAL INFORMATION

Every ASH-DOME unit is completely assembled, inspected and thoroughly tested before being crated for shipment. Average mechanics will not find the reassembly difficult. With the exception of an Engineers Optical Leveling instrument, the entire assembly process can be completed with hand tools found in an average mechanics tool box.

HAND TOOLS REQUIRED

TWO - 1/2" Open End Wrenches
ONE - 3/8' Nut Driver
ONE - Tapered Drift Pin
ONE - Hammer
ONE - Engineers optical leveling instrument (This is used to level the ASH-DOME wall plate assembly + or - 1/32")
ONE- Phillips Head Screw Driver
ONE - 8" Crescent Wrench
ONE - Slot Head Screw Driver
ONE - Wood Drill Bit, Slightly larger than the anchor bolt diameter
TWO - "C" Clamps
THREE - Vise Grips

Most of the assembly work is done from the center of the dome, it is suggested that a platform or scaffolding be erected approximately 5' below the top of the finished dome height. All of the dome roof panels, shutter track rails, observing aperture trim members, shutter drive assembly and the shutter will be installed from this center platform. It is also necessary to have a work platform available for a worker at some point on the outside of the support wall. (The height should be convenient for the installer so it is not necessary for this person to move.) After the dome track has been secured the dome is turned to this person. It is suggested that all dome parts be removed from the crate and laid out in an orderly manner. This will acquaint the mechanic with the general appearance of the components, all parts are numbered to aid in locating their final position.

CAUTION

DO NOT attempt to assemble an ASH-DOME unit during high or gusty winds. Unexpected gusts may cause a mechanic to lose a roof panel or a high velocity gust could tear apart a partially assembled dome from the structure. With a reasonable amount of care, and closely following these instructions, it is certain that the final result shall be a high quality observatory dome structure with excellent operating characteristics.

STEP #1 - INSTALLATION OF CIRCULAR WALL PLATE ASSEMBLY

THIS IS IMPORTANT: (Remove all excess cement and motar from the top of the support wall.) The ASH-DOME wall plate must lay flat and level, all anchor bolts must be straightened to a vertical position, (straight up and down). The ASH-DOME wall plate assembly consists of a number of circular segments which must be fastened together to form a continuous circular member. Join the segments in a manner which shall cause similar numbers to be adjacent at the splice joints. (ref.: supplement page #1) Install the missing support dome rollers fixtures at each splice in the circular plate. The bolts securing the roller fixtures should be drawn down tightly, then backed off until slightly tighter than finger tight. This allows the hard rubber cushion to act as a cushion and allows for any slight variations in the wall plate assembly. Rest the completed circular wall plate on top of the anchor bolts.

Note : The locations at which the azimuth motors will be secured to the wall plate, then shift the entire plate assembly about until the azimuth drive motor is in the most ideal location for electrical connections and also minimize interference between anchor bolts and dome support roller fixtures. Most northern hemisphere astronomers prefer to locate the azimuth drive unit in a northern quadrant. Southern observers usually choose a southern quadrant location for the azimuth drive unit. Adjust the entire wall plate assembly to become concentric with the support foundation wall. Check the outside diameter of the circular wall plate at several locations and make up any final adjustments to cause the plate to be resting in a truly circular configuration. When all outside diameter measurements are of equal length, the wall plate assembly shall be resting in a true circle. After all necessary adjustments have been completed, mark the locations of the anchor bolt. (It may be necessary to cut the anchor bolt off at the location of the azimuth motor mount). Lower the wall plate assembly down over the anchor bolts to a resting position on the wall top. Now, with the aid of the engineer's Level determine the highest elevation about the wall top and the wall plate assembly, recording all the elevations along the outside edge of the steel angle wrapped about the outside edge of the wall plate. When the high point has been located, further elevate this point approximately 1/4" by inserting tapered shims at the underside of the plate and the wall top on either side of the anchor bolt, as indicated on drawing R-100. Install a washer and a nut on this anchor bolt and draw the nut down tight. Now, with the use of the Engineer's Level and tapered shims adjust the entire wall plate to this elevation. DO NOT take the elevations from the top of the roller fixtures attached to the wall plate. When the entire wall plate assembly has been adjusted to a flat and level plane, it will be noted that the width of the space between the underside of the wall plate and the wall top will vary as the elevations of the support wall top vary. This space should be filled cement or grout at this time, however, it can be done after completion of the dome. Recheck all elevations and outside diameter measurements, make any adjustments

