MPL Sun Shade Installation and Setup

I. Purpose:

The MPL sunshade prevents direct sunlight from damaging the MPL photo detector when the sun is overhead and in the MPL viewport field-of-view. The shading device is a solenoid-actuated paddle that swings into the viewport field-of-view thus blocking the sun's direct rays. A timer set to the approximate times of solar noon operates the shading paddle solenoid and serves as the primary control. A separate system using a sun sensor (photoelectric diode) mounted in the viewport provides redundancy and back up in case of primary control failure. If a power outage should occur the sunshade paddle will failsafe – blocking the viewport field-of-view. A dehumidifier and heater/blower provide warm dry air to prevent condensation from forming on the viewport glass. See Attachment 1.

This document outlines the procedures for installing and setting up the MPL Sun Shade.

II. Cautions and Hazards:

- Make sure the field of motion for the sunshade is not in the normal path of personnel entering and exiting the van. The paddle is solenoid actuated and may cause injury when returning to the open position.

III. Requirements:

None.

IV. Procedure:

A. Installation

1. Referring to *MPL Cold Start and Shutdown Procedure, PRO(MPL)-003*, turn off the MPL and carefully move aside so as not to interfere with work or risk damage to MPL components.

2. Remove the old pneumatic sunshade system.

3. Remove the old viewport shroud.

4. Determine where the dehumidifier/heater assembly will sit.

5. Install new sunshade viewport rotating the air duct opening in the viewport to a location convenient to where the dehumidifier/heater assembly will be.

6. Install the sun sensor inside the viewport. Use Velcro and attach the sensor to the air duct inside the viewport.

7. Install the solenoid and sunshade paddle assembly. Find a position around the base of the viewport that will not interfere with any person or object. The paddle should be toward the near van wall when in the open position. **Important:** *Make sure the field of motion for the sunshade is not in the normal path of personnel entering and exiting the van. The paddle is solenoid actuated and may cause injury when returning to the open position.*

8. Install the dehumidifier/heater assembly at the predetermined location. Connect the flexible duct from the heater output to the viewport duct opening.

9. Attach a hose to the dehumidifier drain pan and route to the outside of the van preferably in the same way as the existing dehumidifier.

B. Electrical Connections

1. If power is removed from the timer it will lose its settings. Batteries in the timer unit will provide backup but they must be maintained. It is therefore recommended that the timer circuit be plugged into an UPS outlet.

2. The dehumidifier/heater assembly can be plugged into a normal (non-UPS) 120VAC/50Hz outlet.

3. The sun sensor circuit may be connected to a normal 120VAC 50Hz outlet.

C. Timer Setup

The timer is basically an automatic sprinkler controller adapted for the sunshade application. The timer drives a relay that operates the sunshade solenoid for a period determined by the start time and duration programming. The start time equates to approximately ½ hour before local solar noon with the duration being approximately one hour.

1. Clock and Day of Week

    a) Turn dial on timer to **SET DAY/CLOCK**.

    b) Use a pen or pencil to press **RESET** button.

    c) The day will blink. Press **NEXT** to advance to the current day of the week.

    d) Press **ENTER**.

    e) The time will blink. Press **+** or **-** to set local time.

    f) Press **ENTER**.

2. Timer Shading Start Time

   a) Turn dial on timer to **SET START TIMES**.

   b) Press **+** or **-** to set local start time for Station 1. This time should be approximately ½ hour before local solar noon. Solar noon can be determined by using NOAA's Web calculator at: http://www.srrb.noaa.gov/highlights/sunrise/sunrise.html

   c) Press **ENTER** to record time.

3. Timer Shading Duration

   a) Turn dial on timer to **SET WATER DURATION**. The cursor for Station 1 should blink.

   b) Press **+** or **-** to set the duration for 60 minutes.

   c) Press **ENTER** to record.

4. Timer Shading Days

   a) Turn dial on timer to **SET WATERING DAYS**.

   b) Press **NEXT** to move the cursor to each day and press **ENTER** to record each day. Make sure you have selected all seven days.

5. Timer Enable Operation

   a) Turn dial on timer to **AUTO**. The display should show current time and day.

   Timer is now programmed to operate automatically.

D. Sun Sensor Adjustment and Settings

The sun sensor provides backup should the timer malfunction. The sun sensor will trip an alarm relay when its output reaches the setpoint level of ~7.0VDC. The alarm relay drives the sunshade solenoid. A deadband is provided to provide for duration and prevent toggling of the solenoid.

1. Setpoint Adjustment

   a) With test switch in **TEST** position adjust R5 on the sun sensor circuit board to read ~7.0VDC at TP1&2.

   b) On the Action Pak module set the deadband at its minimum (20 turns CCW).

   c) Set the Action Pak setpoint at maximum (20 turns CW).

   d) With ~7.0VDC at TP1&2 adjust Action Pak set point CCW until the relay trips and shading paddle is in closed position.

2. <u>Deadband Adjustment</u>

   a) With solenoid still energized from above steps turn the Action Pak deadband to maximum (20 turns CW).

   b) On the sun sensor circuit board adjust R5 to read ~5.0VDC at TP1&2.

   c) Turn Action Pak deadband (CCW) slowly until relay resets and shading paddle returns to open position.

   d) Return switch on sun sensor circuit board to normal position.

   e) With MPL and timer controller offline verify that the sun sensor operates the shade paddle. This will have to be done around solar noon. Make sure suns rays do not impinge upon the MPL detector. Some adjustments to the sun sensor field of view may have to be done to avoid early or false triggering. Use tape around the sensor head to vary the field of view.

E. **Dehumidifier/Heater Settings**

The dehumidifier/heater basically provide warm dry air to keep condensation from forming on the viewport glass at the van roof penetration. The heater blower forces the air thru the flexible duct to the viewport plenum where it is directed to the glass.

1. Turn dehumidifier to maximum.

2. Turn heater thermostat to midrange.

3. Monitor viewport glass and adjust as necessary.

V. **References:**

1. MPL Cold Start and Shutdown Procedure, PRO(MPL)-003.

VI. **Attachments:**

1. MPL Sun Shade Diagram.

Attachment 1: MPL Sun Shade Diagram