AWOS 900

Installation Manual

903-042

Rev. D

allweatherinc

All Weather Inc. • 1165 National Drive • Sacramento, CA 95834 • USA • 800.824.5873 • www.allweatherinc.com

Disclaimer
The information and specifications described in this manual are subject to change without notice.

Latest Manual Version
For the latest version of this manual, see the *Product Manuals* page under *Reference* on our web site at www.allweatherinc.com/.

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Contact Customer Service

- **Phone** support is available from 8:00am - 4:30pm PT, Monday through Friday. Call 916-928-1000 and ask for "Service."
- **Online** support is available by filling out a request at www.allweatherinc.com/customer/support.html
- **E-mail** your support request to support@allweatherinc.com

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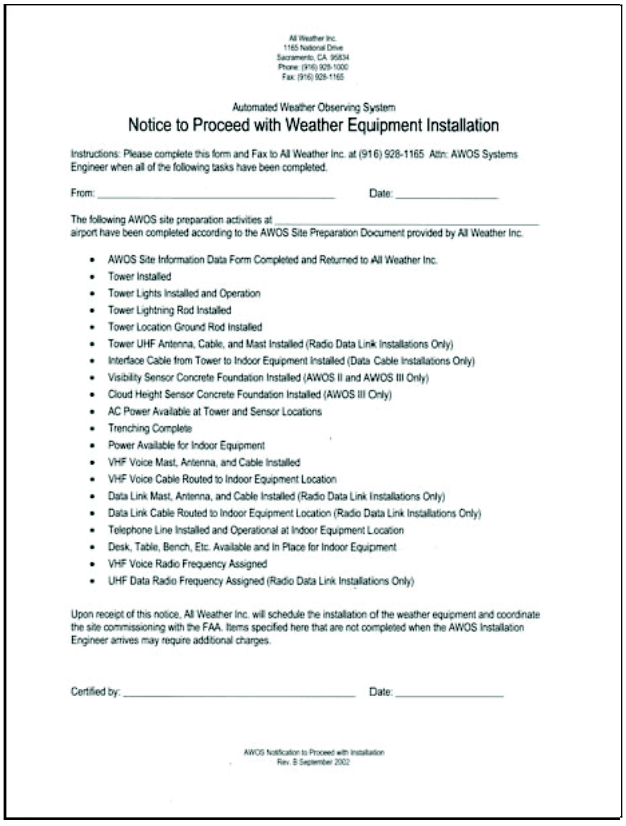
1. PROCEDURES AND INSIGHTS

This manual is a collection of the solutions and techniques we've come up with over many years of installing AWOS equipment. There are many ways to do just about anything, and the content of this manual is *not* the only way to do an AWOS installation. You will almost certainly be doing some on-site engineering to get the job done.

2. PREPARATION AND PRELIMINARIES

Before you go to the airport, it's important that the site is ready for you. It's recommended that you don't travel until you have a signed copy of the NOTICE TO PROCEED in your hands. If it's not signed, return it for a signature, and each item that's completed should be checked off. This gives you recourse if you travel to a site and then wind up doing nothing for a couple of days because the site isn't ready.

Upon arrival at the airport, you'll first check with the airport manager, city manager, FBO, or whoever is listed on the SITE INFORMATION DATA form as the responsible party. Usually, it'll be the name listed as the local contact. This person will probably have the AWOS stored in a hangar or shop, waiting for your arrival.



All Weather Inc.
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Automated Weather Observing System

Notice to Proceed with Weather Equipment Installation

Instructions: Please complete this form and Fax to All Weather Inc. at (916) 928-1165 Attn: AWOS Systems Engineer when all of the following tasks have been completed.

From: _____ Date: _____

The following AWOS site preparation activities at _____ airport have been completed according to the AWOS Site Preparation Document provided by All Weather Inc.

- AWOS Site Information Data Form Completed and Returned to All Weather Inc.
- Tower Installed
- Tower Lights Installed and Operation
- Tower Lightning Rod Installed
- Tower Location Ground Rod Installed
- Tower UHF Antenna, Cable, and Mast Installed (Radio Data Link Installations Only)
- Interface Cable from Tower to Indoor Equipment Installed (Data Cable Installations Only)
- Visibility Sensor Concrete Foundation Installed (AWOS II and AWOS III Only)
- Cloud Height Sensor Concrete Foundation Installed (AWOS III Only)
- AC Power Available at Tower and Sensor Locations
- Trenching Complete
- Power Available for Indoor Equipment
- VHF Voice Mast, Antenna, and Cable Installed
- VHF Voice Cable Routed to Indoor Equipment Location
- Data Link Mast, Antenna, and Cable Installed (Radio Data Link Installations Only)
- Data Link Cable Routed to Indoor Equipment Location (Radio Data Link Installations Only)
- Telephone Line Installed and Operational at Indoor Equipment Location
- Desk, Table, Bench, Etc. Available and In Place for Indoor Equipment
- VHF Voice Radio Frequency Assigned
- UHF Data Radio Frequency Assigned (Radio Data Link Installations Only)

Upon receipt of this notice, All Weather Inc. will schedule the installation of the weather equipment and coordinate the site commissioning with the FAA. Items specified here that are not completed when the AWOS Installation Engineer arrives may require additional charges.

Certified by: _____ Date: _____

AWOS Notification to Proceed with Installation
Rev. B September 2002

NOTICE TO PROCEED

If you show up at the site to install an AWOS and don't have this, you could find the site only half-prepared. You'd waste time and have no recourse.

The first order of business is to establish the protocol for moving about on the airport. At some airports, you may be told to 'just look both ways before you cross the street' and at other airports you may have an escort with you at all times.

Usually, it's somewhere in between these extremes. In any case, you must have either a large checkered flag, or a flashing yellow beacon, or both, and be briefed by the airport manager or the FBO (Fixed Base Operator).

Don't cross the runway without permission from the tower, or if there is no tower, announcing your intentions using a VHF radio on UNICOM frequency!

Under no circumstances should you cross a runway without using a VHF transceiver to clear with the tower. If there's no tower, you must announce your intentions on the UNICOM frequency and wait a moment to see if there's a response. Don't move out onto the runway if there is a plane on final approach, no matter how much time you think you have, unless an air traffic control tower clears you. Also, if the airport is fenced and gated, you'll need a key or a combination from your airport contact.

Next, look over the location for the CDP.

- Is there a working phone line ready for the AWOS? Remember, the AWOS can't share a line with anything else.
- What's the dial-up number for this line? (it should be on the SITE INFORMATION DATA form. Check to see that it works.
- Is (are) the antenna(s) installed and the cable(s) in place?
- If the AWOS won't be using UHF radios for a data link, is there a cable from the sensor site to the CDP location?
- Is there a countertop or a desk or a shelf provided that has adequate room?

If any of these items aren't as required, check the NOTICE TO PROCEED. You may have to call the site preparer if he signed off that it was done.

After you've looked over the space for the indoor equipment, go out to the sensor site and look it over. Is everything the way it was checked on the NOTICE TO PROCEED?

Here are some common problems to look out for.

VISIBILITY SENSOR (not part of all AWOS installations)

- The visibility mast should stand about 7½ to 8 feet tall.
- The mast should be 2½" pipe or conduit. Is it the correct size?
- Is the mast vertical? It won't do to have a leaning mast.
- The visibility mast has a coupler just above the cement. Is it good and tight? If the mast can rock back and forth, you have a problem.
- Are the conduits properly secured to the concrete?
- Is there a pull rope in the signal conduit?
- Are there 3 electrical conductors in the power conduit?
- Both conduits should have junction boxes or condulets that will accept a ¾" conduit fitting.
- Is there a ground wire coming up to the mast?
- Is there a ground lug bolted to the mast?

CEILOMETER (not part of all AWOS installations)

- Is the surface of the slab at least a couple of inches above the soil level?
- Are the conduits properly secured to the concrete?
- Is there a pull rope in the signal conduit?
- Are there three electrical conductors in the power conduit?
- Both conduits should have junction boxes or condulets that have strain reliefs in them.
- Is the slab level and slightly crowned? You don't want water to stand on it.
- Is there a ground wire coming up at the edge of the slab that reaches at least to the center of it?

THUNDERSTORM (LIGHTNING) SENSOR (not part of all AWOS installations)

- The mast should stand about 5 feet tall.
- The mast should be 2½" pipe or conduit.
- Is the mast vertical?
- The mast should have a coupler just above the cement. Is it good and tight? If the mast can rock back and forth, you have a problem.
- Are the conduits properly secured to the concrete?
- Is there a pull rope in the signal conduit?
- Are there 3 electrical conductors in the power conduit?
- Both conduits should have junction boxes or condulets that will accept a ¾" conduit fitting.
- Is there a ground wire at this location?

TOWER

- Is the tower vertical? If it leans more than a couple of degrees, it's a problem.
- Are the bolts that hold the tower together tight? Don't climb it if you can rock it.
- Is the foundation slightly crowned?
- Is there a ground wire clamped to the bottom of the tower?
- Is there a lightning rod on top of the tower? Was the paint scraped before the rod was mounted?
- Does the obstruction light work? It may or may not have a photocell. If it does, cover it with a glove or something, and ensure that the light comes on within a minute. It's a serious violation of the FAA regulations to have a tower at the airport without a working obstruction light.
- The obstruction light should sit barely above the top 'rung' of the tower. If it sticks up higher, it may disturb the wind for the anemometer and vane. If it's not low enough, it may be easy to lower it. Otherwise, you may need to call the site preparer.
- It's best if the conduit for the obstruction light goes up the center of one of the tower faces. If the conduit goes up one tower leg, you'll be forced to mount your Wind sensor crossarm, MARS, and DCP on the opposite face of the tower, even if that's not the best location. Further, the lightning rod takes up another corner and so your wind sensor crossarm may be difficult or impossible to mount with the hardware supplier.
- (For AWOS installations with a UHF radio data link) Is there an antenna mount on the tower as shown in Figure 12 of the site preparation manual? The top of the mount should be about 20 ft above ground (about level with the joint between the upper and center sections of the tower). Are the antenna and cable in place?

ELECTRICAL

- Is there a GFCI outlet? Test it.
- Measure the voltage at the outlet. If it's low (about 108 V), the contractor may have taken your power from a 3-phase supply. It won't work.
- Are there enough breakers in the panel for all the sensors, GFCI, obstruction lights, etc.?
- Is the circuit breaker panel securely mounted? Does everything appear to be to code?
- Does the conduit for the tower lights run along the foundation from the panel to the tower, or does it go straight across, forming a trip hazard?

GENERAL

- Are the sensor pads and the tower about 10 feet apart?
- Is the sensor site level and flat?
- Has the surrounding vegetation been cleared to not over 10" high within 150'? This is an FAA requirement, and will be a problem for you when you try to have the AWOS commissioned if the site preparation contractor has neglected to do it.
- Has the site preparation contractor cleaned up before he left? (no boxes, wire, junk, chunks of concrete, lunch sacks, etc. left behind?)
- Do the signal conduits from the outlying sensors terminate in a junction box at the edge of the tower foundation which will accept a ¾" conduit fitting?

- (If the AWOS won't have UHF radios) Does the communications cable from the CDP location terminate in a junction box at the edge of the tower foundation, and will it accept a ¾" conduit fitting?

Contact the site preparation company about any problems or concerns. If everything is all right so far, the next thing to do is to check out the AWOS that was shipped to the airport. Sometimes, it will be in a hangar or shop at the airport, or it may be in the city's corporation yard, or at the site preparation contractor's place of business.

Check to see that there doesn't appear to be any shipping damage (crushed boxes, etc.) and that everything is present. This last item may be difficult, especially if someone has already opened all the boxes and gone through everything.

Usually, it's a good idea to open the boxes and sort everything into two groups—the stuff that goes indoors (CDP location) and the stuff that goes outdoors (Sensor site). If the materials are stored in a secure area, great. Otherwise, it may be better to transport all the indoor stuff to the CDP location and store it there pending install. This is especially true if it could be rained on, or otherwise damaged environmentally.

It's a good idea to safely store the equipment that'll be installed indoors while you install the outdoor equipment first.

While it isn't mandatory, it's often a good idea to begin with the outside work first. That way if it starts raining, you'll still be able to work inside. If you've finished up with all the indoor work, all you can do when it rains is sit at the window and watch the rain.

Now that you have all the outside stuff at the sensor site, let's start installing. There's no strict order to do this in. This is written on the assumption that you're working alone.

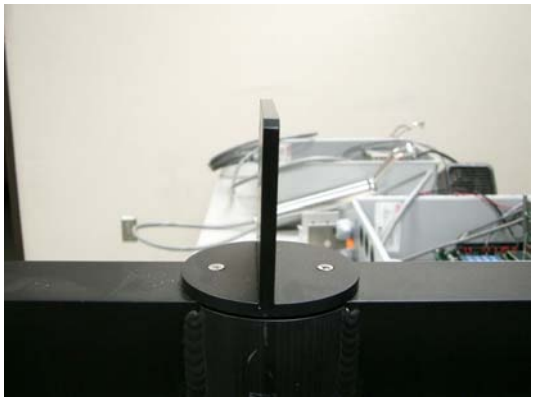
The steps below may be taken in any order, not necessarily inthe order given. It's suggested, however, that you work on one type of activity at a time. For example, connect all of the ground (earth) cables at the same time.

Note: Use only black tie-wraps where they'll be exposed to sunlight. White ones fall apart quickly when exposed to the sun.

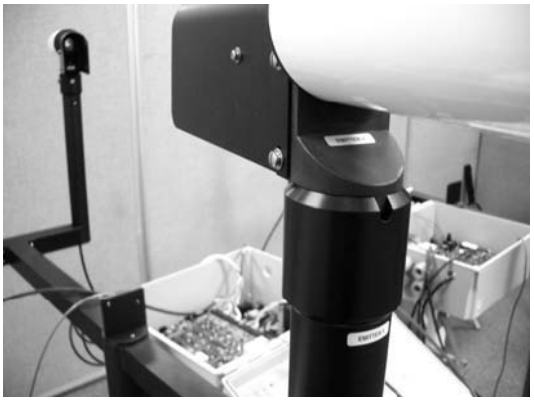
3. VISIBILITY SENSOR INSTALLATION

It's not a bad idea to start with the visibility sensor so that it will have plenty of time to run and stabilize before you do an alignment. Although the visibility manual doesn't say that this alignment is necessary, experience shows that this can prevent a lot of problems.

First, you have to assemble the antlers. You shouldn't have to worry about this, but it's worth checking: The tab for mounting the calibrator on the long beam is offset slightly. It should be closer to the end of the beam marked POLE. Also, when you look at it from the POLE end, the screw hole on the left is higher than the one on the right. It's just worth checking…



The tab is offset towards the end marked "POLE"



Looking past the emitters towards the equator, the hole on the left is higher.