necessary to attain a circular, flat and level wall plate assembly. It is absolutely essential that care be exercised in the adjustments of the wall plate assembly to guarantee that the finished dome structure may be mounted in azimuth without binding action developing in the dome support track rail and support rollers. Cut off any excess length off on adjusting shims before installing the dome support track rails. Cut off the extra length of the anchor bolt this time.

STEP #2 - INSTALLATION OF THE DOME ROLLERS AND TRACK RAILS

Apply any good grade of all weather type lubricating grease to each dome support roller shaft and insert the shafts into the fixtures mounted about the wall plate. (ref.: supplement Page #1)

Option :(If minimum amount of lateral movement is desired, install a spacer washer on the roller shaft before inserting it into the roller fixture.) When all rollers have been mounted, install one segment of the track by inserting one end of the track over a roller and then sliding the segment over the following rollers until the segment is supported by rollers. Note the numbers on the ends of the track rails and install following segments in a manner which causes similar numbers to become adjacent (ref.: supplement page #2). As each additional segment is installed, it must be bolted to the previously installed segment at the overlapping or splice joints. Use the 5/16" x 3/4" low profile truss head bolts, these will be marked "Bottom Track Splice Bolts". Install only those bolts which will be in a straight up and down position on the bottom side of the dome track, the bolts go down, the nuts go on the bottom side of the track. This allows the rail to roll around the wall plate without any obstructions. The horizontal holes are used for the next step of the assembly. During the installation of the track rail segments, care must be exercised to prevent the support roller shafts from sliding out of the mounting fixtures. Roll the track on keeping it tight to the wall plate, as it will roll off just as easy as it rolls on at this time. Don't let the track rail fall from the structure, this could result in a radius change and result in a track that may not turn as freely as it should. When all the segments have been installed and bolted together the track should revolve freely. The track may appear to be somewhat loose at this time but this characteristic shall not be apparent after the dome skirt and roof panels are in place.

STEP #3 - DOME SKIRT ASSEMBLY AND AZIMUTH GEAR RACK

The dome skirt, which is installed around the outside of the dome track, is made of several sections of 14 GA galvanized steel with curved angles spot welded to them. (ref.: supplement drawing #3) Start with the section marked "BACK CENTER", this aligns with the "Back Center on the dome track. Bolt this section in place using the 5/16" x 3/4" stainless steel truss head bolts, these are marked "Skirt Bolts". The bolts go from the inside out. The nuts are on the outside of the

skirt. Continue with sections on either side of the back center bringing the similar numbers together. The last section of the skirt is installed by slipping one end in place and lowering the other end from above. Use the 5/16" x 3/4" bolts for the splices on the skirt panels also. Holes are also drilled in the skirt for mounting the azimuth gear rack.(ref.: supplement Page #4) Position the gear rack with "BACK CENTER" at the "BACK CENTER" of the dome skirt. As in earlier steps align numbers to similar numbers. Fasten the sections together with the self-tapping sheet metal screws provided. These will be marked "Azimuth Gear Rack Splice Screws". The azimuth gear rack is secured to the skirt by using the self-tapping screws provided marked "Gear Rack Screws". These go from the outside of the skirt through the gear rack and tap into a "Gear Rack Chair". These are used to support the gear rack and also hold it in place.

