

Portable Photosynthesis System



Band: LI-COR

Model: LI-6400XT

Custodian: Sirapope Wongniam

Location: K635 Room, 6th Floor, Chaloeprakiet Building, Phyathai Campus

Description and Specification:

The LI-6400XT Portable Photosynthesis and Fluorescence System is the most referenced photosynthesis system worldwide in peer-reviewed literature. It has multiple advantages that make it the top choice for researchers.

The LI-6400XT has two absolute CO₂ and two absolute H₂O non-dispersive infrared gas analyzers that provide superior performance in a field-portable system.

The gas analyzers are in the sensor head, which allows for real-time measurements with leaf-level environmental feedback control. This is not possible when analyzers are in the console. The analyzers are robust and user-cleanable, leading to long-term reliability.

Changes in leaf dynamics are measured in real-time without delays caused by tubing. This allows you to measure the effects of subtle changes in environmental variables such as light and CO₂ concentration. Real-time measurements enable the LI-6400XT to precisely control the chamber CO₂ concentration to within 1 $\mu\text{mol}\cdot\text{mol}^{-1}$, which is critical for measurements like light response curves.

CO₂ Analyzer

Type: Absolute, open path, non-dispersive infrared gas analyzer

Range: 0-3100 $\mu\text{mol mol}^{-1}$

Bandwidth: 10 Hz

Signal Noise (Precision):

Within 0.2 $\mu\text{mol mol}^{-1}$ RMS at 1 Hz with 4 second averaging at 400 $\mu\text{mol mol}^{-1}$

1-Second signal averaging at 350 $\mu\text{mol mol}^{-1}$

RMS: 0.07 $\mu\text{mol mol}^{-1}$

Peak-to-peak: 0.3 $\mu\text{mol mol}^{-1}$ /0.8 $\mu\text{mol mol}^{-1}$ maximum

4-Second signal averaging

RMS: 0.04 $\mu\text{mol mol}^{-1}$

Peak-to-peak: 0.2 $\mu\text{mol mol}^{-1}$

Accuracy: Maximum deviation: $\pm 5 \mu\text{mol mol}^{-1}$ from 0 to 1500 $\mu\text{mol mol}^{-1}$ $\pm 10 \mu\text{mol mol}^{-1}$ from 1500 to 3100 $\mu\text{mol mol}^{-1}$

Sensor: Solid state. Minimal sensitivity to motion

Orientation Sensitivity: $\leq \pm 1 \mu\text{mol mol}^{-1}$ at 350 $\mu\text{mol mol}^{-1}$ from any orientation.

H₂O Analyzer

Type: Absolute, open path, non-dispersive infrared gas analyzer

Range: 0-75 mmol mol⁻¹, or 40 °C dew point.

Bandwidth: 10 Hz.

Signal Noise (Precision):

1-Second signal averaging at 20 mmol mol⁻¹

RMS: 0.009 mmol mol⁻¹

Peak-to-peak: 0.04 mmol mol⁻¹/0.06 mmol mol⁻¹ maximum

4-Second signal averaging

RMS: 0.007 mmol mol⁻¹

Peak-to-peak: 0.03 mmol mol⁻¹

Accuracy: Maximum deviation: $\pm 1.0 \text{ mmol mol}^{-1}$ from 0-75 mmol mol⁻¹

Temperature

Operating Temperature Range: 0 °C to 50 °C

Optical Housing Block and Air Temperature:

Sensor Type: 3-wire thermistor

Range: -10 to 50 °C

Accuracy: Maximum error $< \pm 0.5 \text{ }^\circ\text{C}$

Typical Error: $< \pm 0.25 \text{ }^\circ\text{C}$

Temperature Control: Leaf chamber can be heated or cooled $\pm 6 \text{ }^\circ\text{C}$ from ambient

Control Range: 0 to 50.0 °C

Set point Resolution: 0.2 °C

Leaf Temperature Thermocouple:

Type: E

Range: $\pm 50 \text{ }^\circ\text{C}$ of reference

Reference: Optical housing block thermistor

Accuracy: $\pm 10\%$ of T difference between sample and reference junctions with amplifier zeroed; typically $< 0.2 \text{ }^\circ\text{C}$

Air Flow

Flow rate: 0 to 700 $\mu\text{mol s}^{-1}$

Pressure

Pressure Range: 65 to 115 kPa absolute

Accuracy: $\pm 0.1\%$ of full scale

Resolution: 0.002 kPa

Signal Noise (peak-to-peak): 0.002 kPa typical

System Console

Processor: 400 MHz Intel XScale

Memory: 128 MB RAM for operation; 64 MB flash memory for data storage.

Display: Adjustable contrast, backlit, 8 line \times 40-character (240 \times 64-dot) LCD graphic display

Keyboard: Full ASCII keypad, sealed from dust and moisture with membrane overlay

Power Requirement: 10.5 to 15 VDC; 4A maximum (current draw dependent upon system operation). $< 10\text{A}$ momentary peak

Output

RS-232: Hardwired DTE. RS-232 to USB adapter included

Format: User-definable ASCII

Expansion Slot: Supports either Compact Flash or Ethernet card adapter

Compact Flash Card: Industrial Grade (included)

Ethernet Card Adapter: Type 1 CF Ethernet card, 10/100 Mbps (included)

6400-01 CO₂ Injector

CO₂ Mixing Range: $< 50 \mu\text{mol mol}^{-1}$ to $> 2000 \mu\text{mol mol}^{-1}$

Operating Temperature Range: 0-50 °C

CO₂ Source Assembly:

Type: 12g pure liquid CO₂ cylinder

Lifetime: 8 hours after activation, regardless of use

CO₂ Tank Connector Block:

Minimum Pressure: 1250 kPa (180 psig)

Maximum Pressure: 1500 kPa (220 psig)

Usage Rate: constant at $\approx 10 \text{ sccm}$

Light Measurement

PAR Internal and External Chamber Sensors:

Range: 0 to $> 3000 \mu\text{mol m}^{-2} \text{ s}^{-1}$.

Resolution: $< 1 \mu\text{mol m}^{-2} \text{ s}^{-1}$.

Calibration Accuracy: $\pm 5\%$ of reading, traceable to NIST.

Spare I/O Channels

Input Channel: five differential analog, two digital, and one pulse counting

Digital Outputs: 8 open drain

Analog Outputs: 7 D/A 8-bit, 1 D/A 12-bit, uncalibrated CO₂ and H₂O reference and sample analyzer outputs, +5V regulated power supply (100 ma), battery voltage (fused, 200 ma)