The frame with the EMITTER labels goes on the end of the crossbeam labeled POLE. The DETECTOR frame goes on the EQUATOR end. This is so that the detectors "look" over the crossbeam towards the North, avoiding any chance of a rising or setting sun blinding them.

Now that the antlers assembly is assembled, you can mount it on the pole and then install the heads. Or, you can install the heads and then mount the whole affair on the pole. Basically, the weight of the heads makes it difficult to put a loaded set of antlers in place. If you have a stepladder, it will probably be easier to set the antlers on the pole first. When mounting the heads, be sure to match the labels on the heads with the ones on the uprights. Then when you tighten the set screws, don't overtighten them! The set screws are threaded through a *plastic* collar, and you'll strip the threads if you make them too tight. Now, dress the head cables along the underside of the antlers. Each cable gets a tie wrap on the end frame, turns 90 degrees and joins the cable from the other head, and follows the crossbeam to the center. Use three ties along the crossbeam. When all four cables are secured to the antlers, you're ready to mount the controller.

Tie the head cables to the antlers.

Close the door and roll the cabinet on it's face. By the way, the Ceilometer box makes a great workbench just now! Lay the Unistruts for the visibility mounting kit on the tab with the open side of the channel up. Put lock and flat washers on a bolt, and run it up through the tab and Unistrut. Lay a Unistrut nut in the channel over the bolt, notched side down, and screw the bolt into it. As you turn the bolt, the nut rotates and cams itself into a centered position. This won't work as well if you have the notched side of the nut away from the bolt head.

Preferable. The nut centers itself as the bolt is tightened.

Not as good. The nut can take any position it wants.

Get all four bolts finger tight, then center the Unistruts so that the ends just reach the sides of the cabinet, then (important) slide the Unistrut at right angles to itself, towards the box. Tighten all four bolts.

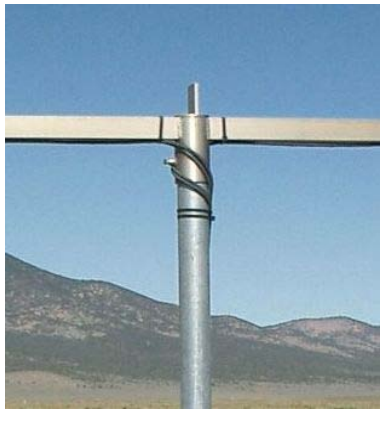
RIGHT — the tab rests on both sides of the hole.

WRONG — the tab will be pulled into the hole and broken.

Now, get the Unistrut clamps ready, and lift the controller onto the pole so that the top of the box is about 5-1/2 feet above the ground. In order to get the cables from the heads to come out just right, you can move it up or down a couple of inches, later. Now hold the box against the mast with your chest, reach around it, and assemble the upper Unistrut clamp. Move the box around the mast to the side of the mast that you've decided is the 'front', and center the box left-to-right on the mast, then tighten the clamp. Assemble the lower clamp, level the box, and tighten.

The four cables from the heads are dangling down and getting in your way at this point. At the hub of the antlers, gather them together and lay them four abreast as you wrap them ½ to ¾ of a turn around the mast, and secure them so that they hang down behind the box. At the bottom of the wrap, use two tie wraps, running them around the mast opposite directions so that they'll all stay in place. The reason for the wrap around the mast is that the visibility sensor has to be calibrated from time to time, and during the calibration process, the antlers have to be rotated. This provides some cable slack without having a big loose loop.

The visibility head cables should be installed with a wrap around the mast to allow rotation of the antlers during periodic calibrations.



Run the cables down the mast neatly, four abreast, and secure them in about three more places with tie wraps. Ideally, the ends of the cables should now be about 12 to 14 inches below the bottom of the box. If not, loosen the Unistrut clamps and adjust the box up or down the pipe. Center and level it when you secure it. Note: if the door is askew when you try to close it, the box has some twist in it. Partially loosen the lower Unistrut clamp and rotate the bottom of the box until the door lines up, then tighten the clamp.

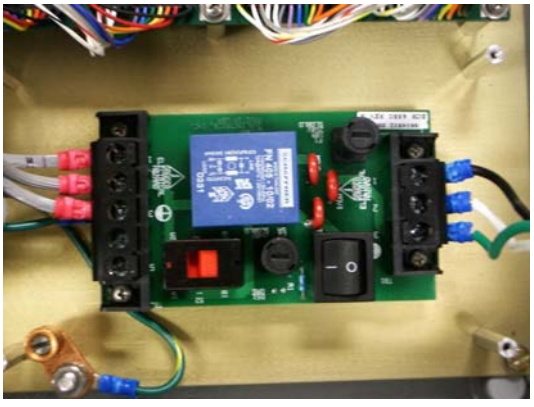
Now, the head cables. Open the door, then remove the collars from the four strain reliefs in the bottom of the box. Peel off the 4 white plastic rings that stuck to the rubber bushings, and don't lose them. Pull out the four rubber bushings. Now the fun part: On each cable one at a time, turn the connector so that it's parallel with the cable, and twist the cable so that it rolls up onto the connector. You're trying to arrange it so that it'll go through a small hole. Put the collar for the strain relief over the end of the cable, then that white ring. The rubber bushing is split and you can snap it over the cable easily. The small end goes toward the connector.

Here you can see how to fold the connector against the cable so that it'll fit through the strain relief. You don't have to cut the white ring.

With the four cables hanging down, take the two shortest ones. These go up through the strain reliefs closest to the back of the box. Connect them to the correct connectors on the PC board (the cables have labels so that you will know which connectors they go to), then tighten the strain relief collars, keeping some cable slack inside the box. Repeat with the two longer cables, using the two strain reliefs closer to the front of the box.

Get two ¾" rain-tite fittings and mount them in the empty holes in the bottom of the box. Put two more in the condulets or junction boxes on the conduits. Assemble the rain-tite hardware from one of the fittings onto the end of the rain-tite conduit, and thread it onto the connector. Dress the conduit into the position it'll be in permanently, and hold it alongside one of the fittings in the bottom of the controller, and mark it where you'll cut it. Now, this stuff is a hassle to cut, but here's the easiest way. Get a piece of Unistrut and lay it with the open channel up, on a concrete foundation with the end overhanging the cement by about ½". Lay the rain-tite conduit in the Unistrut channel with the mark just barely beyond the end of the strut, step on it near the edge of the cement, and cut it. Use a sharp hacksaw with a fine-toothed blade, a worn one will make a mess. The Unistrut holds it straight and stepping on it keeps it from lifting up and pinching the saw blade on the back stroke. Put a connector on this end, install the conduit and repeat the procedure for the other conduit.

Remove the clear plastic cover from over the AC power interface board in the visibility controller, and lay it inside the right-hand edge of the box. You won't put it back for awhile, so turn the screws back into the standoffs so that they won't get lost. If the AC power wires are long enough, run them up through the rain-tite to the AC power interface. Otherwise, use wire nuts to connect some flexible power cord (you'll have a LOT left over from the rain gauge) and run it from the condulet to the AC power interface. Crimp terminals onto the ends of the wires and screw them down to the interface. Terminals 1, 2, and 3 are hot, neutral, and ground, respectively. The heavy trace on the PC board is earth. Replace the black safety insulator over the screw terminals.

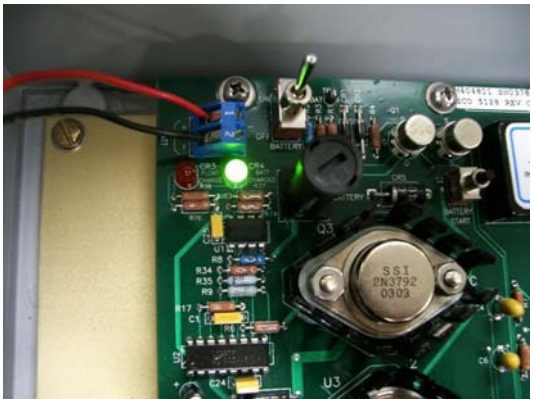


This is the AC power input interface in the Visibility Sensor. If using flexible wire, connectors should be crimped on the ends. Snap the black insulator back in place over the terminals. Don't replace the clear panel yet, you'll connect to the ground lug in the bottom left corner of the photo, later.

The circuit breakers are probably not marked yet, so turn on the switch on the AC power interface in the visibility controller, then go to the circuit breaker panel and turn them on then off one at a time until the LED's in the visibility controller come on. Leave that breaker on and mark it "VISIBILITY".

Near the top left-hand corner of the controller circuit board, there's a tiny chrome toggle switch marked "Battery". Make sure it's off. If the AWOS came with the battery backup option, there'll be a pair of heavy batteries in white plastic cases about a foot long, 4" high and 2" thick. They're both the same, one is for the DCP and you can set it aside for now. Place the one for the visibility sensor inside the bottom of the door, close to the hinge side so that the weight has less effect on the door, and press it into the Velcro. The wires connect to the 2-position terminal strip next to that toggle switch you just checked. Open the door as wide as it'll go, and run the wires to the terminal strip. Cut them about an inch or two longer than they need to be, ONE AT A TIME. That battery has enough power to mess up your wire cutters. Terminate the wires in the terminal strip, observing that the black wire is (-). Now turn on the little toggle switch and note that the LED's next to it change. You can close the door, the visibility is done for now.

The backup battery, if supplied, goes inside the door with Velcro. Position it close to the hinge so that it's weight won't be a problem.



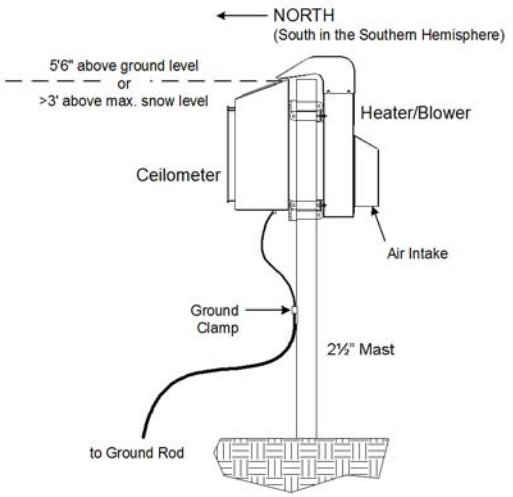
The wires from the backup battery connect here. Observe polarity. Don't turn on the little toggle switch until the controller has AC power.

On the bottom of the controller cabinet, on the right-hand side, is a black block with a notch in it (unless your sensor is configured for RVR and has an ALS head mounted on the antlers). This is the day/night sensor. You should swivel it around in it's mounting hole so that the notch is roughly towards the North.

The black block is a Day/Night sensor. Swivel it around so that the notch is towards the North.

4. CEILOMETER INSTALLATION

The Ceilometer must be firmly mounted to a vertical 2½" mast for proper operation. Any movement of the Ceilometer, such as that caused by strong winds, will reduce the accuracy of the data. The Ceilometer should be installed in an open area away from trees, buildings, or other obstructions. When installing the Ceilometer on its pole, orient it with the windows facing toward the North (South in the Southern Hemisphere) to reduce the amount of direct sunlight on the windows.



4.1 MECHANICAL MOUNTING

4.1.1 Ceilometer

The Ceilometer mounts on the mast using the M488261-00 mounting kit. Refer to Drawing M488261-00-007 in ***Chapter 21,*** Drawings, while installing the Ceilometer.

Mount the Ceilometer on the mast with the top of the enclosure 5'6" (167 cm) from ground level, or at least 3 feet (1 meter) above maximum snow level using mounting kit M488261-00.

4.1.2 Ground Cable

In order for the sensor's built-in lightning protection to function properly, the Ceilometer must be grounded. To install grounding, follow the steps below (see the diagram above).

1. Connect one end of a length of ground cable (4 AWG multi-strand insulated wire, available from All Weather, Inc. as Part Number T605000) to the grounding clamp on the mast.
2. Connect the other end of the ground cable to the ground clamp on the underside of the Ceilometer.

4.1.3 Heater/Blower

The Heater/Blower mounts on the mast using the supplied Unistrut and clamps.

1. Mount the Heater/Blower on the mast as shown in installation drawing 83396-00-007 in ***Chapter 21,*** Drawings.

2. Note that the Heater/Blower installs so that its mounting brackets fit between the Ceilometer's mounting brackets (see the diagram at the start of this chapter). That is, the Heater/Blower's top bracket installs directly **beneath** the Ceilometer's top bracket, and its bottom bracket installs directly **above** the Ceilometer's bottom bracket.
3. Install the blower hood onto the blower unit: The screws are already installed into the blower unit; loosen the screws and slide the blower hood onto the screws. Tighten the screws.

4.2 CEILOMETER POWER CONNECTION

WARNING

Ensure that the circuit breaker for the ceilometer in the main power distribution box is in the OFF position when making power connections.

1. Set the main circuit breaker in the 8339 to the OFF position (see Figure 1).
2. Connect the power cord's circular connector to the INPUT POWER connector on the underside of the ceilometer (see Figure 2).
3. Connect the other (unterminated) end of the cable to a suitable AC source according to wiring diagram 8339-E-019 in ***Chapter 21,*** Drawings, in the condulet.

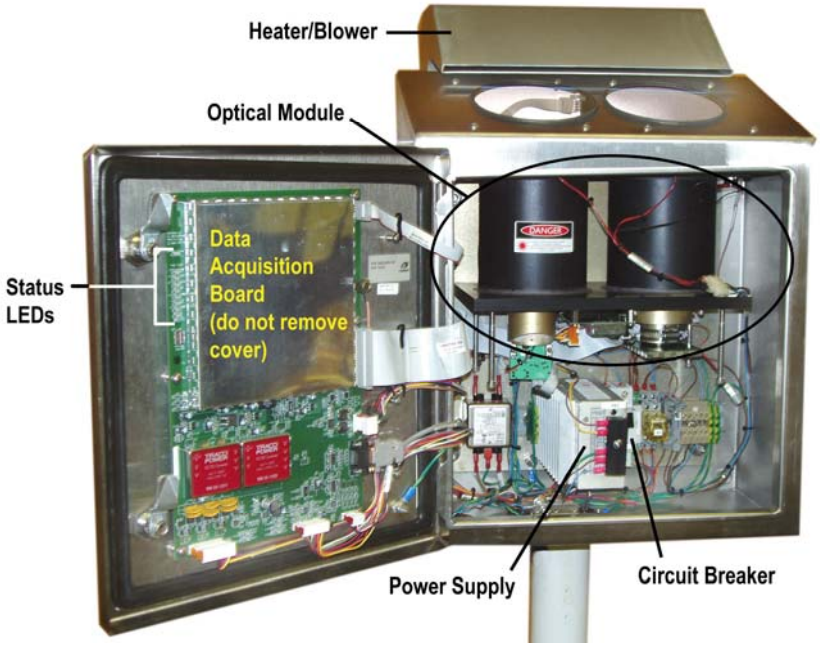


Figure 1. Ceilometer Components

4.3 CEILOMETER DATA CONNECTION

1. Connect the data cable's circular connector to the CEILOMETER DATA connector on the underside of the ceilometer (see Figure 2).
2. Connect the other (unterminated) end of the cable to TB1 on the 11905-F daughter board at the DCP as follows:
    a. Connect the red wire to TB1, pin 1
    b. Connect the white wire to TB1, pin 2.
    c. Connect the black and shield wires to TB1, pin 3.

