LI-7500A
Open Path CO$_2$/H$_2$O Gas Analyzer

High Speed, High Precision, Low Power Consumption

Designed for Eddy Covariance and Atmospheric Measurements

LI-COR
Biosciences
The LI-7500A Open Path CO₂/H₂O Gas Analyzer

- Based on the proven LI-7500 platform
- Low power requirements (12 W)
- High precision
  - 0.11 ppm CO₂ RMS @ 10 Hz
  - 0.0047 ppt H₂O RMS @ 10 Hz
- High speed in-situ CO₂/H₂O measurements
- Ideal for eddy covariance applications

The LI-7500A Open Path CO₂/H₂O Analyzer is a high speed, high precision, non-dispersive infrared gas analyzer that accurately measures densities of carbon dioxide and water vapor in turbulent air structures. With the eddy covariance technique, these data are used in conjunction with sonic anemometer air turbulence data to determine the fluxes of CO₂ and H₂O.

The LI-7500A is based upon the proven technology of the LI-7500, which is the leading open path CO₂/H₂O analyzer for eddy covariance research. It relies upon the innovative optical arrangement and system design that have made the LI-7500 reliable year after year. It has full backward compatibility with data management applications written for the LI-7500.

The LI-7500A improves upon the LI-7500 by providing:
- High speed analog input channels for auxiliary sensors, such as a sonic anemometer (up to 20 Hz bandwidth)
- Logs eddy covariance data sets to an internal removable storage device at up to 20 Hz
- Ethernet for two-way communication/data transfer using standard networking protocols
- Versatile outputs, including Ethernet, SDM (Synchronous Devices for Measurement), RS-232, and high speed digital-to-analog converters
- Reduced energy use in cold climates with a low temperature setting for the chopper housing

Proven Technology

The LI-7500A makes precise, accurate, and fast CO₂/H₂O measurements using non-dispersive infrared (NDIR) detection. NDIR has consistently proven to be the best technology for measuring CO₂ and H₂O at high precision and high speeds. In the 23 years since LI-COR Biosciences introduced our first high-precision NDIR CO₂ sensor, we have continuously worked to improve the measurement technology. The LI-7500A is a result of that ongoing effort.
The LI-7500A simplifies the process of collecting eddy covariance data sets - by simplifying setup and logging eddy covariance data in a text format that easily imports into spreadsheets. Data logging software and an interface utility that converts text files into a format that is suitable for EdiRe1 are included with the instrument at no additional cost.

The 7550-101 Auxiliary Sensor Interface (optional) provides a weatherproof terminal strip for connecting external sensors. It provides four general ±5 V inputs for analog data from any fast sonic anemometer, (including Campbell Scientific2, Gill Instruments3, Metek4, Applied Technologies5, Kaijo6, RM Young7, or others).

**Variables Logged by the LI-7500A:**

- Time
- Date
- CO₂ (mmol/m³, absorptance, or μmol/mol)
- H₂O (mmol/m³, absorptance, or mmol/mol)
- Dew Point (°C)
- Pressure (kPa)
- Temperature
- Cooler Voltage (V)
- Diagnostic Value
- Auxiliary Input 1 (e.g. U sonic voltage)
- Auxiliary Input 2 (e.g. V sonic voltage)
- Auxiliary Input 3 (e.g. W sonic voltage)
- Auxiliary Input 4 (e.g. sonic temperature voltage)

**Integrated Data Storage**

- Ethernet for world-wide connectivity and data transfer
- Removable USB Data Storage

The new LI-7550 Analyzer Interface Unit (included) houses the high-speed Digital Signal Processing electronics. It enables the collection of complete data sets that include CO₂/H₂O, sonic anemometer, and diagnostic data. The LI-7500A has a user-programmable delay time to allow synchronization of LI-7500A outputs with data from additional instruments when logging to an external storage device. With the included 4 GB industrial grade USB storage device, the LI-7550 can store 24 channels of 10 Hz data for about 20 days. Larger USB storage devices can also be used (e.g. ≥16 GB).
Versatile Data Output Options

The LI-7500A supports four data output options, including Ethernet, linearized digital-to-analog converters (DACs), RS-232 serial data, and SDM output for Campbell Scientific, Inc. dataloggers. Selectable output bandwidths of 5, 10, or 20 Hz are available (response times of 0.1, 0.05, and 0.025 seconds respectively).

