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USCRN Temperature Aspirated Shield Modifications

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1. Introduction

U.S. Climate Reference Network (CRN) systems are installed with three air temperature sensors, each mounted in a separate aspirated solar shield assembly. The aspirated shields are manufactured by Met One, Inc. model 076B 7308. Early experience with field operations of the USCRN systems indicated some possible modifications that would facilitate field maintenance and deployment.

The USCRN installations and field maintenance, are assigned to the NOAA Atmospheric Turbulence and Diffusion (ATDD) lab in Oak Ridge, TN. This Technical Note describes the modifications the engineers at ATDD have developed and implemented to the aspirated shields.

2. Description of Modifications

The first modification ATDD implemented makes it easier to remove and replace the fan in the aspirated shield. The assembly, as delivered by the manufacturer, requires the electrical cable to be cut in order to replace the fan. ATDD made a simple modification that allows the connector to be removed along with the fan, and no longer requires the cutting of the cable.

The second modification involved changing the way the fan is mounted in the shield. As originally delivered, the entire shield assembly had to be disassembled to remove the fan from the shield assembly. This made reassembly in the field difficult. After the modification implemented by ATDD, the fan can be removed without disassembly of the entire shield.



Figure 1: An USCRN unmodified Met One aspirated solar shield mounted on a test site at the ATDD facility. The shield assembly is suspended from the mounting bar (horizontal bar extending to the right at the top of the assembly). The fan is mounted in the square box under the umbrella-shaped shield. The electrical connector for the fan can be seen on the right side of the square fan chamber.

A third modification to the aspirated shield was to replace the electrical connector on the aspirated shield. The original connectors suffered from corrosion problems at installed stations, even when taped and sealed. The original connector has been replaced with a gold-plated pin connector which has resolved that problem.

The total cost for materials for the ATDD modifications to the aspirated shields is less than \$15, mainly for the gold-pin connector which costs about \$10. Labor time to do the modifications is approximately one hour. The modifications are generally performed at the ATDD shop prior to the installation of the aspirated shields at the field sites. In addition, the manufacturer of the aspirated shields is now including the modifications on any newly ordered units.

3. Aspirated Shield Fan Electrical Connector Mount Modification

The electrical connector for the fan in the aspirated shield, as delivered from the manufacturer, required the electrical cable to be cut in order to replace the fan. ATDD did a simple modification on how the connector is mounted that allows the connector to be removed along with the fan, and no longer requires cutting the cable.



Figure 2: Exterior view of the electrical connector, as delivered by the manufacturer, for the fan in the aspirated shield. The external mounting of the connector required the cable to be cut in order to remove the fan; the wires for the new fan had to be soldered into the connector after assembly.

The factory-installed electrical connector is mounted on the exterior of the fan chamber (see Figure 1). The ATDD modification consists of removing the electrical connector, enlarging the mounting hole from the original 3/4" diameter to a diameter of 7/8". The connector is then remounted from the inside of the fan chamber (see Figure 2) such that the connector can be removed along with the fan.



Figure 3: The ATDD modified electrical connector for the aspirated shield fan. The connector is mounted from the inside of the fan chamber and can be removed, without cutting the wiring, along with the fan when the fan requires replacement. The fan is replaced as part of routine maintenance every 3 years.

4. Modifications to Fan Mount on the USCRN Aspirated Shield

The factory-delivered aspirated shield assembly is held together with 4 bolts that extend from the top of the assembly down through the shields, with the fan mounted inside the fan chamber at the bottom of these four bolts (see Figure 4). Removing the four nuts on the bolts to remove the fan allowed the entire assembly to come apart, and made it more difficult to install a new fan.

The ATDD modification consists of removing the fan and securing the remaining assembly with the original nuts. The mounting holes on the fan are then bored out from their original 0.17" inch diameter to a diameter of 0.40". This allows the fan to be placed into the fan chamber such that the nuts on the mounting bolts fit within the enlarged holes. A second set of nuts is then applied on all four bolts on the outside holes on the fan, which have been left at their original size. This allows the fan to be removed without disassembling the entire shield apparatus.

Figure 5 shows the interior of the fan chamber with the modified fasteners installed, prior to the mounting of the fan.



Figure 4: The assembled upper shield portion of the aspirated shield. As delivered from the factory, four bolts are used, inserted from the top of the upper flat shield shown above, down through the aluminum spacers separating the flat shield from the lower umbrella-shaped shield, and down into the square fan chamber. The fan assembly was mounted on the lower end of the bolts. Then the nuts were tightened to hold the whole assembly together.



Figure 5: The interior of the fan chamber. The ends of two mounting bolts can be seen. The fan is mounted onto these bolts. The bolt on the left has the new fastener installed, while the bolt on the right is as originally delivered. The modified fastening procedure allows the fan to be removed without the entire shield assembly coming apart.

Figure 6 shows, on the left, the fan assembly prior to enlarging the top mounting holes. On the right the holes have been enlarged. The enlarged holes fit over the added fastener, as seen in Figure 5, and allow the fan to fit snugly at the top of the fan chamber.



Figure 6: Aspirated shield fans before (left) modifying by enlarging the mounting holes, and after the modification (right). The mounting holes are enlarged from the original 0.17” to be 0.40” diameter.

5. Modification of the Aspirated Shield Electrical Connector

Some of the early USCRN sites experienced a problem with the electrical connector to the aspirated shield. Corrosion was occurring in the connector where the leads from the aspirated shield fan were soldered into the pins of the connector. The corrosion was reaching levels significant enough that the fan speed was unreadable and/or the fan would cease operating due to loss of power. In some cases the corrosion advanced to the stage where the pins almost completely disintegrated. Attempts to seal the connectors with tape or a silicone sealer were not successful.

ATDD chose to upgrade the connector to a gold-plated pin connector (Conxall, part number CXS3102A14S-2P). Since the new connectors were installed, there has been no corrosion observed at any locations so equipped.

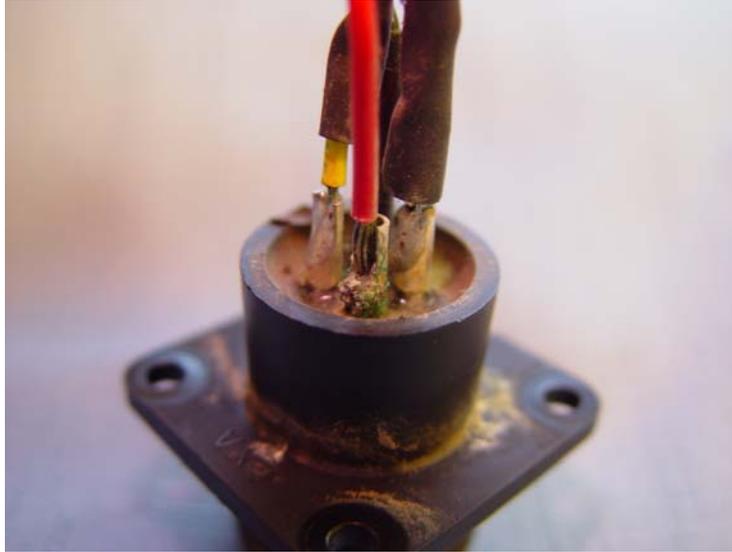


Figure 7: An example of how the originally supplied aspirated shield fan electrical connectors corroded.



Figure 8: The replacement gold-plated pin connector.

6. Disclaimer

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