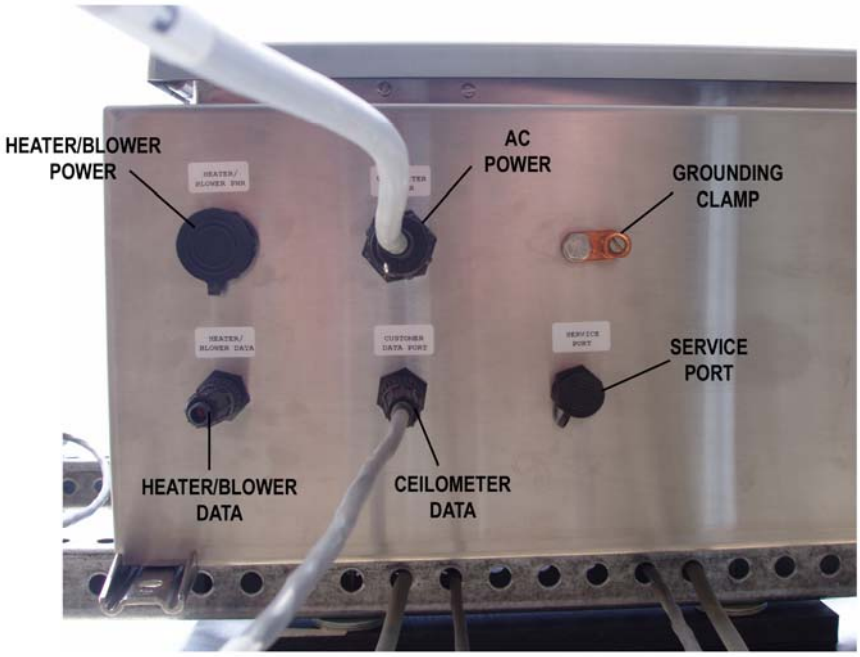


Figure 2. Ceilometer Connectors

4.3.1 Heater/Blower Power Connection

Connect the Heater/Blower's power cord to the HEATER/BLOWER POWER connector on the underside of the ceilometer.

4.3.2 Heater/Blower Data Connection

Connect the Heater/Blower's data cable to the HEATER/BLOWER DATA connector on the underside of the ceilometer.

4.3.3 Desiccant

The desiccant package (M028179-00) is secured inside the Ceilometer by tie-wraps. If the desiccant is not yet installed, remove and discard the plastic bag, then replace the desiccant package in its tie-wrap holder. Figure 3 shows the desiccant bag at the upper left corner near the optical module, but it may

also be placed in the lower right area of the Ceilometer enclosure (Figure 1) with the indicator paper above the desiccant to be readily visible.

Figure 3. Desiccant Installation

4.3.4 Final Steps

1. Ensure that the circuit breaker on the power supply is in the "ON" position.
2. Verify that DIP switch SW1 on the data acquisition board is configured for **8339 Native Format** (SW1 switches 1 and 2 ON).

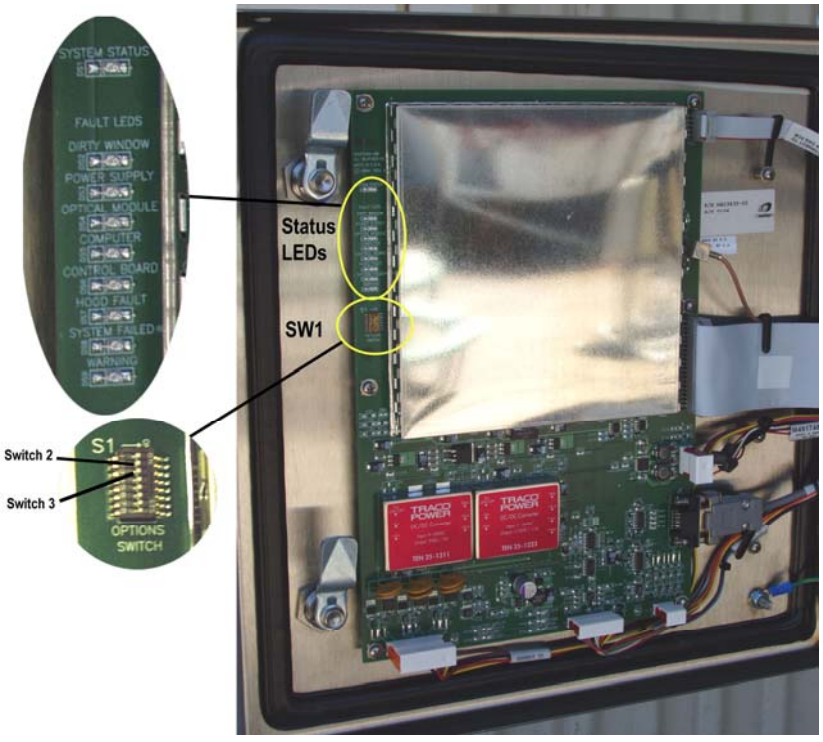


Figure 4. Data Acquisition Board Status LEDs and SW1 Dip Switch

5. THUNDERSTORM/LIGHTNING DETECTOR INSTALLATION (IF INCLUDED)

This machine is not big and heavy, but it's ungainly. Take care that you don't get hurt on the edge of the ground plane. Turn the sensor upside down and set it on your 'workbench'. You want to take care of the bulge in the center of the ground plane, that's the antenna. There's a large 90-degree bracket that bolts to the bottom of the sensor box with four bolts, and then fastens to the thunderstorm mast with a pair of large U-bolts. Fasten this bracket to the bottom of the sensor (it'll only fit one way, so that the mast will be more or less centered under the sensor when it's mounted). Put in the two big U-bolts, loosely. Turn the machine right-side up and set it onto the mast so that the U-bolts slide down over the mast and it butts up under the 90-degree bracket. Tighten the U-bolts finger-tight. Note that the ground plane on top is clearly marked for North. Turn the machine so that this mark is pointed towards (true) North, and tighten the U-bolts.

The Thunderstorm/Lightning detector must be oriented towards North.

Loosen the four screws on top of the machine (visible in 5/8" holes in the ground plane, NOT the allen screws), then lift and tip the ground plane and the lid of the box. It tilts up 90 degrees, and rests there. If it's very windy, you may have to secure it. Get two ¾ rain-tite fittings and mount them in the empty holes in the bottom of the box. Put two more in the condulets or junction boxes on the conduits. Assemble the rain-tite hardware and conduits the same way that you did for the visibility sensor.

Here's a completed Thunderstorm/Lightning detector. It's oriented towards North, which is why the rain-tite conduits cross over from the far side in this example. The ground wire connects to a lug on the mast and again to a smaller copper lug on the bottom of the box. Signal and power cables enter through the rain-tite conduits.

Remove the clear plastic cover from over the AC power interface board. Like you did for the visibility sensor, if the AC power wires are long enough, run them up through the rain-tite to the AC power interface. Otherwise, use wire nuts to connect some flexible power cord and run it to the AC power interface. Crimp terminals on the wires and screw them down to the interface. Again, terminals 1, 2, and 3 are hot, neutral, and ground. Replace the black safety insulator over the screw terminals. The circuit breakers are probably not marked yet. There aren't any LED indicators, so when you turn on the circuit breakers one at a time, you'll have to check at the sensor with an AC Voltmeter. When you have power at the sensor, you can leave that breaker on and mark it THUNDERSTORM. Replace the clear plastic cover over the AC power interface. We'll take care of the signal and ground cables later.

6. FREEZING RAIN SENSOR INSTALLATION (IF INCLUDED)

There will be a 2½" pipe mast about six feet tall, much like the one for the Visibility Sensor. The Present Weather sensor bolts to a backing plate, and the backing plate fastens to this mast with U-bolts so that the probe on top is vertical and about 5 feet above the ground. The probe tip is fragile, and has a bright red plastic guard around it. Leave the guard in place until the AWOS installation is finished. The freezing rain sensor has a strain relief on the bottom with two wires coming out of it. One is for power, the smaller gray one is the signal. Route them both neatly down the mast, securing them with tie-wraps, and through the strain reliefs on top of the junction boxes. Leave the signal cable coiled beneath the sensor for now. Cut the power cord to a convenient length and connect it to the wires in the junction box with wire nuts. The freezing rain sensor doesn't give you any indication that it has power on, so you'll have to use a Voltmeter to identify the circuit breaker. Turn the circuit breaker off for now.

7. WIND SENSOR INSTALLATION

When you get ready to install the wind sensor, you'll find two square struts in the AWOS stuff that look alike. One is for mounting the rain gauge, we'll look at that one later. The one for the wind sensors has one hole bored out to about 5/8" diameter at each end.

The strut with the enlarged hole is the Wind crossarm, the sensor adapter studs will go into these holes.

The strut in the background is for mounting the rain gauge.

Assemble the U-bolts on the strut, getting the spacing right by holding the strut next to the tower. Offset the U-bolts so that the strut will stick out 4 or 5 inches farther on one side of the tower. The reason is that the vane takes more room to swing around than the Anemometer does. Assemble the mast adapters on the strut, so that the end with the female thread goes through the hole and accepts a bolt from underneath. Be sure to put the big lockwasher between the strut and the adaptor so that the sensors won't be able to easily move. The rotation of this mast adapter in the strut is actually the calibration of the wind direction sensor. The Anemometer doesn't care which way it faces. For now, just make the bolts finger tight.

DON'T climb the tower without a safety belt!

Now it's time to climb. Don't do it without a safety belt. Period. It's good to have a couple of carabiners on your safety belt to help carry things. You can clip one of the U-bolts over a carabiner to carry the crossarm. Once at the top of the tower, you'll find that there's only one face of the tower that you can use, as the lightning rod has taken one corner and your U-bolts will only fit over the other two. Turn the crossarm so that the long end is away from the obstruction light, and set the U-bolts down over the tower legs. If the obstruction light is on this face of the tower, you'll have to turn the crossarm so that it goes in front of or behind the obstruction light, it doesn't matter to you. Slide the crossarm up so that it almost touches the plastic caps on the top of the tower legs, and snug up one of the U-bolts. Put your spirit level on the crossarm, level it carefully, and tighten the other U-bolt. If you slide the crossarm up too high and it rests on the plastic caps, it'll tilt a bit and the sensors won't be vertical.

Now, it's time to assemble the sensors. First, assemble the Anemometer. Remove the two set screws from the hub of the cup assembly, coat them lightly with anti-seize compound, and screw them back

in. The screws are tiny, so don't do this over the grass or you'll never see them again. Also because they're tiny, the allen wrench to turn them is really small, and you can't get a lot of torque. If they get a bit of corrosion, you can't disassemble the sensors anymore. So the anti-seize is important, especially in a damp climate! The only pitfall when putting the cups on the sensor is that the shaft has a flat for the set screws to bear against. If you tighten the screws against the round part of the shaft, it'll raise a bump and the bearings won't slide past it for replacement in the future – and the bearings are so good that the shaft won't stay in position for you to line up with the flat. Here's how: Plop the hub on the shaft at random and turn in one of the set screws in until it just touches. Pull the hub off of the sensor and turn in the screw another ½ turn. Now it won't go on unless you find the flat. When you have it together, make sure that the skirt of the hub doesn't rub the neck of the sensor. It may be necessary to use your thumbnail to raise the hub a tiny bit before tightening the set screws.

The anemometer shaft has a flat spot. It's important that the set screws press against the shaft here, or they'll make a bump that'll prevent you from replacing the bearing in the future!

Now the vane. As before, anti-seize is important here. Remove, coat, and reinstall the two screws that hold the hub on the sensor shaft, one at a time. Then coat and reinstall the two screws that will press against opposite sides of the arrow shaft. Now, note that the hub and the neck of the sensor have scribe marks. When these are aligned, the sensor indicates North. Align them and put the arrow shaft through the hub from behind, so that the tail is on the opposite side from the scribe marks. Put the nose weight on the end of the shaft as far as it'll go and tighten the screws. It's a good idea to turn the weight on the shaft so that when the vane is vertical, the two screws are on the bottom of the weight so that they don't collect rainwater. Now – indoors where there's no air movement – hold the sensor horizontal and slide the arrow shaft in and out until it balances. It's almost never calm enough to do this outside. Snug down one of the screws and check that the vane is parallel to the shaft of the sensor. If not, use the nose weight to turn the shaft. The tail vane may break if you try to twist from that end. When everything is straight and balanced, tighten the two screws against the arrow shaft. It takes about all the tightness you dare to put on that tiny allen wrench, or a couple of months from now you'll find the vane has tilted.

Balancing the vane. This is important, as an unbalanced vane may not report the wind direction accurately at low velocity.

If these two screws aren't about as tight as you dare to make them, the vane won't stay in position for long.

The wind vane has scribe marks on the hub and on it's neck. When they're aligned, the sensor is reporting NORTH. With these marks aligned, insert the vane shaft from behind so that the nose weight will be over the scribe marks.

To carry the sensors up the tower, one easy way is to lower the body of the Wind direction sensor down the back of your collar so that it hangs inside your jacket or shirt by the arrow shaft. You can put the Anemometer down the front the same way, with one cup sticking out the front. Once at the top of the tower, put the Anemometer on the stub at the shortest end of the crossarm and turn it until it drops down on the index pin. Use an allen wrench on the clamp bolt in the side of the sensor's base and tighten the sensor onto the stub. You left the mounting bolt under the crossarm finger tight, so now you can turn the sensor and it's mounting stub until the green connector points back over the crossarm and then tighten the bolt under the mast adapter stub.

Likewise, place the Anemometer on it's stub at the long end of the crossarm, engage the index pin, and tighten the base clamp screw. Swing the vane around through 360 degrees to make sure that it doesn't touch anything. Now rotate the body of the sensor so that the green connector points out into space off the end of the crossarm (same direction as the Anemometer's connector is pointed). We'll cable up the sensors later.

The connector extends out so that there's enough slack in the cable to turn the Sensor to any direction.