- Ethernet - The instrument uses industry standard TCP/IP networking protocols to facilitate communication with networked computers.
- RS-232 - Serial data output is available at up to 20 records per second at a connection speed of 115,200 baud. A software command or serial hardware control line is also available to query the LI-7500A for individual data records.
- Digital-to-Analog Output - Six user-configurable linear DACs are updated at 300 times per second by Digital Signal Processing electronics.
- SDM - Serial data can also be output at rates of up to 50 Hz using the SDM output.

Intuitive Software

Intuitive Windows® software provides versatile, yet simple instrument setup. Configuring the instrument is accomplished with a personal computer connected with either the RS-232 or Ethernet connection. The graphical controls window provides easy access to instrument options, including auxiliary sensor inputs, live data charting, and data logging settings. There is no need to learn a complex programming language to setup your eddy covariance data collection. Just configure the parameters through the graphical interface and let the instrument do the rest.
A Tradition of Excellence...

The LI-7500A sensor head has a 12.5 cm open optical path, with single pass optics and a large 8 mm diameter optical beam. Optical filters centered at 3.95 μm provide a reference signal for CO₂ and water vapor. Absorption at wavelengths centered at 4.26 μm and 2.59 μm provide for measurements of CO₂ and water vapor, respectively. This design minimizes sensitivity to dirt and dust, which can accumulate during normal operation.

The figure to the left shows a cutaway representation of the LI-7500A sensor head. The Infrared Source emits radiation that is directed through a Chopper Filter Wheel, Focusing Lens, and then through the measurement path to a temperature controlled lead selenide Detector. A brushless Chopper Motor rotates the chopper filter wheel at 9,000 rpm. Lifetimes of the source, detector, and chopper motor are extremely long – in a ten-year period, over 96% of instruments have never had these repairs done. The Windows at both ends of the optical path are made of scratch resistant sapphire, allowing for worry-free and easy cleaning in the field. The LI-7500 operates over a temperature range of -25 to 50 °C (-40 °C verification test available).

The LI-7550 Analyzer Control Unit houses the digital signal processing electronics, encloses the USB data storage device, and has weatherproof connections for the cables used for data output, power, and auxiliary inputs.

Proven Performance

LI-7500A Open Path CO₂/H₂O Analyzer
Includes the LI-7500A Open Path CO₂/H₂O Analyzer, LI-7550 Analyzer Interface Unit, 4 GB industrial grade USB storage device, IRGA cable (5 meters), 5 meter data cables (RS-232, Ethernet, SDM interface, Analog input/output cables), Windows® software, mounting hardware, and instruction manual.

LI-7500ADP CO₂/H₂O Analyzer Package
LI-7500A Open Path CO₂/H₂O Analyzer
LI-610 Portable Dew Point Generator

GHG-1 Greenhouse Gas Analyzer Package
LI-7500A Open Path CO₂/H₂O Analyzer
LI-7700 Open Path CH₄ Analyzer

7550-101 Auxiliary Sensor Interface
The 7550-101 is a weather resistant terminal strip for connecting external sensors. It provides four general purpose ±5 V for a sonic anemometer. Includes mounting bracket, hardware, and a 0.8 meter cable.

LI-7500 Upgrade Kit
Includes hardware upgrade to convert an LI-7500 to an LI-7500A, the LI-7550 Analyzer Interface Unit, IRGA Cable, (5 meter), data cables (5 meter), Windows® software, and instruction manual.

High-speed sonic anemometers are available with gas analyzer purchases.

Contact LI-COR Biosciences for more information.
The LI-COR board of directors would like to take this opportunity to return thanks to God for His merciful providence in allowing LI-COR to develop and commercialize products, through the collective effort of dedicated employees, that enable the examination of the wonders of His works.

"Trust in the LORD with all your heart and do not lean on your own understanding. In all your ways acknowledge Him, and He will make your paths straight."
—Proverbs 3:5,6