STEP #4 INSTALLATION OF THE DOME ROOF PANELS

Should your ASH-DOME have a diameter of 12'6" or larger, it will be fitted with a circular reinforcing pipe ring. This ring is secured to the inside of the dome with fittings that are attached to the ribs of each of the dome panels. (ref.: drawing R-105) Another examination of the dome skirt will reveal the locations of "FRONT CENTER" and a "BACK CENTER" marked on the skirt panel. The "BACK CENTER" point indicates one end of the center line through the hemisphere of the dome. This is the point where you begin to install the roof panels (ref.: supplement page 5). It should be noted that all roof panels are numbered at the bottom (wide) end,on the inside. Take the time to lay the roof sheets out in sequence. These are the only numbers you will be concerned with at this time. The first panel to be installed is marked "BACK CENTER" and some number. These panels will fit flush on the outside angle of the dome skirt. Have one person hold the sheet up, while another installs the sheet metal screws provided. These will be marked "Sheet Screws". Next install the "Rib Blocks" using the nuts and bolts marked "Rib Bolts". These go through the sheet rib, rib block and skirt. The bolt goes from outside to inside. Note the number on the bottom end of the starting roof panel and install all the other panels in a manner which causes the numbers to increase in a clock-wise direction and decrease in a counter clock-wise direction. (It is recommended that you install a few of the panels each way from the "BACK CENTER" to help bring the roof shape.) All panels are installed from the scaffold inside the dome. The bottom end of each successive panel is entered into the top end of the preceding panel. Use vise grips as shown in supplement. This is then slid downward through the interlocking joint until it comes to rest in a position on the dome skirt angle. The sheet will slide in and out of the rib somewhat so as to allow the installation of the sheet metal screws and the rib blocks. The first several sheets are difficult but as the roof comes into shape, a hemisphere the sheets will slide easier. Use soap on the interlocking edges, this will lubricate the sheet so it will slide easier. 'If you use oil, it will bleed eventually and may stain the roof pannel.

DO NOT DRILL NEW HOLES, take your time and the panels will come into alignment. With all the sheets in place, screwed and bolted you now have a semi-rigid dome structure.

STEP #5 - INSTALLATION OF THE SHUTTER TRACK SYSTEM

The shutter track system consists of two half-circles of fabricated track. Each half circle is made up of two or more segments which must be bolted together before the track is raised into position over the top of the dome (ref.: supplement page #8). One track is positioned along the left side of the observing aperture, the other track is fitted to the right side. Identification of the right and left tracks may be readily made by noting the locations of the bolt holes through the track base angle matching them to the holes along the side of the aperture. Lay out all the aluminum spacer blocks or shim blocks in order, letters and numbers. The track rails are fastened at the ends first, front and back, do not tighten these blocks and bolts yet. Use a "C" clamp at the top of the dome to hold the rails in place. (ref.: supplement page #9) Bolt the rails onto the rib locations next, the wide part of the shim block away from the aperture, square side of the shim to the track, taped side to the dome rib this holds the track rail straight up and down. This operation will secure the rails and allow you to bolt the side trim angles into position. The aperture side trim angles must be installed along both sides of the observing aperture. These bolt through the track as well as the roof sheet and the trim angle. (Tapered aluminum shim blocks under the track base angle hold the track base hold the track rails in a vertical position when the fasteners are drawn down tightly, ref.: supplement page #10) All Shim blocks and their respective locations are clearly marked with numbers and letters. When two blocks are on the same bolt the block that fits on the outside of the dome will always be the one with the mark on it. The other block fits in between the trim angle and the dome skin. This is tricky to get in, but if you take your time, it will fit. After the track rails are in place the internal cross bracing is now ready to be installed. These fit on the inside of the dome and fit onto the bolts that are coming thru the back side of the roof. These locations have also been marked (ref.: supplement pages #11 & #12). When installing the shim blocks on the backside of the dome you must put putty around the bolt on the inside of the dome along with the specified number of the spacer washers to guarantee that leaks shall not occur about these bolts. The "Motor Bar" serves to support the shutter drive motor. This can be identified by its markings. The Top Bar also serves to support the shutter drive motor, this is also marked. This is a heavy angle that has a plate bolted onto it and mounts across the top of the aperture. Use the rib blocks called for and bolt this angle into position. They are marked "Top Bar Rib Blocks". These will only fit one way. Install the rectangular frame "Gear Hole Trim" at the top of the dome. This trims the opening and allows the shutter drive gear access to the shutter. (ref.: supplement page #13)

