

Initial Sampling Protocol using the AccuPAR LP-80
Basic setup and instructions
For full project instructions read ‘Sampling Protocol Standard’

Hardware setup

Each LP-80 light bar should come with the following:

- AccuPAR model LP-90 light bar
- RS-232 Cable (for data transfer)
- Operator’s manual
- External PAR sensor attached to a 25 ft cable with 3 pin lock
- LP-80 utility software (for data transfer)

You will also need:

- LI-COR 2003s mounting/ leveling fixture (~ \$54 round plate)
- Camera tripod with mount (shown as black attachment to tripod)

The external sensor and tripod attachment will be bolted onto the LI-COR 2003s mounting/leveling fixture. This will allow for leveling of the external sensor in the field.

Figure 1: Top view of mounting plate with external sensor.

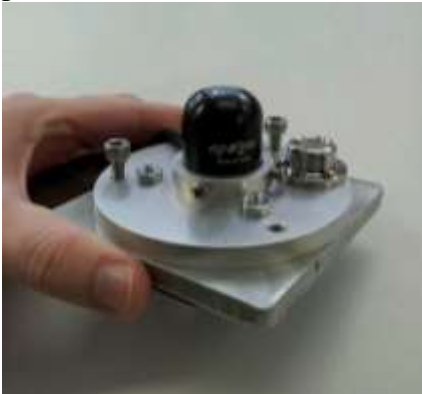


Figure 2: Bottom view of mounting plate with tripod attachment.



Figure 3: External sensor and leveling plate on the tripod.



Figure 4: The entire setup for taking light measurements.



First time setup of the light bar

It is important to enter all of the following information accurately as each will be used to calculate the zenith angle, fraction of beam radiation, and the leaf angle distribution all of which are used for the leaf area index (LAI) calculation.

1. Access the CONFIG menu by pressing the menu button 4 times.
2. Calibrate by following carefully the steps in the manual on p.37. (Note: The external sensor must be connected to the light bar and both level with PAR greater than $600 \mu\text{mols m}^{-1} \text{s}^{-1}$).
3. Under location set the country, city, latitude, and longitude (manual p. 38).
4. Set date and time at your location (manual p. 39).
5. Set daylight savings on or off (manual p. 39).
6. Set leaf distribution depending on your plant - 2 is for rapeseed (manual p. 40).

Optional, but ideal for a 50cm X 50cm area:

7. Set active segments to 5 (manual p. 41).
8. Put blue painters tape around the bottom 30 cm of the light bar (closest to the control unit) that has been turned off. This makes it easy to see what part of the light bar is active when taking measurements.

Choosing a sample area

Light measurements will be taken in a 50cm X 50cm quadrat with in each plot between 10 a.m. and 2 p.m.

- Avoid grazed areas, areas directly adjacent to past sampling, and resampling past areas.
- Remove any non-targeted plant in your quadrat.
- In natural settings: with widely spaced plants in your quadrat, be sure to include measuring the empty space around the plant. In other words, sample the quadrat as if it had a complete vegetative canopy. This will allow us to encompass the spatial relationship across the landscape.
- In crop settings: place your quadrat within the interior, making sure to avoid the edge of the plot.
- Place the quadrat between the rows so that number of plants and rows present is representative of the entire area.
- Try to sample from mid row to mid row (see manual p. 72 and figure below).

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Figure 5: Sampling in row crops.



Figure 6: Sampling in natural environments.



Figure 8: Preparing a natural sample area.



Figure 10: Area ready to sample.



Taking light readings

1. The light bar and external sensor should both level.
2. The person taking the light readings should be facing the sun so that no shadows hit the light bar or the external sensor.
3. The default screen is the first menu option (press menu once).
4. Your screen should look like the one shown on manual p. 16.
5. Every time the down arrow key is pushed a reading is taken above and below the canopy when the external sensor is connected.
6. Calibrate the light bar with the external sensor by taking 10 light readings in the open.
 - a. If you are using a datasheet: record the average shown on the screen in the box on the right. To clear the average, hit the ESC button.
 - b. If you are saving the average in the ceptometer: push the enter button (manual p. 17). An option to annotate your record will appear. Push the down arrow once so that Annotate is selected, and then press enter to annotate your record. (Annotate each record as the enter button may be pushed accidentally.) Select your number or letters using the up and down arrows. Use enter to move forward saving the character you selected or press the left arrow to go back a space. I usually name the calibration C. Press enter until the end of the line is reached to save the reading.

Figure 11: Calibrate.



- When measuring row crops, take the readings perpendicular to the rows.
 - In natural setting, be sure you measure the whole quadrat regardless of the empty space between widely spaced plants.
7. Take 6 readings in a 50cm X 50cm quadrat by pushing the down arrow once every 10 cm at the 0, 10, 20, 30, 40, 50 cm marks.
 - a. If using our datasheet: fill out the top, and then record the species, replication (rep) number, light above, and light below. Make sure to press ESC between each quadrat to clear your averages.
 - b. If storing in the ceptometer: save the average of all 6 measurements by pushing the enter button (manual p. 17). An option to annotate your record will appear. Push the down arrow once so that Annotate is selected, and then press enter to annotate your record. (I highly recommend annotating each record as the enter button may be pushed accidentally.) Select your number or letters using the up and down arrows and use enter to move forward saving the character you selected or press the left arrow to go back a space. I usually name them a plot # and an A or B if more than one quadrat is being sampled in a plot. Finally, press enter until the end of the line is reached to save the reading. If you wish, you can now push menu three times to access the data menu and review how many readings have been logged (manual p. 21).
 8. Whenever you move the tripod, or if it falls over, you must recalibrate.

Figure 12: Take light readings.



Download data from the light bar

1. Install the LP-80 software utility (cd that comes with light bar)
2. Follow the steps on p. 28 in the LP-80 manual
3. Save data as an excel file.
4. Erase data- follow steps on p. 31 in LP-80 manual.
5. If you are following the 'Sampling Protocol Standard':
 - a. If you are mailing your samples: once downloaded email data to: Amber.Williams@ARS.USDA.gov
 - b. If you are processing on your own: wait until you enter all data into provided spreadsheet before emailing results.