

Logging Eddy Covariance Datasets

Contents

Configure the LI-7200RS or LI-7500RS	1
Adding an LI-7700	4
Adding a Biomet System	5
Connecting to FluxSuite	6
Cellular Communication for Eddy Covariance Stations	6

This quick start guide shows how to configure the LI-7500RS and LI-7200RS CO₂/H₂O analyzers for eddy covariance measurements. It also describes how to add the LI-7700 CH₄ analyzer and Biomet Station.

- Data sets include all the required information to compute flux results.
- Data are logged as compressed files that will be processed directly by EddyPro® Software on the SMARTFlux System.
- Methane data from the LI-7700 Open Path CH₄ Analyzer and ancillary biological and meteorological data from the Biomet System can be included in the logged data and processed in EddyPro Software, the SMARTFlux System and displayed on FluxSuite™ Software.

Configure the LI-7200RS or LI-7500RS

1 Configure the Sonic Anemometer

Choose settings that are suitable for your anemometer, research site, and objectives. The settings below are suitable for Gill WindMaster™ and WindMaster Pro anemometers. Configure other anemometer brands similarly.

- Analog outputs: On
- Analog output voltage range: ±5 V
- Output rate: Set to twice the sampling rate (20 Hz)
- Flow distortion correction: On (if available)
- DAC channel 1: U, -30 to 30 m/s
- DAC channel 2: V, -30 to 30 m/s
- DAC channel 3: W, -5 to 5 m/s
- DAC channel 4: T_s: -40 to 70 °C

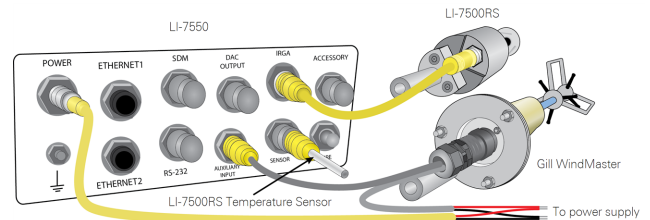
2 Connect the Anemometer and LI-7550

Anemometer data cables are available from LI-COR:

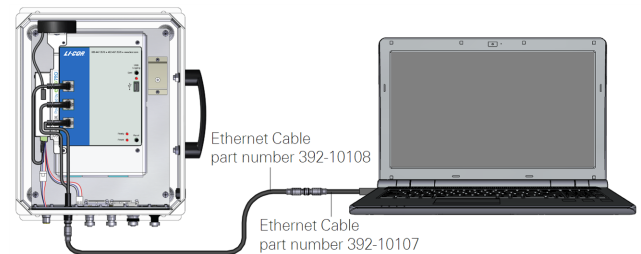
- Gill WindMaster™/Pro: Part number 9975-033
- Gill R3™/HS-50™: Part number 9975-041
- CSAT3: Part number 9975-035

3 Connect the gas analyzer to the LI-7550¹

Power up the LI-7550 and anemometer.

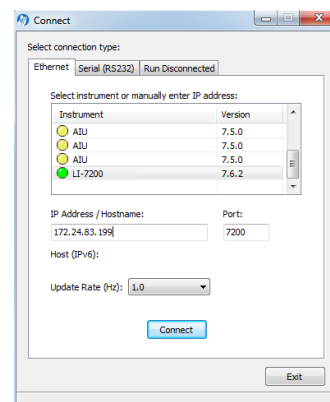


4 Connect a computer to the LI-7550



5 Connect to the instrument

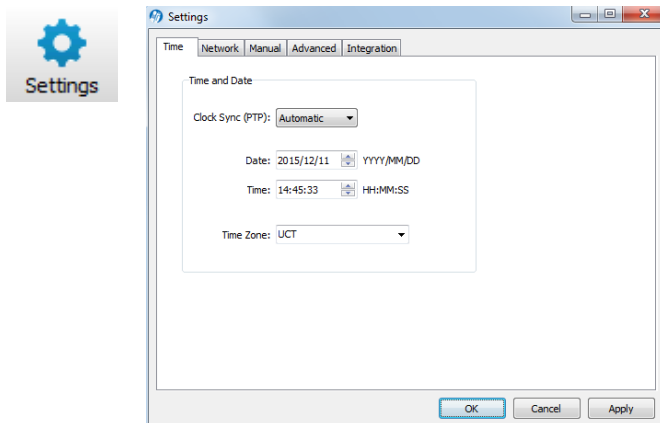
Download the software from www.licor.com/env/support and install it on your computer. Open the software, select the analyzer from the list and connect to it.