Next install the "Back Shutter Seal Angle", this is mounted on the outside of the dome just past the gear hole trim. It fits between the shutter tracks, the flange of the angle faces the gear hole trim (ref.: supplement page#14) Mount the "Track Rail Angle Braces" at the back ends of the shutter track sections. After all parts of the shutter track system and back shutter seal angle are secured in place you now have to caulk the dome. The glazing compound is squeezed into the space between the track rails and the skin of the dome, up both sides of the aperture. You start at the bottom on the front and work your way to the back shutter seal angle, and across under the back shutter seal angle. DO NOT CONTINUE OVER THE BACK PAST THE BACK SEAL ANGLE. You are only sealing up the area under the shutter when it is closed. Make certain that you have sealed along both sides of the entire opening completely. The "Side Weather Seals" are now ready to be mounted. These fit along either side of the aperture and bolt to the sides of the shutter track. In order to mount the sections you must remove the nuts from the track splices and fit the assembly over the bolts. Use the nuts and bolts marked "Side Seal Nuts & Bolts". The bolts go through the dome track, nuts on the outside of the dome.

STEP #6 - INSTALLATION OF THE REINFORCING RING

All ASH-DOMES with a diameter larger than 12'6" are built with one or more reinforcing rings installed. A reinforcing ring consists of a number of circular segments of steel tubing with special end connectors (ref.: supplement page#15). The ring is held in position on the inside of the dome by means of a fixture and clip attached to the rib of each roof panel. The tubing segments are clearly marked to indicate the sequence of assembly. A "BACK CENTER" point is indicated on one of the circular tube segments. This mark must coincide with the "BACK CENTER" point of the dome. Other segments are marked so as number aligns to number. The ends of the tubing secure to the sides of the observing aperture with readily identified fixtures. Work your way from the "BACK CENTER" around to the aperture, securing the clips as you go. The fixture at the end will bolt onto the side of the aperture. The end is adjustable and when it has been secured to the track rail tighten the set screw.

STEP #7 - INSTALLATION OF THE SHUTTER DRIVE UNIT

In all ASH-DOME units the shutter drive gears are mounted in the same manner, whether manually or electrically operated. Remove the two small retaining angles which are bolted through slots at the top of the gear housing. (ref.: supplement page #16) The purpose of these angles is to lock the gear in mesh with the shutter drive rack after the shutter has been installed. The shutter drive track runs down the center on the upper shutter section. Remove the nut (3/4" flex lock nut) and one washer from the support bolt,(1/2" bolt fixed to gear box yoke).

Remove the 1/2" flex lock nut from the brackets at the back of the motor assembly, do not remove the 1" hex head screw from the bracket. Lift the unit into position and insert the 1/2" bolt through the slotted hole at the center of the top bar. Replace the washer and the self-locking 3/4" nut that holds the motor drive unit in position, DO NOT TIGHTEN THE NUT AT THIS TIME. Swing the back of the motor up and put the 1" bolt in the brackets into the holes drilled in the motor bar and tighten so as to just start to squeeze the rubber grommet between the bracket and the motor bar. This allows the motor to travel with the shutter during high cross wind loading conditions.

