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The World Dobson Calibration Center, Boulder Staff
(from left to right: Brooke Walsh, Mike O'Neill, Sam Oltmans, Bob Evans, Gloria Carbaugh, Dorothy Quincy)
From all of us here in Boulder, we thank you for your help in our continuing effort to obtain the best, most accurate data set of total ozone measurements. Many of your stations have over 30 years of data. It’s people like you that have made this program successful. Your continued help and cooperation is essential for the survival of the global network. We thank you for all that you do!
Introduction

- This guide is a reference tool, and does NOT take the place of hands on training by the Boulder Staff.

- Lamp tests are very important. It is essential that they are done correctly and promptly.

Brooke Walsh, CMDL Boulder

Karl Venneberg, NWS Bismarck, ND

Duane Wolfe, NWS Caribou Maine
Importance of Standard Lamps

- The monthly lamp tests help track the calibration drift of the instrument between intercomparisons here in Boulder.
- They are also used in processing as a correction factor for generation of total ozone values.
- Sudden or drastic shifts in lamp correction values help identify problems in the instrument.
Our Network of Dobsons

NOAA/CMDL Dobson Network

Map courtesy of Tom Mefford NOAA/CMDL
Safety Reminders

- NEVER touch the bulb in a standard lamp.
- Keep both the mercury and standard lamps in a cool, dry place.
- The lamp covers should NEVER be put over the hot bulb. This can cause premature burn out or in some cases a fire if improperly handled.

Nick Tarrish, NWS Nashville, TN
Safety Precautions

- Use caution when removing lamp units. They become very hot, very quickly.
- Use only the black cover on the lamp holder to block light.
  - Covering the lamp will cause the unit to overheat and burn out.

Black lamp cover
Mercury Lamp Test

- Check to make sure that microampmeter (meter) is zeroed while the instrument is off.
  - If not zeroed, take a flat head screw driver and adjust the small screw on the front of the meter.

- Turn the instrument on and put the Ground Quartz Plate (GQP) inside the inlet window.

- Turn on and warm up Mercury light for approximately 5 minutes.
  - **DO NOT look directly at the mercury lamp light!!** The Hg wavelength can be very damaging to your eyes!!
Mercury Lamp Test

- Verify that the Q2 lever is always set to the 15° C Hg temperature setting defined in the Q-table.

- Read the temperature of the instrument to the nearest tenth of a degree. Remember the value to record into program at the beginning of the test.

- Q1 should be placed at the Hg setting on the Q-table that equates with temperature of the instrument.
Mercury Lamp Test

- Reset the Counter and make sure it is zeroed.
- Turn the R-dial to 300.

Mercury Lamp in place

R-dial at 300

Mercury Lamp in place

Duane Wolfe, NWS Caribou Maine
Mercury Lamp Test

- Go to the maintenance tab on the home screen of the program and scroll down to **Mercury**.
Mercury Lamp Test

- Start with the sensitivity switches fully counterclockwise.
  
  - Observe the meter while adjusting the A wavelength sensitivity switch clockwise and moving Q1 up and down.
  
  - If the needle does not move, continue to adjust the sensitivity clockwise until movement on the meter is observed.
Mercury Lamp Test

- After movement is detected on the meter, continue to move the Q1 lever up while watching for the needle to hit a maximum point and then returning back down.
  - This may require adjusting the sensitivity control to keep the needle from going past full scale and causing damage to the meter movement.

- Adjust Q1 until the maximum point is once again reached. At this point, adjust the sensitivity so the needle reads approximately 20 on the meter.
  - This is the max power point. Mercury tests measure the values located at the half power points, in this case 10 on the meter.
Mercury Lamp Test

- From the maximum point, move Q1 up until the needle reads approximately 10, half of the max power peak.
Mercury Lamp Test

- Read the position of Q1 and record the information into the program.

![Mercury Lamp Test Graphical User Interface](image.png)
Mercury Lamp Test

- Move Q1 in the opposite direction until the needle once again reads half of the max power peak, and record.
- The needle should move back up to the max power point and then come back down again.

Record the lower value here
Mercury Lamp Test

- Repeat the upper and lower measurements five times as prompted.

- Record the final temperature of the instrument into the program.

- After completion, click Accept, then Done (Save).
  - Accept will give the table difference.
Mercury Lamp Test

- If the results are less than $\pm 0.3$, the findings are acceptable within the programs parameters.

- If the results are greater than $\pm 0.3$ the test needs to be re-done. If the findings on the second test are still above $\pm 0.3$ contact Brooke.Walsh@noaa.gov or Robert.D.Evans@noaa.gov for further instruction.
Standard Lamp Tests

- Always make sure to have the Ground Quartz Plate (GQP) in!!
- Place the lamp holder over the inlet window and attach all cords to the power supply.

Ralph Troutman, NWS Nashville, TN
Standard Lamp Test

- Slide the lamp into the lamp holder firmly, taking care NOT to touch the bulb.

Insert until the plug is connected securely in the lamp unit.
The lamp holder needs to be in place over the GQP before sliding the lamp in.