¹ Refer to the LI-7200RS CO₂/H₂O Analyzer Instruction Manual and 7200-101 Flow Module Instruction Manual for more information on the LI-7200RS.

6 Set the Time

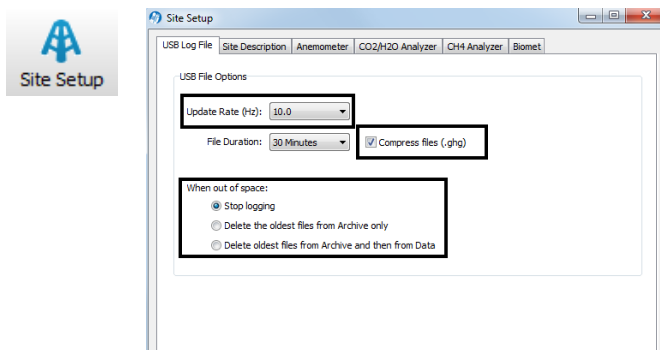
Click the **Settings** button. Under **Time**, set **Clock Sync (PTP)** to **Automatic**.



7 Configure USB Data Collection

Under **Site Setup**, click the **USB Log File** tab and configure the settings:

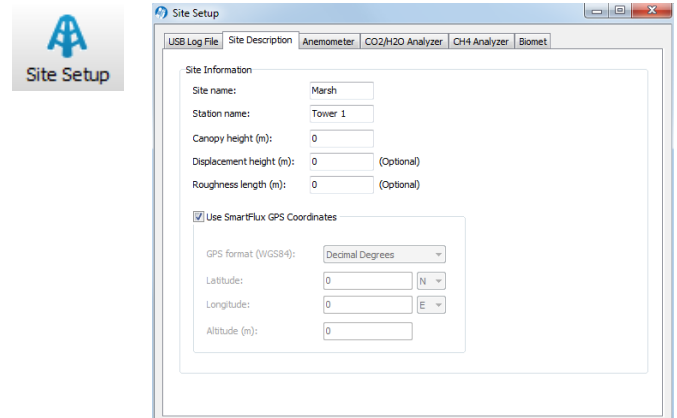
- **Update Rate (Hz):** 10 Hz typically
- **File Duration:** 30 Minutes
- **Compress files (.ghg):** (check this box)
- **When out of space:** Select an option



8 Enter the Site Description

Under the **Site Description** tab, enter the following:

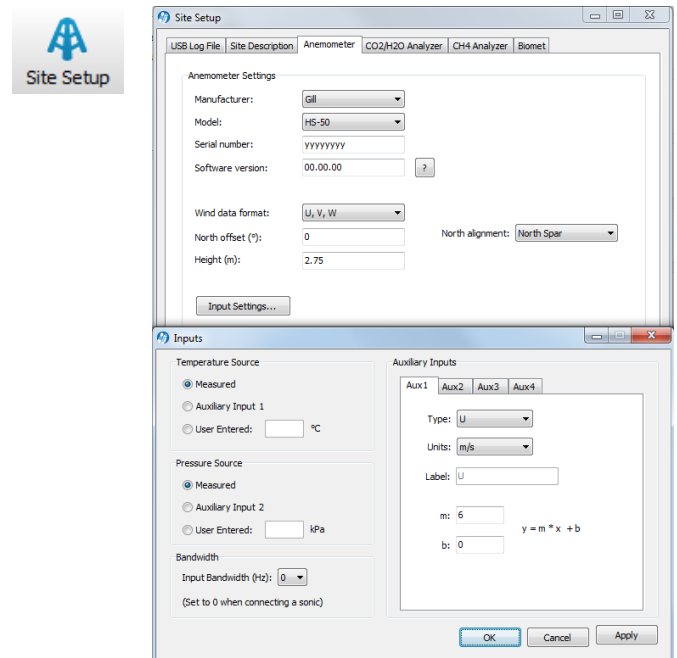
- **Site name:** Optional
- **Station name:** Recommended
- **Canopy height (m):** Mandatory
- **Displacement height (m):** Optional
- **Roughness length (m):** Optional
- **Use SmartFlux GPS Coordinates:** (check this box)