The anemometer connector should point back along the crossarm.

This photo shows a completed installation of the wind sensors. The crossarm is level and the sensors are accurately vertical. The red obstruction light is not mounted high enough to block the wind to the sensors.

The crossarm is offset towards the right so that the wind direction vane has more room to swing around. This helps especially if the obstruction light is between the sensors.

8. WIND DIRECTION REFERENCE BENCHMARK

There is a brass survey monument, a can of gray cement, and a 2 foot length of 2" pipe shipped with the AWOS. This is to establish an accurate directional mark to calibrate the wind direction sensor to.

There are several ways to establish the location for this marker. The most accurate solution is to visit the site after dark and walk around until you see the North star (Polaris) directly on top of the wind direction sensor, and mark the spot you're standing on for the benchmark. Alternatively, if you have a military or hiker's compass, you can determine the declination for the site and then (having removed all ferrous metals from yourself or nearby) find a point that is the same number of degrees from North as the declination. With this technique, you have to be very careful about which way to go: East or West? If you're wrong, your benchmark will be off by twice the number of degrees of declination! The next technique is to utilize the services of a surveyor. If the place you've identified isn't convenient (in the middle of a road, in a rocky place, etc.), you can extend farther away from the tower as much as 75 feet. Tie a string to the tower and stretch it so that it passes over the point you've identified an on to a more acceptable spot. Or, you can extend your line back through the tower and place your marker to the North instead of South. Once you've identified the correct spot for the marker, Drive the 2" pipe into the ground until thee's only 4 to 6" of it still visible. Pour sand or gravel into the pipe until it's within 6" of the top of the pipe. Mix water with the cement in the can until it will just barely pour, about the consistency of catsup. Be careful, if you put in too much water, you can't take it back out! Pour the cement into the pipe until it's full, and press the marker disk into the cement. It'll be firm within a few minutes.

The wind direction benchmark.

At this site, the location was identified by a surveyor – note the stake.

9. UHF ANTENNA INSTALLATION (IF INCLUDED)

(NOTE – If the AWOS uses UHF radios instead of a land-line, there'll be two more antennas to cut to size. You may as well do them both at once. You can install the second one later.)

The site preparation contractor was supposed to have this all done, but often it's left for you. Assuming there's an antenna mount 20 feet up the tower, open one of the antenna tubes (they're all the same) by bending a spot on the edge of the metal plug in the end of the tube inwards, and using a pliers to pull it from the tube. The small parts inside should be in a plastic bag, but sometimes some of them get loose. Also, it often happens that someone wanted to inventory the AWOS (or was just curious) when it arrived, and has already opened all the boxes and looked everything over. If this is the case, some tiny nuts, screws, and such will be rolling around loose in the tube and will surely be lost when you spill them out on the ground. Over a place where the small parts won't be hard to find, carefully tip the contents out of the tube. There should be an antenna, four radial rods, a mounting bracket with a U-bolt, 2 nuts and washers, a large nut and lockwasher for the bottom of the antenna, four tiny nuts, 4 tiny lockwashers, and four tiny black plastic tips to put on the radials, and a little tube of grease and an instruction sheet.

First, use a tubing cutter to cut the chrome antenna tube to length. It's brass and cuts easily. Cut it so that five inches of metal are left above the black plastic on the base of the antenna. Be accurate, it's important. Pull the plastic tip from the cut off piece before discarding it and push it over the end of your 5-inch antenna.

Now the radials. They're hard and they'll ruin a pair of wire cutters. If you have a big heavy square nosed pliers (often called 'Kleins') you might be all right.

Heavy pliers like this can usually cut the radials without being damaged. Don't try to do it with a pair of diagonal cutters, they'll be damaged.

The best way to cut the radials is with an abrasive disk in a Dremel tool. Another way is to notch the radial on the corner of a bench grinder wheel, and then bend it until it breaks. Still another way is to notch it with a hammer and cold chisel, then bend it until it breaks. These last two methods require a pretty good notch to get a break without bending the radial. You will be impressed by their toughness! Using the hammer and chisel, you'll need an anvil. Lacking one,You could take the tools and radials with you to lunch and stop at a railroad crossing on the way. The rail makes a fine anvil. However you do it, cut the radials so that they're 8 ½ inches long, including the threaded portion. If you used a grinder or Dremel tool, it's nice to smooth and round the cut ends. In any case, put the black plastic tips on the cut-off ends for safety. Even if the ends are rounded and smooth, this makes them more visible.

Screw the nuts on the radials, and slip the lockwashers over the ends. Coat the threads with the grease that's provided and screw them into the base of the antenna. Tighten the nuts, then slip the mounting bracket over the connector, followed by the large lockwasher and nut. Tighten the nut while holding the bracket so that the U-bolt will be centered between two radials. Put in the U-bolt and start the lockwashers and nuts on it. Find the shortest of the three antenna cables that are supplied with the AWOS. Before you connect the cable to the antenna, take a look at both. Note that the connector on the base of the antenna has two little notches in the rim at 180 degrees to each other. Looking into the connector on the end of the cable, you'll see two little spurs that can engage the notches. Screw the PL-259 connector onto the antenna, again with some of the Teflon grease. When the collar feels snug, back it off just a bit and turn the body of the connector while pushing it towards the antenna. You'll probably need a pair of pliers to do it. You're trying to get those spurs into the notches. Once you get them engaged, go ahead and tighten the connector.

Push the body of the connector as you turn, and try to feel the teeth drop into the notch in the antenna body.

A finished UHF antenna, mounted on the tower. The top of the antenna mount is about 20 feet (6 meters) up. Use plenty of tie-wraps to secure the antenna cable.

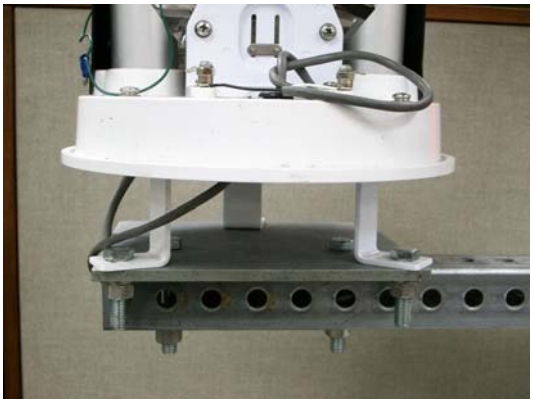
Once you're up on the tower, mount the antenna at the tip of the mast, then dress the cable along the mast with tie-wraps. Don't tie it to the tower yet, there are going to be other cables and you'll do them all at once. The end of the cable should hang down to within a foot of the tower foundation and you should have a clear line of sight to the building where the CDP will be.

10. RAIN GAUGE INSTALLATION (IF INCLUDED)

Remove the two bolts that secure the upper portion to the base. Lift off the upper portion, noting that except in rare cases it's connected to the base by wires. There are pieces of foam stuck in various places, leave them for now. Turn over the upper half and ensure that the heater is securely bonded to the underside of the funnel. There was a problem for awhile with a wax coating that prevented the heaters from sticking well. If it's loose, use silicone RTV to secure it.

The mount for the rain gauge is a strut like the wind sensor crossarm, but none of the holes are enlarged. It's packed with a square steel table and the fasteners to put it all together with. Bolt the table to the very end of the crossarm. The idea here is to have the rain gauge far enough away from the tower to avoid being influenced by it. Mount the strut about seven feet up the tower, using the U-bolts.

When you mount the rain gauge base on the table, you'll see a bulls-eye level on the base. Level this on one axis by loosening a U-bolt and tilting the mast. You'll level the other axis by using a washer under one of the mounting feet of the rain gauge.



The rain gauge mounts on a plate at the end of a strut which is fastened to the tower withU-bolts.

It's very important that the rain gauge be level.

Two views of a rain gauge installed on the tower. You can level it on one axis by tilting the strut up and down, and on the other axis by putting shim washers under the feet of the rain gauge. Tie the wires along the bottom of the strut to protect them from the sun, from climbers' feet, from birds, etc.

Now you can remove the foam packing pieces from inside the rain gauge. One was to keep the tipping bucket from beating itself to death during shipment, and the others were keeping the screens from falling out of the drains.

Now you can put the upper portion of the rain gauge back on. Reconnect the Molex connector, and avoid pinching the wires as you reassemble it. Tie the cables along the bottom of the strut with tie-wraps. Again, we'll tie the wires to the tower leg later.

11. DCP INSTALLATION

If the AWOS is a –IIIP model (includes a Present Weather senor), the controller will mount side-by-side with the DCP, on a longer set of rails. ***See the next section.***

Lay the Unistruts on the DCP and secure them as you did with the Visibility sensor, after looking over the tower, etc. and deciding which face of the tower to mount it on and whether it would offer any advantage to offset the controller to the left or the right, or leave it centered on the tower. The main consideration for setting the DCP off-center would be the arrangement of the flexible conduits. Don't install it where you'd have to reach over the circuit breaker panel or step over trip hazards to look inside. Get a pair of Unistrut clamps ready and lift the DCP up onto the tower. Hold it in place with your chest, reach around it, and assemble the clamps. The top of the DCP should be about 5' 6" above the cement, about eye level. You may have to go up or down a bit so that all four of the Unistrut clamps will be clear of the tower's cross braces. Tighten one clamp, level the box, and tighten the other three clamps.

Open the door and install two Raintite fittings, choosing the two larger holes to the left. There's going to be a Quad-Plate Pressure Port in the smaller hole all the way to the right, and it may interfere with a conduit that's too close. Install a pair of Raintite conduits the same as you did for the visibility. The other end of the power conduit goes to an AC power junction box on a rigid conduit at the edge of the foundation, if it's there. There are a lot of variations for site preparation. If there is no separate junction box for power, you may have to run the flex conduit to the circuit breaker panel itself. There should be knockouts in the bottom or sides of the panel, or you might have to use a holesaw or chassis punch. If so, be careful that you don't hit anything inside, especially anything that's live! If the DCP is above and near the point that the flex conduit connects to, you might be able to run a short piece directly. Otherwise, the conduit should go down to the cement, cross over to the tower, and then go up to the DCP in order to avoid a trip hazard. It would be best to use some conduit clamps and ¼" masonry anchors to secure the conduit down. In order to install and dress the conduit neatly, you may have to locally purchase some 90-degree raintite fittings. There will be a junction box at the edge of the foundation that has two or three rigid conduits going down out of it. These go out to the Ceilometer, Visibility, and Thunderstorm sensors. Run a flex conduit from the DCP to this one as well, keeping it neat. Ideally, the conduits will run side-by-side.

A few variations of junction boxes and power panels. Note that the conduits avoid making a trip hazard by going all the way down to the cement before crossing. The photo at top right is a good example of a neatly installed DCP.

If the AWOS doesn't have UHF radios, it'll communicate via a cable. If this is the case, there'll be another junction box at the edge of the foundation to run a conduit to. You'll either run your conduit to the remaining large hole in the bottom of the DCP and secure it to clear the Quad Plate Pressure port, or use a 90-degree rain-tite fitting at this location. Depending on the lay of the conduits, etc, it may be more feasible to enlarge the unused hole at the center rear position in order to keep this conduit from bearing against the Quad-Plate port. Again, this paragraph doesn't apply if there's a UHF radio in the DCP. Run the cable from this junction box into the DCP and cut it to length so that it'll easily reach the connector at the bottom left corner of the DCP circuit board. Strip the ends and terminate it to pins 9 and 10 of TB4. Connect the black wire to (-).

If there's a UHF radio in the DCP, the hole mentioned above (possibly enlarging) will have a large plastic strain relief in it. The antenna cable goes in here. Unscrew the collar and pull out the rubber grommet and the plastic bushing. Although the antenna cable hasn't been secured to the tower yet, visualize the way that you're going to route and dress it, and put the end through the collar. The rubber grommet should be split so that you can snap it over the cable. If it's not, you can do it with a pair of diagonal cutters or a knife. The colored plastic bushing goes between the grommet and the collar, flat side against the rubber. Put the connector and the cable up through the strain relief fitting (it just barely fits) and connect it to the UHF radio. Route the cable with some slack so that it doesn't pull and kink on the connector, and tighten the strain relief.

Assembling the antenna cable into the DCP. Note that the rubber grommet has been split to go around the cable.

Install the quad-plate pressure port in the hole farthest to the right. Secure it in place with the conduit nut, plastic side down, and then screw on the cap with the two hose barbs. Attach the two clear hoses that are hanging down from the pressure sensor to the hose barbs. The hoses are usually a bit longer than they need to be, so you can trim them if it's necessary to make things neater.

The Quad-plate pressure port installs in the hole farthest to the right. It's held in place by a conduit nut, and then a cap with 2 hose barbs is attached.

Run and connect electrical wiring for the DCP. The clear plastic cover over the AC power interface board is held in place by three screws, and it's very difficult to install/remove after the signal cables are in place. It's tricky even now. If you can't get it in and out any other way, you might remove the two screws from the bottom corners of the DCP circuit board and loosen the top two so that you can tilt the bottom of the board out a bit. When you route the wires, note that you'll have to run them around the right-hand edge of the clear plastic cover and back behind it to the AC power interface. Once wired, replace the black cover over the terminals and reinstall the clear plastic cover. It's Ok to turn the AC power on *only if the antenna cable is connected to the UHF radio.*

In this view, a DCP at the factory is temporarily wired for testing. At an AWOS site, the AC wiring will have to pass around the right-hand side of the clear plastic cover.

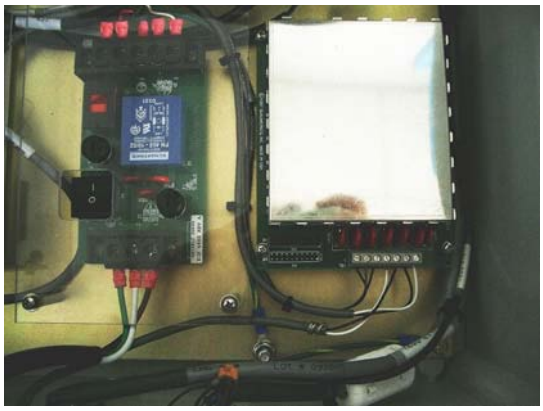
12. PRESENT WEATHER SENSOR INSTALLATION (IF INCLUDED)

If the AWOS is a –IIIP model (includes a Present Weather senor), the controller will mount side-by-side with the DCP, on a longer set of Unistrut rails. Usually, the DCP goes best on the right and the PWX controller on the left, as you face them on the tower. One reason for this is that the MARS - which you'll be installing later - has a cable that's just long enough, not much to spare. The cable enters the DCP at the bottom left corner, and if the DCP is on the left, it would use another foot of cable that you can't spare. You have to put the DCP and PWX controller on the Unistrut rails with some space between them so that the door of the cabinet on the right can open.