Always hold the lamp from the base.

Slide into lamp holder touching only the lamp base.
Standard Lamp Test

- Hold down the warm up switch on the orange power supply. While holding, flip the power switch and release.

- Continue to hold the warm up switch until the fans finish starting up and the lamp begins to dimly glow. Release the warm up switch.

- Adjust the voltage on the power supply to 24 +/- 0.02 volts.

- Attach a volt meter to the power supply to verify voltage.
Let the lamp warm up for approximately 5 minutes.
Press Alt-E (on the maintenance tab) and scroll down in the menu to Standard.
Standard Lamp Test

- Read the temperature off the thermometer located on the right side of the Dobson, and record into the program.
- Click on the lamp that is in use, located in the drop down menu.
Standard Lamp Test

- Adjust the Q-stops for the A and D wavelengths defined by the temperature setting in the Q-table.

- Set both Q1 and Q2 to the A wavelength or upper setting.

- Turn the R-dial until the meter reads close to 0.

- Increase the sensitivity until the needle has about a +/- 0.5µA “wobble” over 0.
Selected Lamp Test

- Press **Start** on the menu.
- The program will verify what to set the Q-levers values to.

Each setting will pop up before the selected wavelength pair.

Alt- S to start
Standard Lamp Test

- With the Q-levers set to the designated values on the screen, begin your measurement by keeping the needle on the meter close to 0.

- Repeat until all measurements are taken.
  - If values have changed considerably, do not accept the values. Re-test.

- If you do make a mistake, you can exit out of the lamp test at any time by hitting the escape key.
Standard Lamp Test

- After standard lamps are completed
  - release the lamp from the housing using a screwdriver, levering it between the socket and plug (keep the shield up to prevent the lamp from falling out of the unit).
  - Use vice grips to remove the lamp from the unit, and set aside to cool down.
- After cooled, return the lamps to their holders and store away.

Each station should have at least two standard lamps

Return the lamp to the holder and store in a cool dry place
Lamp Test

- Standard lamps are to be done the first week of each month.
- Use the lowest numbered lamp once a month, all lamps every three months.
- After running the lamps, one should check the desiccant and change if necessary.
Problems and Questions

- **If your standard lamp test fails:**
  1. DON’T PANIC! Re-do the test again.
  2. Reference the standard lamp section in this guide to make sure all steps have been completed.
  3. Double check all of your settings.
  4. Verify that the lamp power supply is at **24 volts** with a volt meter.
  5. Check to see if the bulb is failing.
  6. Has the lamp warmed up for at least five minutes?
Problems and Questions

- If your **standard lamp** fails to ignite:
  1. **DON’T PANIC!** Try another lamp to see if you can get another bulb to light.
  2. If you cannot get any of the bulbs to light:
     1. Double check all power connections to and from the lamp housing unit and try to re-ignite the bulbs.
     2. Hold down the warm up switch longer than normal to see if you can get the bulbs to light after powering up.
     3. If the lamps still do not light:
        1. Contact us in Boulder, your power supply has either failed, or is failing.
Problems and Questions

- Reference the online **Dobson Troubleshooting guide**
  [http://www.cmdl.noaa.gov/gallery/dobson_troubleshooting](http://www.cmdl.noaa.gov/gallery/dobson_troubleshooting)
- If a lamp breaks
  - Collect the pieces carefully and ship back to Boulder.
  - Contact **Brooke.Walsh@noaa.gov**
  to notify which lamp broke, and the highest numbered lamp the station has remaining.
Problems and Questions

- Record the problem you are having in the program under the comments section (Alt-C).
Problems and Questions

- If you’re still having trouble with your standard lamps:
  1. Run the other lamps to see if they fail also.
     - If all lamps fail, report the incident immediately.
     - If other lamps pass, record the results into the comments section and send an email to Boulder.
  2. Check for any sort of water damage around the instrument. The Dobson may have been damaged and needs immediate attention. REPORT IMMEDIATELY!!

Water damage near the seal on the Dobson. Water in the instrument can cause significant damage.
Problems and Questions

- If you are having trouble with your mercury lamp tests:
  1. Confirm the settings on the Q-levers are accurate.
  2. Verify the lamp has warmed up for at least five minutes.
  3. Check the temperature of the instrument, values more than a degree apart can cause the test to fail.
Problems or Questions

- If you continue to have trouble with your mercury lamp test, please do not hesitate to email or call the station liaison,

Brooke Walsh at:
Brooke.Walsh@noaa.gov (303) 497-6666

Or Bob Evans at:
Robert.D.Evans@noaa.gov (303) 497-6679

Some problems are easy to deal with, others may require further investigation. Either way, let the staff in Boulder know. We are here to help!!
Conclusion

- Lamps are an essential part to the upkeep of the Dobson network.
- Monthly processing depends on the timeliness of the lamps tests.
- If you have any questions please do not hesitate to contact us in Boulder with any further questions.
Staff in Boulder NOAA / CMDL

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