9 Enter Anemometer Information

Under the **Anemometer** tab, enter the following:

- **Manufacturer:** Select Campbell, Gill, Metek, or Young
- **Model:** The list shows models from manufacturers
- **Serial number:** Enter the anemometer serial number
- **Software version:** Enter the anemometer software version
- **Wind data format:** Select from the options
- **North offset (°):** Degrees clockwise from due north
- **Height (m):** Meters above the ground
- **North alignment:** Enter the setting (Gill only)

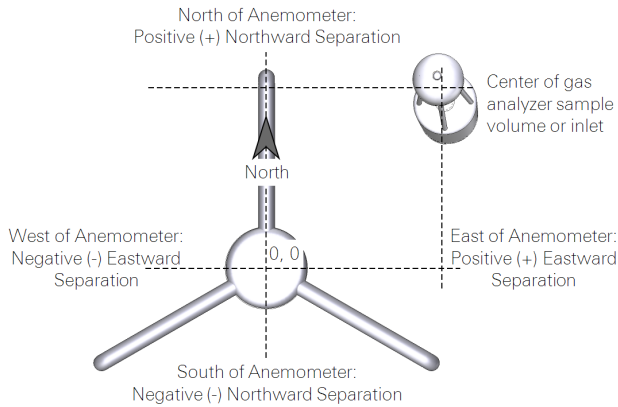


10 Configure the anemometer Input Settings... for Auxilliary Inputs 1-4

Recommended Settings¹:

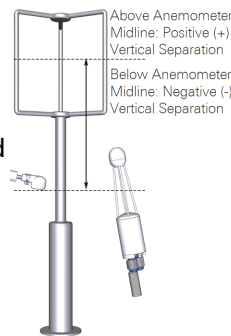
- Aux 1: Type: U; Units: m/s; m: 6; b: 0
- Aux 2: Type: V; Units: m/s; m: 6; b: 0
- Aux 3: Type: W; Units: m/s; m: 1; b: 0
- Aux 4: Type: Ts; Units: C; m: 11; b: 15

11 Enter CO₂/H₂O Analyzer Information



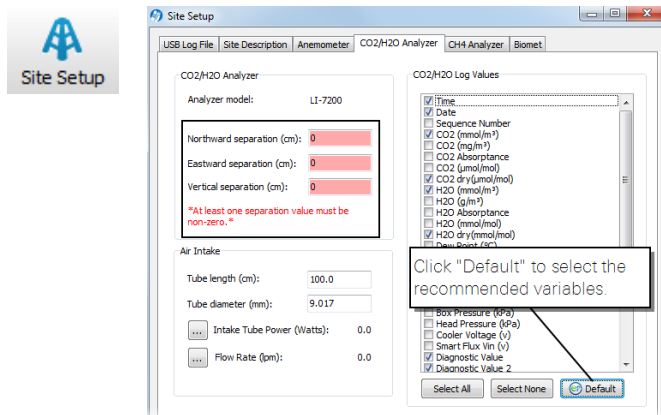
Under the CO₂/H₂O Analyzer tab:

- **Northward separation (cm):** Measured at the site
- **Eastward separation (cm):** Measured at the site
- **Vertical separation (cm):** Measured at the site



For the LI-7200RS, enter the following:

- **Tube length (cm):** Enter the length
- **Tube inner diameter (mm):** 5.334 mm, typically
- **Intake tube heater (Watts):** Enter the setting
- **Flow rate (lpm):** Enter the setting

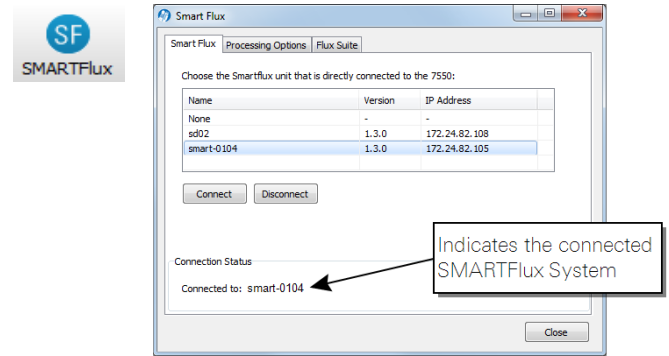


12 Select CO₂ and H₂O Log Values

Click **Default** to log the minimum recommended data set for processing data with EddyPro on the SMARTFlux System.


