

Procedure for using the external 50 Watt lamp kit to monitor the spectral responsivity of a Mk IV Brewer spectrophotometer

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Introduction

The external 50 watt lamp power supply kit is used to determine the stability of the Brewer spectral responsivity. NUVMC staff routinely analysis the full spectra data obtained from the lamp scans which are performed during the annual spectral response calibration visit and by the local Brewer operators on a bi-weekly schedule. A rotating lamp schedule is used so that a change in the measured lamp intensity due to an actual change in the Brewer responsivity can be distinguished from a change in the output of the lamp or power supply. It is strongly recommended that the 50 Watt lamps be calibrated immediately after the Brewer spectral responsivity is calibrated via standard 1000 Watt FEL lamps.

Equipment

Brewer Mk IV spectrophotometer (multiple electronic boards)

50 Watt lamp calibration kit

50W lamps

Personal UV protection, such as hats, sunscreen and sunglasses

Purpose

To measure the response of a Mk IV Brewer spectrometer to an external 50 W QTH lamp for spectral response performance evaluation.

Lamp Setup

1. If the Brewer is still running in schedule exit the schedule by pressing the Home key when the message "Press Home to abort schedule" appears on the computer screen.
2. Carefully mount the 50W lamp base over the UV dome on the top of the Brewer case. The lamp base can only be oriented one way. The two nylon pegs should be snug against the side of the Brewer. Care should be taken not to bump the quartz dome which may cause scratches.
3. Select the 50W lamp to be tested, noting the three digit number inscribed on the lamp shell.
4. Check the alignment of the 50W bulb by looking through the two holes in the side of the lamp shell. The center of the filament should be horizontally aligned with the holes. The lamp alignment can be adjusted if necessary by gently pushing the bulb slightly up or down. **DO NOT TOUCH THE BULB WITH BARE FINGERS, USE A KIMWIPE OR TISSUE.**
5. Clean the lamp with a Kimwipe® and methanol. Do not touch the bulb with fingers or allow other objects to come into contact with the bulb. This will reduce the life of the lamp.
6. Remove the rectangular lamp cover by unscrewing the thumb screw which secures it to the lamp base. Insert the lamp, ensuring that it is seated completely into the socket. There is a tab on the lamp base and a groove on the lamp shell. Be sure that the lamp is oriented properly so that the tab

goes in the groove. Replace the rectangular lamp cover and fasten the thumb screw to the base.

7. Place the 50W lamp kit on the ground beside the Brewer so that the wind does not blow it off. Connect the leads from the voltage readout of the digital multi meter (DMM) to the connections inside the 50W kit. Then connect and latch the signal cable 9 pin connector from the from the lamp kit to the 9 pin connector on the cable coming from the lamp base. Plug the AC power cord from the lamp kit into a 120V power outlet. Turn the lamp power supply on by flipping the toggle switch inside the kit.
8. **CAUTION!** The 50W lamps emit harmful UV radiation. This can cause damage to your skin and eyes. Always ensure that the lamp cover is in place before turning the power supply on.
9. Press the yellow button on the DMM while turning the dial on the meter to the DC Volts position. Release the yellow button after two or three seconds. The meter should display an output with three decimal places. (If the yellow button is not depressed while turning on the Voltmeter, it displays two decimal places.)
10. To maintain the 50W lamp and a stable power output the voltage readout on the DMM should be kept at 12.000 +/- 0.003 volts. Carefully monitor the voltage during the calibration and make adjustments as needed by turning the potentiometer dial inside the 50W kit to maintain a stable level of 12.000 +/- 0.003 volts.
11. 50W lamps should be warmed up for a minimum of 10 minutes prior to a scan to ensure the stability of the lamp output.

Computer commands

12. After the 50 Watt lamp is turned on, type "PNHGQSTUXL" at the Brewer Home screen command line and press the **Enter** key to initiate the sequence. The commands in the sequence are described below;
 - PN- turns the printer on,
 - HG- performs the mercury lamp wavelength calibration. It takes about 7-9 minutes,
 - QS- performs the "Quick Scan" of the UV lamp. It uses or creates a reference file named lamp_???.###, where ??? represents the lamp number and ### represents the Brewer serial number,
 - TU- measures the zenith motor step position at which the UV lamp intensity is the highest through slit number one of the spectrometer slit mask,
 - XL- measures a spectral scan of the 50W lamp from 286.5 to 363nm at 0.5 nm steps.
13. Enter the following information into the computer when prompted;
 - The 3 digit lamp number inscribed on the 50W lamp shell;
 - The lamp to diffuser distance: 5cm. If the default value equals to 5cm, you can press the **Enter** key to accept it,

- If a data file does not exist for a particular 50W lamp number, the computer will prompt the user to press the **Esc** key to create a new reference file,
 - If the lamp has already warmed up for ten minutes, press the **Delete** key to skip the lamp warm-up delay.
14. The computer software will initiate the five commands in sequence and print the results if a printer is available. The data are stored to various data files and will be analyzed later by NUVMC staff.
 15. After the last scan has finished, the UV lamp power supply can be turned off via the toggle switch. The lamp and mount will be **VERY HOT**. Wait about 5 minutes before removing the rectangular lamp cover from the lamp base. Remove the lamp from the socket by pulling firmly on the shell. The lamp should be allowed to cool adequately (a total of 15 minutes or so) prior to being stored in the 50W lamp kit.
 16. Repeat steps 4 through 15 for each 50W lamp.
 17. Perform the SR/SI tests if possible before returning the Brewer to schedule.
 18. Enter an electronic comment (CM or CO command) describing the work done at the site and any other observations made. Also enter a brief entry in the paper station log form and the lamp log form.
 19. Place the Brewer back into schedule by giving the command "skc" at the command line. When prompted for schedule, enter the name of the current network schedule (epa96d for the US EPA/UGA network as of September 2002).

For further information or advice concerning this SOP please contact the NUVMC at the University of Georgia at <http://oz.physast.uga.edu>