STEP #8 - INSTALLATION OF THE SHUTTER SECTIONS

The main shutter section may now be raised into position over the observing aperture. Lift the shutter onto the dome, resting it upon the shutter track rails and the side weather seals. Make certain that the end with the back shutter seal is up (ref.: supplement pages #18 &#19). DO NOT DAMAGE THE SIDE WEATHER SEAL. If this should happen, contact cement can be used to glue the seal back together. Remove the support roller mounting fixtures from the shutter side rails. Insert the shaft of the support roller into each fixture. Then replace each fixture with the roller intact. Tipping and securing the roller and fixture together into the track rail. It is necessary to elevate the shutter somewhat to replace the fixtures with roller installed. When all the rollers are in place, roll the shutter section upward until the top of the shutter is well past the back shutter seal angle. DO NOT PUSH THE SHUTTER OVER THE TOP OF THE DOME. BE CAREFUL, SECURE THIS SECTION WITH A VISE GRIP IN THE TRACK SO THE SHUTTER CAN NOT MOVE EITHER DIRECTION (ref.: supplement page #19). Now the shutter drive track is positioned over the shutter drive gear unit. Raise the shutter drive gear unit upward until the gear is meshed with the shutter drive rack, reinstall the two small angles (ears) which lock the gear in position. Some slight forward or backward adjustments may be necessary to position the angles to allow freedom of movement and yet maintain a permanent lock between the drive gear and the shutter drive track. Adjustments are made by shifting the angle fastener bolts slightly in the curved mounting slots which are cut into the drive gear housing. The angles must appear to lay flat on the top of the shutter drive track. Tighten the 3/4" flex lock nut on the 1/2" shutter drive support bolt, allow 1/32" clearance to allow this bolt to shift with any side movement of the shutter. This is necessary because of wind loading. After the motor is installed the shutter can not be moved except by activating the shutter drive unit, whether manually operated or electrically operated. Install the lower shutter section in the same manner. Make certain the locking device is upward so it will be in proper position so when the two sections are brought together they meet and lock. The two shutter sections will then travel together if this a TYPE "A" shutter style. Should this be a TYPE "B" style the lower door is mounted on hinges, the two sections should meet evenly when they are brought together. Run

the main shutter section open and install the "Back Shutter Seal" at the back of the shutter or the top. Run the lower door section up with the upper door section and, also install the front shutter seal. Some adjustments may be necessary so that the shutter stops in the correct position.

STEP #9 - INSTALLATION OF LOWER WEATHER SEALS

Locate the azimuth motor mount. The "Azimuth Drive Seal" mounts at this location, the neoprene strip goes up and must be trimmed to fit the radius of the dome. Remove the nuts and washers from the motor mount and place the seal into position. When properly fitted the neoprene strip should just brush along the inside of the dome track. This is the location where you start with the rolled weather seal. This is inserted over the bolts and roller fixtures around the wall plate assembly. The edge of this seal should wipe against the inside of the dome track and fit into the space between the track and the azimuth gear rack. (ref.: supplement page #19). Use the roofing nails to secure the rolled weather seal. The opening between the dome track and the top side of the wall plate assembly is effectively sealed from blowing dust and snow using this method. (ref.: drawing R-100)

STEP #10 - INSTALLING THE AZIMUTH DRIVE UNIT

The location of this drive unit should already be known. It has also should have been marked clearly on the wall plate assembly. Two mounting bolts are extending upward from this location through the azimuth motor seal. (ref.: drawing R-105) Mount the unit in a manner which shall cause the drive gear to mesh with the circular punched azimuth gear rack. It should remain in this position throughout one complete revolution of the dome. It may be necessary to shift the unit to accomplish this but that is the reason for the slotted holes in the mounting fixture. Use the wing nut to adjust gear pressure, tighten until light pressure is applied to the circular rack, the compression spring will hold the gear up and the unit should more or less float in the azimuth gear rack while remaining engaged in the track.

STEP #11 - LUBRICATION

All dome rollers and shutter support rollers have ball bearings. These have been packed with an all weather grease. It is suggested that the inside configuration of all shutter and dome support track rails be lubricated with the same type grease. It is important that the top sides of the shutter drive rack be lubricated for the entire length of the rack, also grease the rack openings which come into contact with the shutter drive gear. The drive motor gear boxes are filled with lubricating oil at the factory, however it is suggested that the oil level be checked and oil added if necessary. Any good grade of all temperature oil should be suitable.

PAINTING

All ASH-DOMES are fabricated with aluminized steel or galvalume plated steel. These materials do not require painting. Should it be desired to to paint your observatory clean the surface with a detergent and rinse. This should remove any oils that are used during the roll forming process. Use a zinc-chromate primer, after which any good exterior paint should work.

OWNERS RESPONSIBILITIES

As the owner, you are responsible for maintaining your ASH-DOME properly. Repairs required as a result of failure to maintain property are the owners responsibility.

ASH MANUFACTURING COMPANY
PHONE: (815)-436-9403
FAX: (815)-436-1032