13 Connect with the SMARTFlux System


Click the **SMARTFlux** button and verify that SMARTFlux is connected. You may need to select the SMARTFlux system and click **Connect**.





By default, the SMARTFlux System is configured run EddyPro express settings. To load an **Advanced** file, click **Processing Options** then **Upload Advanced File**. Select the file created in EddyPro and load it. Refer to EddyPro documentation for more information.

14 Turn on Data Logging

To turn on data logging, click the **Start** button () at the bottom of the **Site Setup** window. Data logging will begin automatically when a suitable USB drive is inserted into the LI-7550 USB port and any time the instrument restarts.

 Transfer logged data over a network using the File Transfer tool. Transfer can occur at scheduled intervals or whenever desired.

 Use the LI-7x00 File Viewer software to quickly evaluate your data for spikes and trends. To open a file, simply drag it over the icon and release it.

 **Get a free 60-day trial of FluxSuite Software**
FluxSuite puts eddy covariance results online, provides status information, and sends email alerts to inform you of any issues at your site. See **Connecting to FluxSuite** for more information.

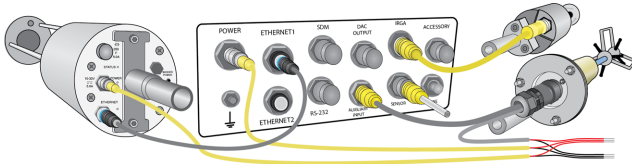
¹Corresponds with anemometer settings of U, V : ±5 V, ±30 m/s; W: ±5 V, ±5 m/s; Ts: ±5 V, -40 to 70 °C.

Adding an LI-7700

The steps below show how to install an LI-7700 Open Path CH₄ Analyzer in the eddy covariance system. With this configuration, methane data are logged in .ghg files for processing in EddyPro or by the SMARTFlux System.

1 Connect the LI-7700 to the LI-7550

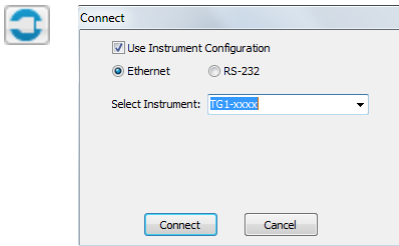
Connect a PC to the LI-7700 directly or through the LI-7550 Analyzer Interface Unit.



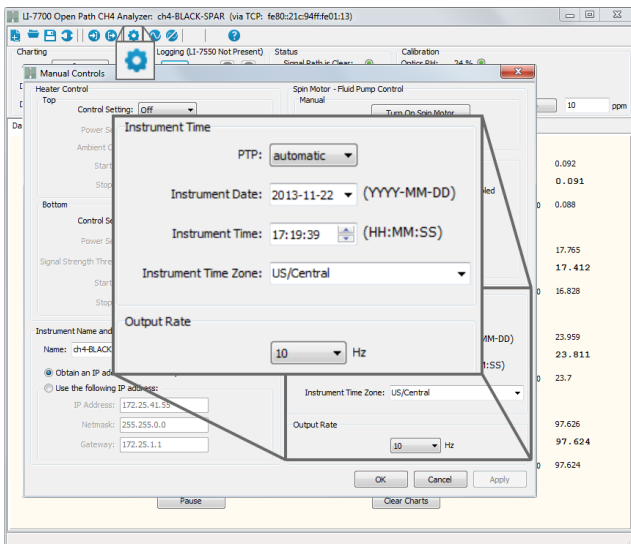
2 Connect to the LI-7700



Download the software from www.licor.com/env/support and install it on your computer. Launch the software and click the connect button. Then select your LI-7700 and click **Connect**.