Assemble the Unistrut rails on both cabinets. When it's all together, lift it onto the tower and secure with Unistrut clamps, as described in the DCP chapter.

There are a dozen ways to do this. In this case, the DCP is on the right (you can see the quad-plate pressure port on the bottom) and the MARS is mounted with the cables coming out of the right. Depending on the situation you have, the boxes may be offset a bit to the left or to the right, or the DCP might be on the left. Don't put the boxes close together, or the door on the right won't open completely.

Refer to the DCP section for conduits, antenna cable, electrical wiring, etc. for the DCP. Assemble a raintite fitting in one of the holes in the bottom of the PWX cabinet, and a strain relief in the other. Install a raintite conduit and AC wiring to the AC power junction box or circuit breaker panel, same as you did for the DCP. There are no LED's or other indicators in the Present Weather Sensor to tell you that you have power on, so you'll have to use a Voltmeter to identify the circuit breaker for it. Be sure to replace the clear plastic cover over the AC power input board. Switch off the power inside the Present Weather controller for now.



The power and signal connections for the Present Weather sensor controller.

The sensor head for the PWX requires some thinking, you can't just stick it up there any old way. The lens of the larger head has to 'look' to the North. It's not critical, just try to be within around 15 or 20 degrees. If there are runway strobes or other sources of flashing light in that direction, it'll give false alarms, so you may have to aim to one side of north to avoid problems.

It is important that the PWX head be oriented correctly. The lens in the large box must "look" to the North, so in this photo, North is over your left shoulder. This head assembly must be mounted outside the tower the way you see it here.

The PWX head should be installed 10 feet up the tower. In this photo, North is towards your left.

The head should mount at about 10 feet up the tower, so mount it at or just above the first tower joint. Assemble it to the tower using the stainless Vee block and stainless U-bolts supplied with it, choosing the tower leg that gives the larger head an unobstructed view to the North without rotating the head assembly into the tower. As much as possible, it should be completely outside the tower. Note: due to the metallurgy of the stainless U-bolts, the nuts will seize to the U-bolts and twist them off. Lubricate the threads with grease or anti-seize compound before assembling.

It may help to loosen the nut that holds the green ground wire and rotate the terminal for the neatest dressing of the cable.

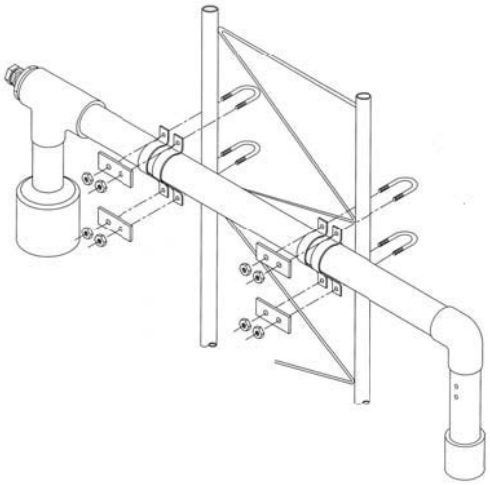
13. MARS INSTALLATION

The MARS is tricky to get installed, but simple in theory. You'll be convinced that the job requires you to have more than two hands. Usually, the end with the cables coming out will go on the left if it's mounted over the DCP so that your cable will be long enough. Alternatively, the MARS could go on another face of the tower with the cable end closest to the DCP. The objective is to mount it at the proper height while still having enough cable *and* to keep the other end of the MARS (the intake end) AWAY from surfaces that may be warmed by the sun or otherwise environmentally influenced. The MARS wants to pull in air that hasn't been affected by it's surroundings.

By mounting the MARS offset to the right as shown, your white cable should be long enough and the air intake (on the right) shouldn't be near any surfaces that might warm the air being taken in.

Just keep your eyes open so that you don't walk into the end of the MARS, it hurts when you bang your head!

Lay the four conduit clamps on top of the DCP along with the U-bolts, nuts, etc. Use an elastic shock cord or bungee to secure the MARS to the tower as nearly as you can in the correct position. The horizontal pipe of the MARS should be 4.1 to 6.5 feet above ground. In order to clear the DCP effectively, it'll be more like 6 feet. Scoot the MARS to one side so that the tee fitting over the fan assembly is adjacent to the tower leg. This puts the intake end farther away from outside influence. Note that if you aren't watching as you're walking around the tower, the MARS will bring your face to a painful, sudden stop, so be careful. Put two of the conduit clamps on the horizontal pipe of the MARS next to the tee fitting. Shift the MARS around so that they're in position and feed two U-bolts around the tower legs and through the holes in the conduit straps. Put the rectangular plates that came with the U-bolts on the ends, and then lockwashers and nuts. Do the same to secure the MARS to the other tower leg. Now ensure that the MARS is level and vertical and tighten all 8 nuts. They don't have to be super tight, you don't want to crack the plastic MARS.



This shows how the MARS clamps to the tower using four conduit clamps and four U-bolts. If you're working alone, you can put the MARS in position with bungee cords or tape while you assemble the clamps. In this drawing, the MARS would be moved to the right before tightening the clamps so that the fan assembly is close to the tower leg.

The MARS is mounted with the fan close to the tower leg to conserve cable. Note the slack in the white wire so that the probe can be withdrawn for maintenance without disconnecting the cable.

Before tightening the clamps, make sure that the MARS is vertical.

14. CABLING

Now it's time to start tying it all together.

First a word about the shield wire in the data cables. The shield is a layer of aluminum foil under the gray insulation, with a bare wire to connect to. Generally, this shield wire is connected to earth at one end of the cable and the other end is cut off and left un-terminated. If there is a green connector (such as for the wind sensors or Ceilometer data cable) on one end of a cable, the shield is not terminated there.

Go to the top of the tower with the signal cables for the wind sensors. One at a time, unroll them and let them hang down, and connect them to their sensors. One has 3 pins, the other has 4 so you won't have any trouble deciding which sensor gets which cable. Leave some slack in the cables between the sensor and the crossarm, and secure them with tie-wraps. Choose the tower leg that'll give you the best route to the left-hand side of the DCP and proceed down the tower, securing the cables with tie-wraps at every second rung. When you come to the UHF antenna if there is one, begin tying the antenna cable, too. Keep the cables neat and parallel. As you proceed, you'll pick up the cables from the Present Weather sensor head cables (if included), and the rain gauge cables. Finally, you'll gather in the cables from the MARS. By this time it's getting to be quite a bundle, but keep them parallel and neat. Use plenty of tie-wraps, you don't want cables flapping in the breeze. As you gather in the cables for the MARS, tie them so that there's a few inches of slack at the top end. For periodic maintenance, the probe has to be withdrawn from the pipe for cleaning, and it's not possible unless there are a few inches of slack next to the gray strain relief.

On the bottom of the DCP at the left-hand side, there are two strain reliefs. One has four black plastic pins in it, the other has five. When you loosen the collar, the pins may fall out. It looks like it'll be difficult to feed your wires through these bushings, but the rubber is amazingly stretchy and you can get the wires in fairly easily. You may have to moisten the ends of the wires to lubricate them in the rubber. Keeping the wires dressed neatly, feed them through the bushings one at a time. Use the bushing nearest the back of the cabinet for the white cable, that's the one from the MARS that will be only just long enough. Keep some of the black plastic pins that came out of the bushings in order to plug up any unused holes when you're done.

Several signal cables can enter the DCP through one strain relief.

If you have a Present Weather sensor, you'll have two cables coming down from the sensor head with green connectors on the ends, and a green ground wire. The connectors fasten to the sockets on the bottom of the Present Weather controller. They're keyed so that you can't put them on the wrong sockets. The green ground wire will be too long. Cut it to length and terminate it in the copper ground lug on the bottom of the Present Weather sensor controller. At the same time, strip and terminate the cut-off portion along with the ground wire coming down from the head. You'll use this cut-off portion to extend the grounding for both the head and the controller to the ground lug at the bottom of the tower, later. Fold up the excess signal cables from the head and secure it to the lower Unistrut rail where it'll be out of the way.

At this point, you have cables from the MARS, rain gauge, wind sensors, etc. coming out of the tops of the strain reliefs and hanging out of the DCP cabinet. They aren't has hard to identify as it appears. The wind speed has 4 conductors and a shield. The Wind direction has 3 and a shield. The temp/humidity is the white cable. The MARS fan power and the rain gauge each have two conductors and look alike. You can physically trace one of them to see which it is, or you can use an ohm meter. The rain gauge cable will show an open circuit and the MARS power will show around 18,000 ohms.

Cut each of the cables that will connect to the DCP so that they reach about 2 or 3 inches above the connectors where they'll be terminated, except for the white one from the MARS. If this one has a couple of extra inches, you can back it down through the strain relief and put the excess length near the MARS where it'll be handy when the probe needs to be removed for cleaning. You don't have to crowd your hands into the DCP to make the connections, the terminal strips unplug from the edge of the DCP board so that you can make the connections more easily and then plug them back in. The DCP is printed next to the connectors to indicate which color wires to put in each place. There are a couple of things to watch for, though.

The wind speed and wind direction terminals have two colors identified at each position, one in parentheses. The colors indicated in parentheses are for use when connecting a model 2100 skyvane. This is rare, it hasn't been done since the 900-series AWOS was introduced. It's just a capability that the DCP has, so you can ignore the colors marked out in (parentheses).

The other thing to watch out for is that the wire colors have been changed for the Model 5190 temperature/humidity probe, but the DCP hasn't been changed yet. The correct way to connect this is on terminal TB2:

1 (at the bottom) is BROWN.

2 (working your way up) is WHITE.

3 is GREEN.

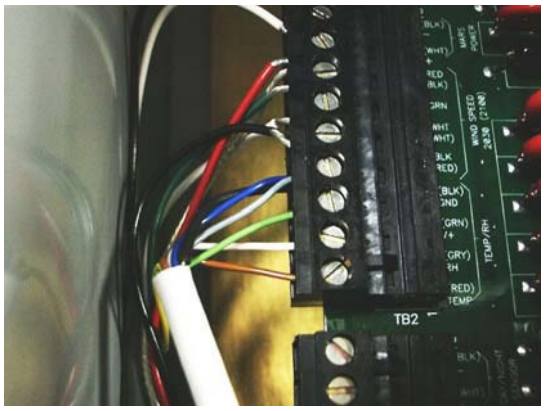
5190-D

4 is the SHIELD, BLUE and GRAY. (The shield has a black sleeve over it.)

5190-F

4 is the SHIELD, YELLOW and GRAY. (The shield has a black sleeve over it.)

Note: Any other wire colors from the sensor should be covered and insulated so they do not make electrical contact.



The temperature/humidity connection:

4 – Shield, Gray, and (Blue 5190-D / Yellow 5190-F)

3 – Green

2 – White

1 – Brown

If you have power on in the DCP, you can see each of the sensors data by pressing "#" or "*" on the keypad to scroll from one sensor to the next. Not every sensor will show evidence that it's connected and working. RAIN, for instance, will remain at 00 until the tipping bucket inside the sensor is moved. As you connect the wires, connect the shield wires as follows:

For MARS power, the shield shares with the black on pin 10.

For Wind speed, the shield shares with either red or green on pin 8 or 7.

For Temp/RH, the shield (black wire) shares with gray (and blue for 5190-D or yellow for 5190-F) on pin 4.

For Precip, the shield shares with black on pin 8.

For Wind Direction, the shield shares with black on pin 3.

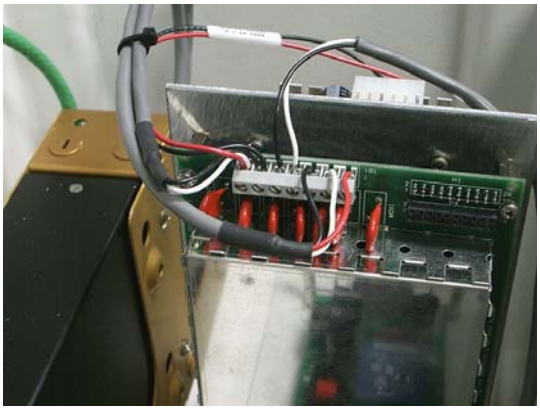
Now it's time for some wire pulling. Take care not to kink or knot the signal cables, or cut the insulation. If you step on the cables, the insulation may be punctured, so avoid this. Uncoil the Ceilometer signal cable in a straight line on the ground. When it's fully uncoiled, carry the end back to the junction box or conduit at the Ceilometer pad. Push the raw end of the cable down through the strain relief and into the junction box, then secure it to the pull rope. At the tower foundation, there's a junction box with more than one pull rope in it. Determine which is the one from the Ceilometer pad, and pull the cable through. If you're working alone, the signal cable won't go through the strain relief easily enough to let you pull it. It will help to pull all of the cable through the strain relief and out of the junction box, laying it out straight on the ground again. Now as you pull on the rope, the cable is pulled from the ground into the open junction box and down the conduit. Once the cable is pulled, you'll have a lot of extra cable coming out of the junction box at the tower. Back at the Ceilometer pad, connect the green plug to the Ceilometer, route and dress the cable so that it'll stay out of trouble, and then tighten the strain relief and put the cover back on the junction box.

Next, pull the data cables for the Thunderstorm, Visibility, and Freezing rain sensors in the same way. The difference here is that the visibility and thunderstorm cables have only two conductors and no connectors. The freezing rain sensor has 3 conductors and a small black plastic connector on one end that should already be connected inside the box. The sensor ends for the visibility and thunderstorm sensors will be connected to terminal strips. Also, instead of strain reliefs, for the visibility and Thunderstorm sensors you'll be running the wire through a flex conduit from the junction box to the sensor. The freezing rain has strain reliefs and you previously ran the wire to the junction box.

In the Visibility Sensor, you'll terminate the cable at the top right-hand corner of the controller PC board. The wires connect to pins one and two, putting the black wire on the pin marked "-". For this cable, let's connect the shield at the sensor end: pin 8 is marked "Shield". Don't lay the wire diagonally across the controller board, but instead route it across the top of the board and then down the left side to the conduit.

The two wires for the Visibility communication cable connect to the terminals marked "RS-485. The shield can connect to the terminal marked "GND" *unless you connect it in the DCP*.

In the thunderstorm sensor, you'll find an interface with a terminal strip near the top of the box. The data cable connects to pins 4 (+) and 5 (-). Again, lets connect the shield at this end. Ground is pin 6 on the interface assembly.



