



- Technique independent measurements
- Multiple system configurations
- A complete, dedicated field-study system

Introduced in 2003, the LI-8100 Automated Soil CO₂ Flux System provides researchers sophisticated flux monitoring instrumentation in a dedicated system that is integrated and easy to use. The LI-8100 System provides unparalleled versatility with two short-term survey and two long-term chambers available, in addition to the ability to multiplex up to 16 long-term chambers. Modular by design, the LI-8100 System's flexibility allows researchers to build custom systems from a selection of available components.

Survey System



- 10 or 20 cm chamber options
- Conduct measurements over a number of location

The inherent spatial heterogeneity of soils means that a soil CO₂ flux reading taken at one location could be significantly different from a reading taken even meters away. The Survey configuration provides a way to rapidly take measurements in multiple locations in order to calculate a spatial average. The system is quickly and conveniently moved from collar to collar to "survey" flux rates over a larger area of interest.

A Survey system is comprised of the LI-8100 Analyzer Control Unit (ACU) and one of two Survey Chambers: 8100-102 (10 cm diameter) and 8100-103 (20 cm diameter). The system can be conveniently carried by the user - the ACU comes with a shoulder strap, and each chamber is lightweight and comes with a handle. A soil temperature sensor is included with Survey chambers, and a soil moisture sensor is optional - readings from these auxiliary sensors are integrated into the dataset. Power is provided by an onboard, rechargeable battery. The user can easily configure and monitor the system on a PDA while out in the field using the Wireless Communications Package (recommended). Data can be stored either on internal flash memory or a Compact Flash card (included).

Single Chamber Long-Term System

- Automated long-term measurements
- Assess CO₂ flux patterns for weeks or months at a time



In addition to spatial heterogeneity, soils also exhibit both diurnal and seasonal patterns of variation in CO₂ evolution due to changes in soil water content, temperature, soil organic carbon resources, etc. In order to capture these long term patterns, measurements must be made continuously for days, weeks, even months at a time. The LI-8100 and Long-Term Chambers were designed to be deployed, unattended, for these extended periods of time.

A Single Chamber Long-Term configuration is comprised of the LI-8100 Analyzer Control Unit (ACU) and one of two Long-Term Chambers: 8100-101 and 8100-104. Both chambers are automated to move away from the measurement collar when not taking a measurement, minimizing perturbations to the natural microclimate at the measurement site. Soil temperature and moisture sensors are optional - readings from these auxiliary sensors are integrated into the dataset. The Analyzer Control Unit's weatherproof box is designed for long-term field deployment. DC power, provided by the user, is wired into a weather-tight box on the side of the ACU. The user can configure the system with a PC or the optional Wireless Communications Package. Data is stored on a removable Compact Flash card (included).

Multiplexed Long-Term System



- Multiplex up to 16 long-term chambers (30 m diameter coverage)
- Assess spatial and temporal variability

To satisfy both temporal and spatial resolution requirements of soil CO₂ flux monitoring with one system, a multiplexed solution is required. The Multiplexed LI-8100 System can integrate measurements from up to 16 chambers into a single dataset, enabling a spatial average to be calculated as well as capturing long-term variation in soil CO₂ flux rates.

A Multiplexed Long-Term configuration is comprised of the LI-8100 Analyzer Control Unit (ACU), the LI-8150 Multiplexer, and either 8100-104 or 8100-101 Long-Term Chambers. Both chambers are automated to move away from the measurement collar when not taking a measurement, minimizing perturbations to the natural microclimate at the measurement site. Soil temperature and moisture sensors are optional and can be connected at each chamber - readings from these auxiliary sensors are integrated into the dataset. The LI-8100 and LI-8150 weatherproof boxes are designed for long-term field deployment. DC power can be provided by the user, or the system can be powered with an optional AC Power Supply. The user can configure the system with a PC or the optional Wireless Communications Package. Data is stored on a removable Compact Flash card (included). Multiplexed System packages and chamber discounts are available.

Analyzer Control Unit

PDA Requirements:

With serial cable: PDA running Palm® OS 3.51 or higher.
Wireless: PDA running Palm® OS 4.1 or higher, and supporting 802.11b wireless connectivity.

Memory: 18 MB on-board flash memory for data collection (32 MB total)

Compact Flash: Type I industrial grade, 1 GB with adapter sleeve included, will accept Type II with appropriate adapter sleeve.

Wireless PC Card: Fixed wireless networking Type II PC Card, Cisco Systems Aironet® 350 Series 11 Mbps DSSS for Wi-Fi (802.11b) networking

RS-232

Signal output rate: 1 Hz
Baud rate: 57,600 bps

Pressure Sensor:

Measurement Range: 15-115 kPA
Accuracy: 1.5% over 0 to 85 °C

Maximum Gas Flow Rate: 1.7 liters/min

Infrared Gas Analyzer

Measurement Principle: Non-Dispersive Infrared

Traceability: Traceable to WMO standards for CO₂. NIST traceable LI-610 Portable Dew Point Generator for H₂O

CO₂

Measurement Range: 0-3000 ppm

Accuracy: 1.5% of reading

Calibration Drift:

Drift at 0 ppm: <0.15 ppm/°C
Span Drift1: < 0.03 %/°C
Total Drift at 370 ppm: <0.4 ppm/°C

RMS Noise at 370 ppm with 1 sec signal averaging: <1 ppm

Sensitivity to water vapor: < 0.1 ppm CO₂/mmol/mol H₂O

H₂O

Measurement Range: 0-80 mmol/mol

Accuracy: 1.5% of reading

Calibration Drift:

Drift at 0 ppt: <0.003 mmol/mol/°C
Span Drift1: <0.03 %/°C
Total Drift at 10 ppt: <0.009 mmol/mol/°C

RMS Noise at 10 ppt with 1 sec signal averaging: <0.01 mmol/mol

Sensitivity to CO₂ <0.0001 mmol/mol H₂O/ppm CO₂

Power Requirements:

Auxiliary Input Voltage:

10.5-28 VDC

Battery Input Voltage:

10.5-15 VDC

3A @ 12V (36W) maximum during warm-up with heaters on
1A @ 12V (12W) average after warm-up with heaters on



Operating Range:

Temperature: -20 °C to 45 °C
Relative Humidity: 0 to 95% RH, Non-Condensing

Weatherproof Rating: Tested to IEC IP55 standard

Dimensions: 29 cm L x 38.1 cm W x 16.5 cm H
(11.4" x 15" x 6.5")

Weight: 5.3 kg (11.8 lb.) without battery;
6.7 kg (14.8 lb.) with battery

Battery Weight: 1.4 kg (3.0 lb.)

Auxiliary Sensor Interface

Dimensions: 10.2 cm L x 3.8 cm W x 6.4 cm H
(4" x 1.5" x 2.5")

Inputs:

4 Thermocouple channels (Type E, J, or T)
4 General input channels (0-5 VDC)



Power Out: 0-5 VDC

Power In: 10.5-28 VDC

Connections: Terminal strip with screw posts

Accessories

Soil Temperature Probe (Type E): 6.4 mm (0.25") dia., 250 mm (10") immersion length

Soil Temperature Thermistor:

6 foot cable accuracy: ± 1.0 °C from -20 to 50 °C

Soil Moisture Probe (ECH₂O Model EC-5): 5 cm (2") length

Soil Moisture Probe (Theta Probe Model ML2)