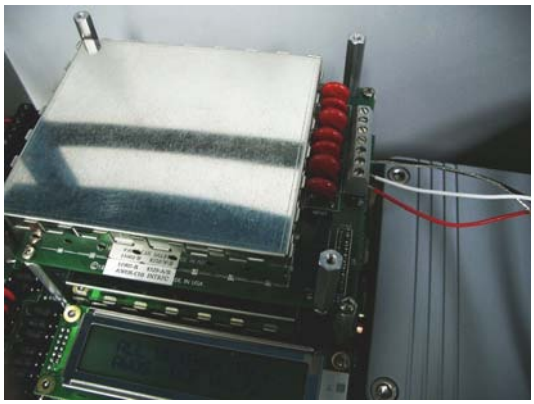
In the Thunderstorm sensor is a serial sensor interface where you'll connect the signal wire that runs to the DCP. You can connect the shield either here, or in the DCP.

The freezing rain sensor signal cable has a small black plastic connector on the end which connects inside the sensor to J2. This should have already been connected. At this point, you'll pull the wire through the conduit to the junction box at the tower.

Now at the tower, you have 1, 2 3, or 4 data cables hanging out of the junction box. Run them up through the raintite conduit to the DCP, and then put the cover on the junction box. In the DCP, your next chore is to identify and connect the wires.

If you have no freezing rain sensor, the only 3-conductor wire is for the Ceilometer. If there's a freezing rain sensor, here's how to identify them: Go to the breaker panel and ensure that the Ceilometer is ON and the freezing rain is OFF. The signal is about 8 or 9 Volts, so if you touch the

cut-off end of a cable to your tongue, you'll know safely and quickly if it's dead or energized. If it's live, it's the Ceilometer. At the top center of the DCP's circuit board, there's at least one interface with a shiny rectangular metal cover and a terminal strip on the right side. These interfaces will be stacked, if there's more than one, and a label on the bottom edge identifies it as Ceilometer or Freezing Rain, etc. Route the Ceilometer (and freezing rain, if you have one) up the left side of the DCP, across the top, and down to the terminal strip(s) on the interface(s). Cut them to length, strip the ends, and terminate them as follows: From the bottom and working up, 1 = Red, 2 = White, and 3 = Black. The shield may share #3 with the black, or it may be easier to use another pin that's ground - #6. Be sure to connect the Ceilometer to the interface marked 'Ceilometer' and the freezing rain to the interface marked ''freezing rain'.



Inside the DCP, RS-232 signal cables (the Ceilometer and the freezing rain sensor) connect to interfaces like this.

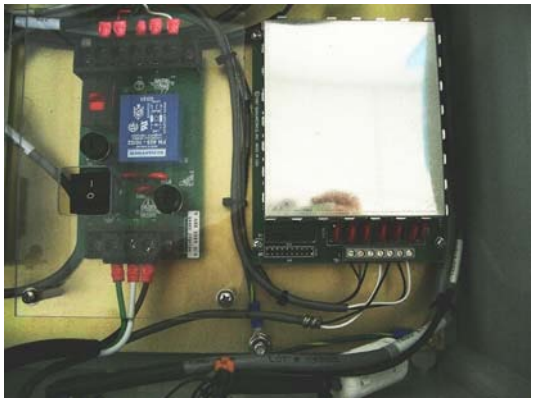
1 – Red

2 – White

3 – Black

6 - Shield

Before we connect the remaining wires, let's bring in the Present Weather sensor data cable, also a 2-wire cable. There are a couple of ways to do this. One is to install a strain relief in the empty hole in the bottom of the PWX controller. Now you can run a cable through this strain relief, along the Unistrut rail, and into the DCP through one of the multi-strain relief's. The other is to use raintite conduit. Probably the best way to do this would be to use 90-degree Raintite fittings on the bottom of the PWX and in the remaining hole in the bottom of the DCP. Once you have the cable in place, connect the PWX end to the terminal strip on the serial sensor interface in the bottom right-hand corner of the controller. The white wire goes on 4, the black goes on 5. Let's connect the shield to pin 6 with a black wire that's already there.



The serial sensor interface in the Present Weather controller.

4 – White

5 – Black

6 – Shield

In the DCP, you now may have as many as three identical 2-conductor wires to connect, depending on what options were included with the AWOS. Don't worry about which is which, they'll all be effectively connected in parallel. If you have one cable, connect the wires to pins 1&2 on the lowest connector "Vis/Ceil/Other". If there's a second cable, it can connect on 3&4. If you have a third cable, it'll have to share with one of the first two. The shields were connected at the other ends, so you don't have to connect them here.

There is a number of ways to connect power for the rain gauge. In this photo, the cord comes down the tower leg to the AC junction box. If no other provision exists, you can tie the cord along the rain-tite from the DCP and put a strain relief in the circuit breaker panel.

15. GROUNDING

There are a couple of considerations for ground cables. It's important to avoid bending them sharply, try to make wide, sweeping bends. Lightning won't follow a sharp turn. Good grounding is critically important to the reliability and operation of the AWOS. It provides protection from electrical surges and spikes, and reduces electrical noise, which otherwise gets mixed with the signals we're trying to use.

The Ceilometer is easiest, let's start there. A ground wire is coming out of the earth next to the Ceilometer pad, and you placed a ground lug on the leg of the sensor closest to it. It may be anything from a solid #4 to a stranded 4/0. If it's #4, you might want to bend it back on itself and stick the folded end in the ground lug to increase the contact area. Cut off the excess.

The Visibility sensor has a ground lug on the mast and a smaller copper one inside the controller cabinet. If the cable is long enough, run it up through the clamp, up the mast, into the cabinet through the small strain relief, and finally into the ground lug. If it's too short, fold it and terminate it on the mast the way you did for the Ceilometer, and add a length of #4 cable from this clamp to the small one inside the cabinet. The bottom end can lay between the fold of the one already in the clamp on the mast, so that it makes a very solid connection, which is critically important. If the end of the cable spreads when you bend it, making it hard to get into the small copper lug, remove the lug from the stud and clamp it to the end of the cable before you bend it around to get the lug back on the stud.

The Thunderstorm/Lightning Detector is easy. Run the ground wire up the mast, cut of the excess, and clamp it in the small copper lug on the bottom of the box.

The freezing rain sensor is also easy. There's a small copper ground lug on the bottom of it, same as for the Thunderstorm.

Finally, the tower, DCP, and Present Weather. The site preparation people should have grounded the tower at the bottom of one of the legs. They may have left another ground wire at the bottom of the tower. If not, you'll add a #4 wire to the clamp at the bottom of the tower and run it up to the DCP. If there's a separate wire, you may not have to disturb the tower ground. Run the ground wire up to the DCP and into the cabinet through the smallest strain relief. There's a stud in the back at the bottom center, with no ground lug on it. It's in a plastic bag with your installation hardware. Cut the cable to the right length, snug the clamp on the end, then bend it over to put the clamp on the stud. Tighten the nuts to hold it on the stud and re-tighten the clamp.

If there's a present weather sensor, you'll be using the green wire that you left hanging from the bottom of the PWX controller earlier. Run it to the bottom of the tower and add it to the clamp there.

16. VISIBILITY SENSOR ALIGNMENT

Now that your visibility sensor has been running for awhile, it's stabilized enough that you can do an alignment to optimize it's operation. While the sensor will probably operate just fine, it'll give better performance if all of it's alignments are optimized. If you have experience with electronics please perform this step. You'll need a step ladder and a digital multimeter that can measure AC Volts (true RMS) and function as a frequency counter.

Refer to manual 8364-E01 which is on the CD-ROM supplied with the AWOS for the procedure. It's in section 7, beginning with SENSOR HEAD MECHANICAL ALIGNMENT. Skip the BANDPASS FILTER ADJUSTMENT, it requires an oscilloscope and is difficult to do outdoors. Also, this adjustment is very stable and not likely to require attention.

17. FINISHING THE SENSOR SITE

Make sure that all the circuit breakers are on, and the switches are on inside the DCP, Present Weather, Thunderstorm, and Visibility sensors. Gather up all the boxes, trash, plastic bags, cut off ends from the tie-wraps, and anything else that shouldn't be there. The airport manager or the FBO should be able to direct you to a dumpster that you can use.

18. CDP INSTALLATION

Finally, you can do the inside work. Take the computer, monitor, etc. out of the boxes. Slide the desk, etc. where you'll be setting it up away from the wall so that you can make your connections in back. Set the CDP computer (Olive green case, lays flat) in position, and set the monitor on top of it. Lay the keyboard, mouse, and mouse pad in position, and connect them. The keyboard and mouse usually share one connector using a 'wye' cable. Connect a black power cord to the PC and the UPS, but don't turn the computer on yet. The monitor has a white power cord, connect it too.

This is ***not*** the way to install the CDP!

The mini-tower case isn't a computer, it's the peripheral interface. Remove the cover from the side that gives you access to the components inside and set it and the screws aside for now. Set the mini-tower upright next to the PC. There should be a plastic bag full of cables, screws, etc. inside, take it out.

18.1 CONNECTING A LAND-LINE DATA LINK

If the AWOS doesn't have UHF radios, there'll be a wye-cable with 9-pin connectors on all three ends and there'll be a cable somewhere near the CDP location that comes in from the sensor site. The wye cable connects to COM1 on the back of the olive green PC, and if necessary, the white data extension cable connects to one of the 9-pin connectors on wye as marked by the label on the connector and to the connector on the back of the peripheral interface. The other leg of the wye adapter gets a B&B RS-232/RS-485 adapter. Secure all the 9-pin connectors. There's a power supply for the B&B adapter. You may have to cut a connector off of the end, determine the polarity with a meter, and then connect the cord to the B&B adapter. Run the wires through the holes in the end of the adapter before putting them in the terminal strip in order to have some strain relief. Find the two conductors in the land-line that are connected to the DCP at the other end and do the same as for the DC power wires, using the holes for strain relief. Connect them to the top two terminals, observing polarity.

The B&B adapter and a wye cable will be supplied for the AWOS's thatconnect with a land line instead of a UHF radio. The bottom two connectors get DC power, the top two get the cable from the DCP, and the center two aren't used.

18.2 UHF RADIO DATA LINK

If you have UHF radios, the B&B adapter and wye cable won't be there; connect the white cable that was shipped in a package inside the peripheral interface cabinet to COM1 on the PC and to the connector on the back of the peripheral interface. The UHF antenna cable will be routed into the peripheral interface chassis and connected to the BNC connector on the radio, later. Don't turn on power to the peripheral interface chassis until the antenna cable is connected, you don't want to transmit without an antenna connected.

18.3 PRINTER

The printer goes with the AWOS, but if space is limited the users may elect to leave it uninstalled. The printer isn't necessary for the operation of the system, and there are other ways to print the data. If it's to be installed, set it on the desk (the user may want to provide a printer stand) and connect it to the UPS and the printer port of the PC. The printer cable connects to the printer and to the printer port on the back of the CDP computer.

18.4 VHF (VOICE) GROUND-TO-AIR RADIO

The VHF radio sits on or under the table. Find the cable with a 25-pin connector and secure it to the back of the radio. You'll cut the other end to length and route it into the peripheral interface chassis and connect it to the terminal strip labeled "VHF RADIO" following the colors indicated next to the terminal strip. Connect a black power cord from the radio to the UPS, but don't turn the radio on**.**

Here are three different CDP installations. The one above is at the factory where it was set up for test and burn-in. The other two are tightly crowded, which is often the case.

18.5 UPS

The UPS is best placed on the floor underneath the desk. Before you plug it in, check to see that the batteries are connected. Usually, there is one wire that you have to connect to the battery or a plug that you have to insert in the back to enable it. Once ready, plug it in. After a moment, it should show only green light(s). Note that some of the outlets are battery-backed and some are surge-supressed only. The PC, the peripheral interface, and the monitor should be battery backed. The others may be in the surge suppressed outlets. The VHF radio should not be in a battery-backed outlet unless the optional large UPS was supplied, as it draws too much power for the 5-minute UPS.

There's a flexible tube coming out of the back of the peripheral interface for the wires. You have to add more wires to it, and they won't all fit. Clip the small zip ties that hold the tube in the peripheral interface. Find the telephone line cord that came with the UPS and shove the end past the corrugated tube into the back of the peripheral interface. Plug it in to the empty jack on the edge of the PC board, then spread the split in the corrugated tube and work the wire into the tube. Try to get it into the tube for a distance of about eight or ten inches outside the cabinet. Connect the other end to the phone jack on the wall that was installed for the AWOS.

18.6 SPEAKERS

Get out the PC speakers and set them up next to the PC. Leave the switch off, and plug them in to the UPS. The other cord has two jacks on the end, one of them insulated with heat shrink tubing. Like you did for the phone cord, shove this past the corrugated tube and work it in through the split. If it makes it easier, you can cut off the insulated jack, as it won't be used. Plug the jack in to J8.

18.7 CONNECTING THE PERIPHERAL INTERFACE TO THE PC

Route the corrugated tube to the back of the PC and secure it with a plastic cable clamp, substituting a longer screw for one of the screws on the back end of the PC. The wires coming out of the end of the tube are identified with labels as are the corresponding connections on the back of the PC. Connect them as indicated.

18.8 MICROPHONE

Connect the microphone where the label indicates on the back of the PC (MIC IN), and either set it on the desk next to the PC or use the adhesive mount to put it on the side of the monitor.

18.9 PERIPHERAL INTERFACE FINAL CONNECTIONS

Cut the gray cable from the VHF radio to length and shove it into the peripheral interface and work it into the corrugated tube, as with the other wires. Strip the end and connect it to pins 1, 2, 3, and 4 of the terminal strip J2, noting the colors as marked on the board. Put a small tie-wrap around the corrugated tube about 8 inches from the cabinet to keep the wires from pulling out, and cut off the tail. Use a couple of tie-wraps inside the case to replace the ones that you had to cut earlier.

18.10 UHF DATA LINK RADIO ANTENNA CONNECTIONS

Knock out the plug in the back of the case that was intended for a keyboard connector and if you can find a grommet or bushing to protect the wire, insert it. If you're dealing with UHF radios, there will be TWO antenna cables that look exactly alike. You'll have to identify which one is connected to the UHF antenna (which should be cut down to small size). Hopefully, the site preparation contractor has marked it for you. Otherwise, the easiest way is to go on the roof and use a piece of wire to short the radials to the vertical tubes of the UHF antenna (only) and then you'll be able to identify the cables downstairs with an ohm meter. The BNC connector on the end of the UHF cable won't fit through the hole, so don't assemble it onto the cable until after you've run the cable in through the hole to the UHF radio position. After you put the BNC connector on the cable, connect it to the UHF radio and secure it with tie-wraps so that if someone pulls on it, it won't kink or be pulled out of the BNC. Return to the roof and remove the shorting wire from the UHF antenna!

Here are three different sites with VHF and UHF antennas. They illustrate several different ways to mount antennas. Often the real challenge is finding a path for the antenna cables. Also you have to find a way to locate the VHF antenna as far as possible from other antennas on the roof within the length of antenna cable you have.

18.11 VHF RADIO AND ANTENNA

Now that you know which antenna cable is which, put a BNC connector on the VHF antenna cable and connect it to the VHF radio transmitter. You'll need an adapter that's packed with the radio. If the FCC license for the radio is on-hand and you have an FCC license to work on radio transmitters, remove the top cover of the radio (note that there are four screws longer than the others and mark which holes to return them to) and set the jumpers so that the radio will be at the assigned frequency. Otherwise, leave the power switch on the front of the radio turned OFF until these conditions are met.

18.12 FINAL CHECKS AND TROUBLESHOOTING

Now you can turn on the power to everything (except the VHF radio, if you don't have the licenses). After the computer boots up and shows the normal weather display screen, check the status in the bottom left-hand corner. It should say "COM OK". That means that the data is arriving from the sensors, and should begin displaying within a few minutes. Replace the cover on the peripheral interface.

If it says "COM FAIL", check the following:

- Is the 9-pin serial cable connected between the peripheral interface and the PC?
- Is the cable connected to COM 1 on the PC? Com 2 won't work.

- Is power applied to the peripheral interface? The switch is in back. There should be an LED burning steadily on the PC board, it's label is "Power on".
- There are two other LED's next to the POWER LED. Are they blinking? One of them is green (TXD) and represents the computer requesting data. The one in the middle (RXD) is the response from the DCP out on the field.
- If the AWOS uses UHF radios, is the antenna cable connected? Check the antenna and cable for short circuit.
- If the AWOS communicates with a cable, exchange polarity of the 2 wires at J2 pins 5 & 6.
- Is the DCP powered on?
- If the AWOS uses UHF radios, is the antenna cable connected in the DCP? Check the antenna and cable for short circuit.
- If the AWOS communicates with a cable, check that it's terminated in the DCP at TB4 pins 9 & 10.
- If the AWOS uses UHF radios, check that SW1 in the DCP is configured as follows: off-off-on-off-off-on-off-off.
- If the AWOS communicates with a cable, check that SW1 in the DCP is configured as follows: off-on-off-off-on-off-on-on.

Now check the operation of the rest of the AWOS.

- Display looks OK
- PC speakers work, audio is clear?
- Dial the RMM phone number. Answers? Clear audio?
- Printer works, if installed?
- Keyboard works, you can gain access to the menus?
- Mouse works?
- Record a voice remark. It plays back OK?
- If the VHF radio is on, can you receive it with a receiver? Audio OK?

19. REMOTE DISPLAY

Some AWOS's will have a remote display. The site preparation crew will have installed a cable for you between the remote display location and the CDP. The remote display has only the PC and a monitor – no keyboard, mounse, modem – nothing else. You'll connect a B&B adapter to the back of the remote display and the two-wire cable and a power supply to the B&B adapter. At the CDP, the cable from the remote display connect to J2 pins 5 (-) and 6 (+) in the peripheral interface.

A remote display.

20. SYSTEM CALIBRATION AND CHECKOUT

Before you hand the AWOS over to the customer, you have to check the calibration and operation of every sensor and major component. If all the requirements are met for commissioning (FCC licenses for radios, MOA and OMM between the airport and the FAA, you possess an FCC license to work on radio transmitters, etc.) your complete checkout of the AWOS can be the commissioning inspection. If not, you still have to ensure that everything is correct while the system operates in TEST mode pending the commissioning inspection. The FAA representative has to be present to oversee the commissioning inspection. On the CD-ROM that came with the AWOS, you'll find maintenance forms. One of these is the "AWOS COMPREHENSIVE FACILITY PERFORMANCE AND ADJUSTMENT DATA FORM". You'll use this form as a checklist and a means to record the results of your checks. It remains a permanent part of the AWOS maintenance records. Refer to the various manuals on the CD-ROM for the procedure to check out each individual part of the AWOS.

At the CDP, enter the 'Operator menu' and ensure that the system is in TEST mode until the FAA notifies you that the commissioning is complete.

This finishes the AWOS installation. Carry away and dispose of the packing materials, trash, etc.

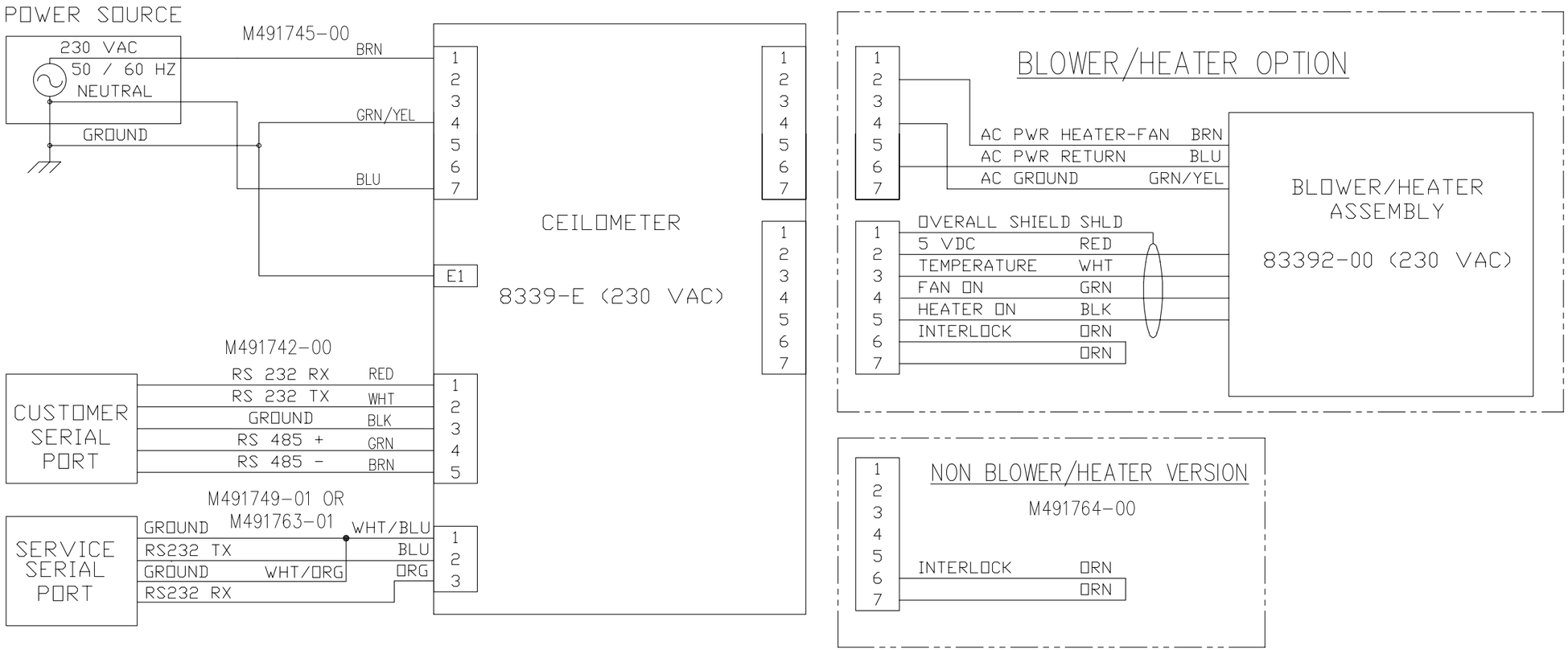
The only thing left to do now is to train the users on how to operate the AWOS.

21. DRAWINGS

The following pages contain supplemental installation drawings and wiring diagrams.

8339-E-019	8339 Ceilometer Wiring Diagram
M488261-00-007	8339 Ceilometer Mounting Kit Installation Drawing
83396-00-007	Ceilometer Blower Mounting Kit Installation Drawing

REVISIONS			DWG NO. 8339-E-019	
REV	ECN	DESCRIPTION	DATE	APPROVED
A	5030	INITIAL RELEASE	6-23-04	JC
B	1245	"M491749-01 OR M491763-01" WAS: M491749-00	9-19-07	PMK



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DO NOT SCALE DRAWING

MATL

FINISH

TREATMENT

DRAWN BY: J.CONNER	6-23-04	TITLE: WIRING DIAGRAM, CEILOMETER ASSY, 8339-E, TOP LEVEL
REVISED BY: PMK	9-19-07	
CHECKED BY:		
DESIGN ENGINEER: SLVS	5-13-04	
PROJECT MANAGER:		
APPROVALS	DATE	

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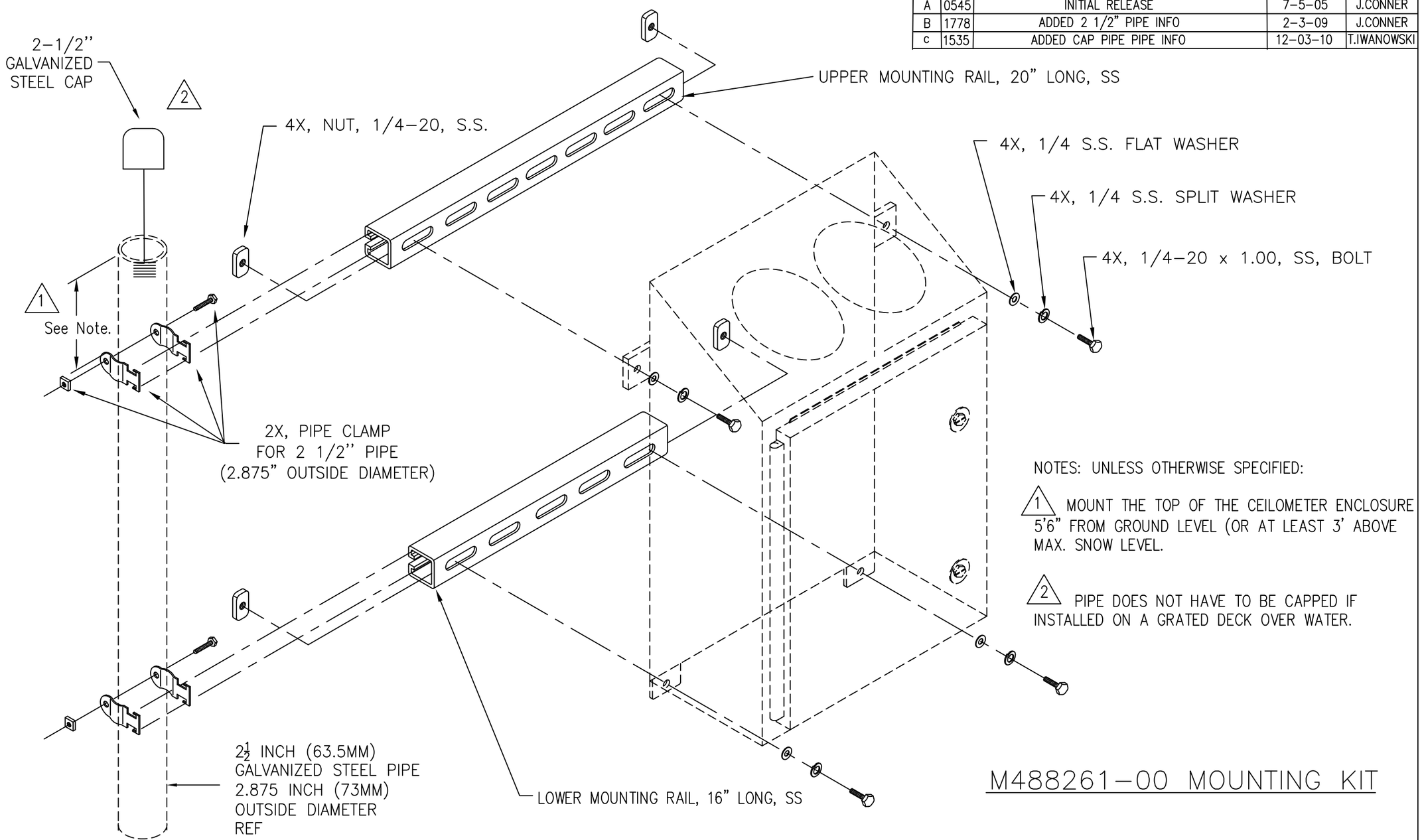
SIZE C | DWG NO. 8339-E-019 | SCALE NONE | RELEASE DATE | SHEET 1 OF 1

REVISIONS			DWG NO M488261-00-007	
REV	ECO	DESCRIPTION	DATE	APPROVED
A	0545	INITIAL RELEASE	7-5-05	J.CONNER
B	1778	ADDED 2 1/2" PIPE INFO	2-3-09	J.CONNER
c	1535	ADDED CAP PIPE PIPE INFO	12-03-10	T.IWANOWSKI



NOTES: UNLESS OTHERWISE SPECIFIED:

1. MOUNT THE TOP OF THE CEILOMETER ENCLOSURE 5'6" FROM GROUND LEVEL (OR AT LEAST 3' ABOVE MAX. SNOW LEVEL.

2. PIPE DOES NOT HAVE TO BE CAPPED IF INSTALLED ON A GRATED DECK OVER WATER.

M488261-00 MOUNTING KIT

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MATL: AS ISSUED

FINISH: AS ISSUED

TREATMENT: NONE

DRAWN BY: J.CONNER	7-5-05	
REVISED BY: T. IWANOWSKI	12-03-10	
CHECKED BY:		
DESIGN ENGINEER:		
PROJECT MANAGER:		
APPROVALS	DATE	

TITLE: INSTALLATION DWG, MOUNTING KIT, STAINLESS STEEL, 8339 CEILOMETER

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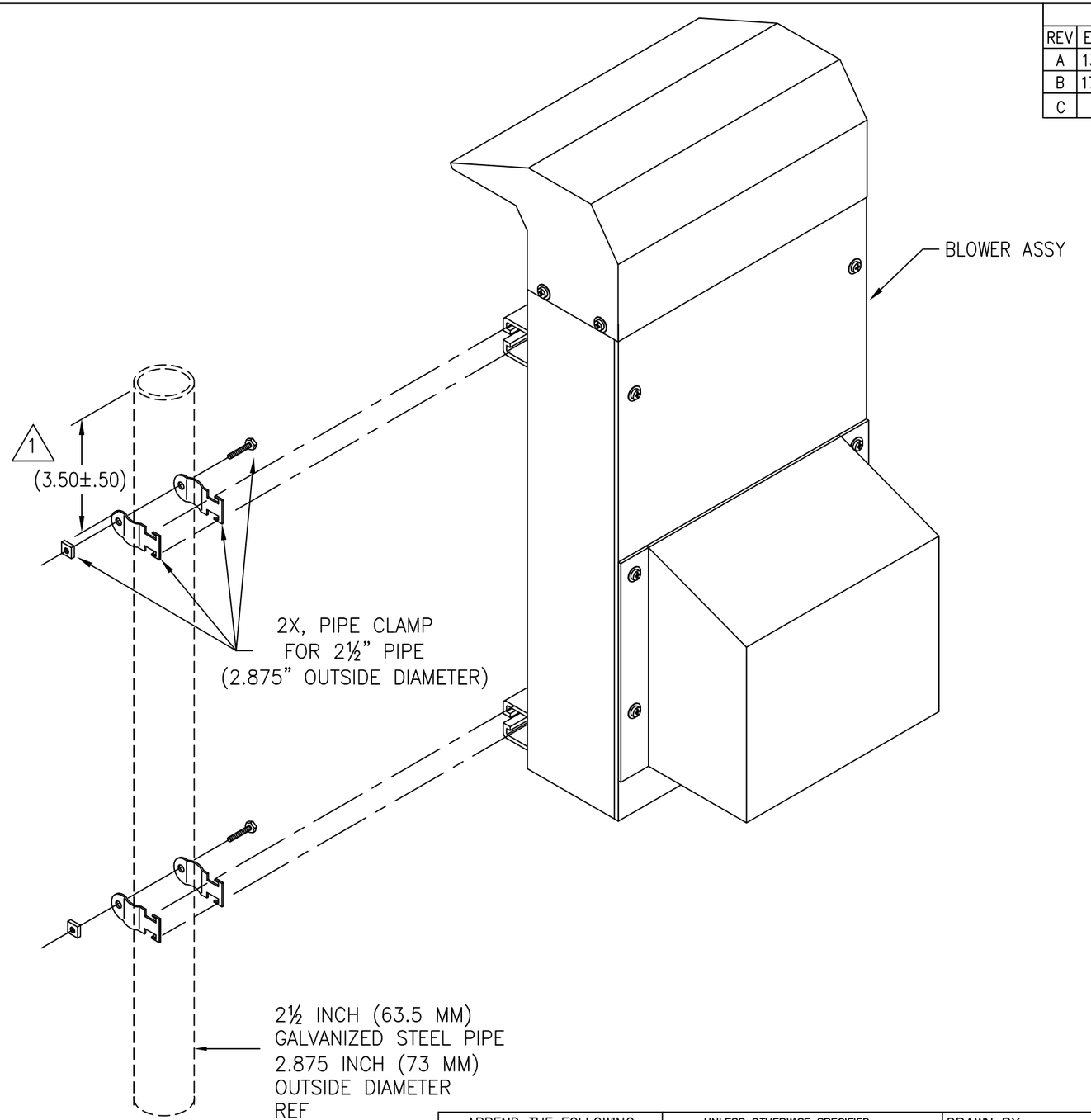
SIZE C | DWG NO. M488261-00-007

SCALE NONE | RELEASE DATE | SHEET 1 OF 1

REVISIONS			DWG NO. 83396-00-007	
REV	ECO	DESCRIPTION	DATE	APPROVED
A	1317	INITIAL RELEASE	11-27-07	PMK
B	1778	ADDED 2 1/2" PIPE INFO	2-3-09	J.CONNER
C		ECP 180 ADDED VENT POSITION ABOVE LENSES	9-28-10	π



NOTES: UNLESS OTHERWISE SPECIFIED:

1. MOUNT THE BLOWER ASSY UPPER PIPE CLAMP JUST BELOW THE CEILOMETER UPPER PIPE CLAMP (APPROX. 3½" FROM THE TOP OF THE MOUNTING PIPE) AND THE BLOWER LOWER PIPE CLAMP JUST ABOVE THE CEILOMETER LOWER PIPE CLAMP. THIS WILL POSITION THE BLOWER VENT APPROX. ¼" ABOVE THE CEILOMETER LENSES.

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TOLERANCES
.XX=±.010 ANGLES ±1/2°
.XXX=±.005 CONCENTRICITY: .003 TIR
DO NOT SCALE DRAWING

MATL: AS ISSUED

FINISH: AS ISSUED

TREATMENT: NONE

DRAWN BY: PMK	11-27-07	
REVISED BY:		
CHECKED BY: J CONNER	11-27-07	
DESIGN ENGINEER: J CONNER	11-27-07	
PROJECT MANAGER:		
APPROVALS	DATE	

TITLE: INSTALLATION DWG, MOUNTING, BLOWER, SS, 8339 CEILOMETER

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SIZE C | DWG NO. 83396-00-007

SCALE NONE | RELEASE DATE | SHEET 1 OF 1

This antenna is supplied to operate satisfactorily within the frequency range(s) specified on the carton label. Some models require cutting of radiator and/or radials in accordance with Figure 11. If the antenna is to be used over a range of frequencies, the element lengths should be chosen for mid-range or favor the element length for the most used, or the frequency requiring the greatest range.

ASSEMBLING THE ANTENNA

1) Select antenna location and route cable from set to antenna.

2) Loosen mounting nut and assemble radials to hub as shown in illustration. Tighten jam nuts and lockwashers against hub to secure the radials. Retighten mounting nut.

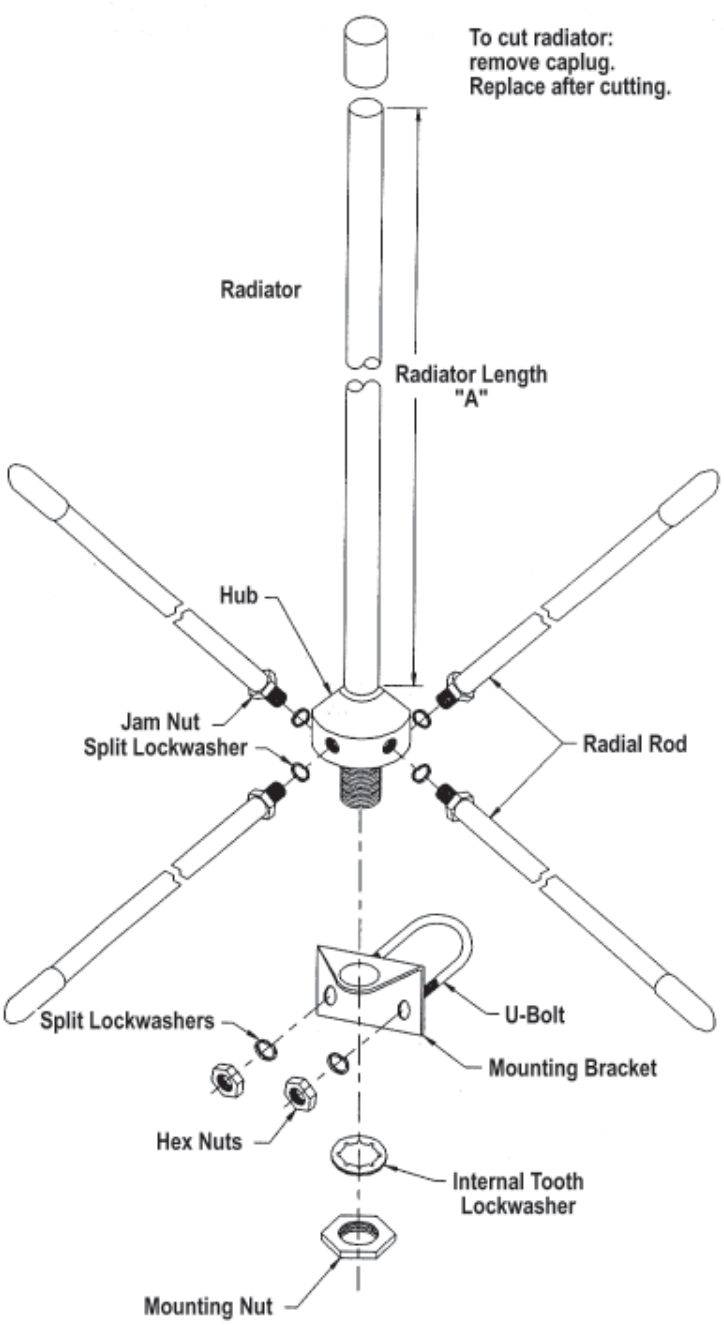
3) Connect cable to antenna (accepts PL-259).

Some models are supplied with cable and connector for the antenna end. Radio end connector is not supplied.

4) Mount antenna onto 1/2"-3/4" pipe, or up to 1-3/8" O.D. tubing (not supplied) with U-bolt, lockwashers and hex nuts provided.

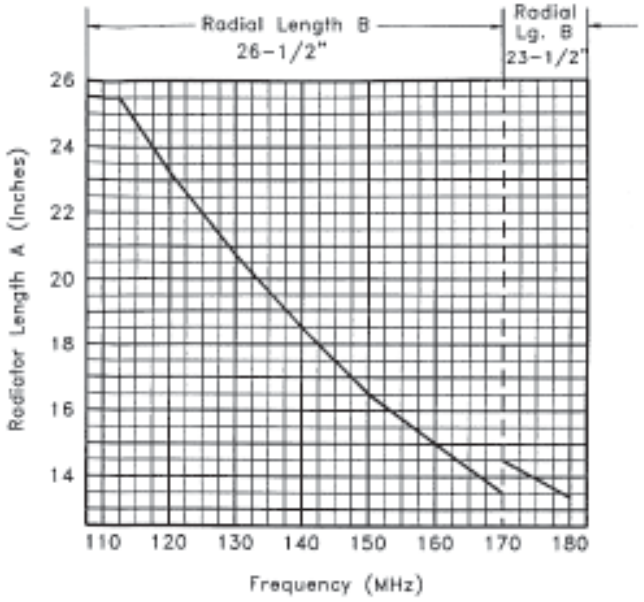
5) Secure cable to mounting pipe with straps or plastic tape to avoid strain on cable connections.

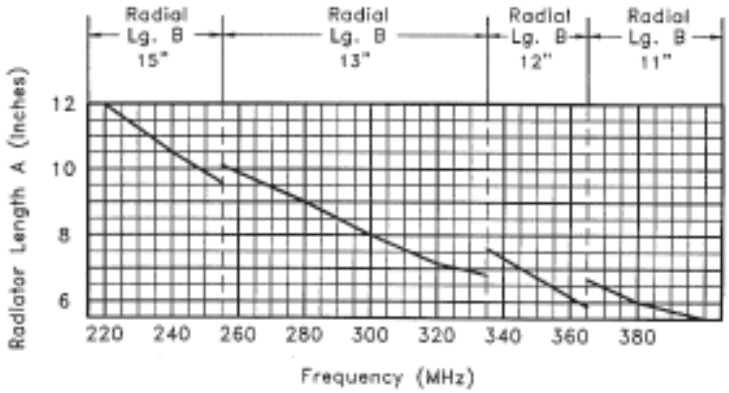
The use of a PTFE or similar lubricant on the threaded portions of the antenna prior to assembly will provide protection from weather and ease future disassembly.



UHF/VHF Antenna Assembly

Lengths on chart are approximate. For finer tuning, use a VSWR bridge if antenna is to be used for transmitting.

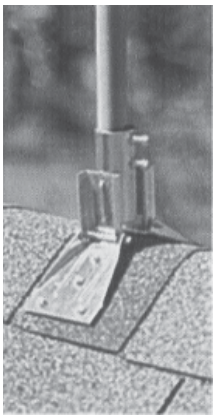




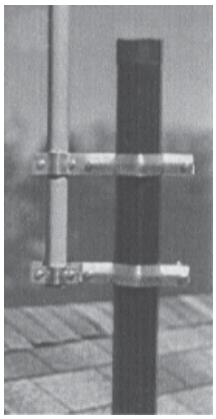
Remove vinyl cap before measuring and cutting. Slide vinyl cap back on after cutting.

TUNING ADJUSTMENT TABLE

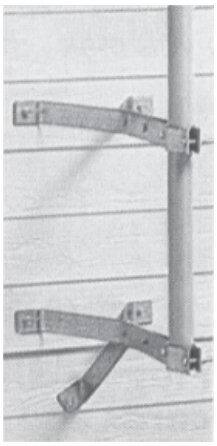
Frequency (MHz)	Radiator Length A (Inches)	Radial Length B (Inches)
406–420	5–5/8	10
450–470	5	8–1/2
470–488	4–15/16	7–3/4
488–512	4–5/8	7–3/4



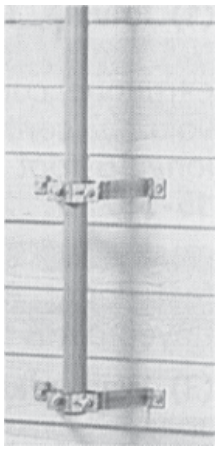
Base and Roof Mount.
Heavy-gauge steel swivel base fits the slope of most roofs. 1¼" mast locks into U-bolt.
Radio Shack P/N 15-889



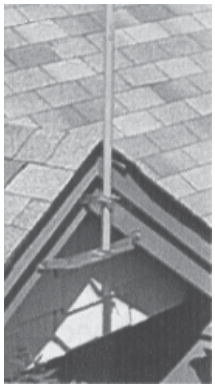
Vent Pipe Mount.
Brackets attach to 2" to 5" vent pipes (GC model fits 2" to 4" vents). 1¼" mast clamps into place.
Radio Shack P/N 15-893
GC Electronics P/N 8802



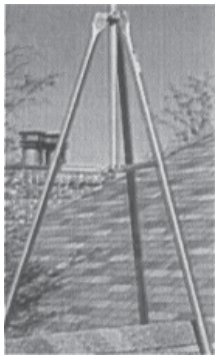
12" Wall Mounts.
Secures 1¼" mast 12" from side of building.
Radio Shack P/N 15-885
GC Electronics P/N 8312



4" Wall Mounts.
Secures 1¼" mast 4" from side of building.
Radio Shack P/N 15-883
GC Electronics P/N 8304



Eaves Mount.
Secures 1¼" mast to hanging rafters or trim boards; fits most medium-pitch roofs. Includes 4 lag bolts.
Radio Shack P/N 15-891



3' Tripod Mount.
Designed for larger antennas and areas subject to strong winds. Fits slope of most roofs. Fits 1¼" mast.
Radio Shack P/N 15-516
GC Electronics P/N 9160

Masts:
Use with 1¼" diameter 5' steel mast (Radio Shack P/N 15-842, GC Electronics P/N 32-9013) or 10' steel mast (Radio Shack P/N 15-843, GC Electronics P/N 32-9014).

Central Station Antenna Mast Options

All Weather Inc.
1165 National Drive
Sacramento, CA 95818
Fax: 916.928.1165
Phone: 916.928.1000
Toll Free: 800.824.5873

903-042
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June, 2011