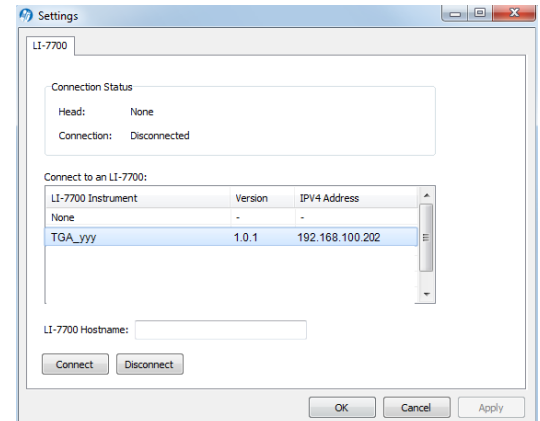
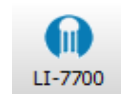
3 Under Settings (⚙️), set the PTP time to automatic and set the Output Rate to 10 Hz



Click **OK**, then close the LI-7700 software.

4 Connect the LI-7700 in the LI-7500RS or LI-7200RS Software

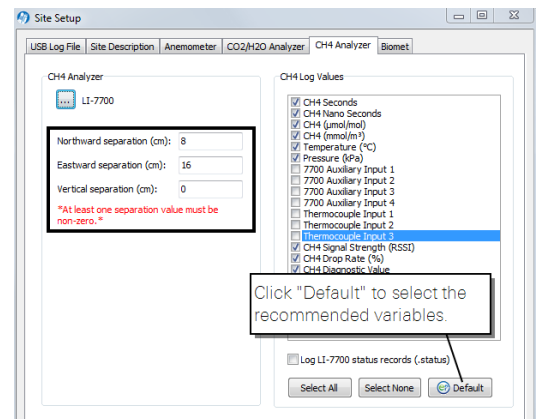
In the software, click the **LI-7700** button. Select the LI-7700 and connect to it.



5 Enter CH₄ Analyzer Information

In the **Site Setup** window, enter the CH₄ Analyzer information:

- **Northward separation (cm):** Measured at the site
- **Eastward separation (cm):** Measured at the site
- **Vertical separation (cm):** Measured at the site



6 Select CH₄ Log Values

Click **Default** to log the minimum recommended data set for processing data with EddyPro on the SMARTFlux System.

7 Turn on Data Logging

To turn on data logging, click the **Start** button (⏸️) at the bottom of the **Site Setup** window. Data logging will begin automatically when a suitable USB drive is inserted into the LI-7550 USB port and any time the instrument restarts.

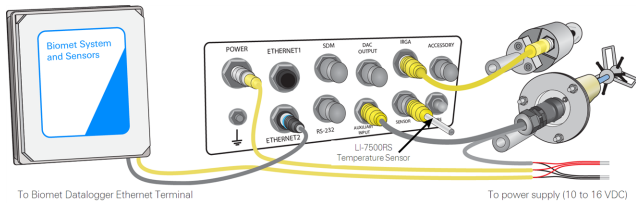
Verify the connection under the **dashboard** of the gas analyzer software. Here the software indicates connection errors with a warning symbol (⚠️) and provides guidance to resolve the errors.

Adding a Biomet System

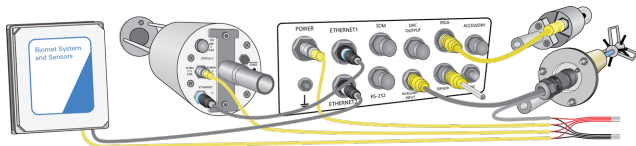
Data from ancillary sensors are logged to the biomet system datalogger. If the biomet system is running one of the pre-configured programs or a properly configured custom program data from the ancillary sensors will also be logged in .ghg files for processing in EddyPro Software or the SMARTFlux System.

1 Connect the Biomet System to the LI-7550

Configure the Biomet station as described in the Biomet Station instruction manual. Then connect the biomet system to the LI-7550 as shown below, and connect a PC to one of the vacant Ethernet terminals on the LI-7550.

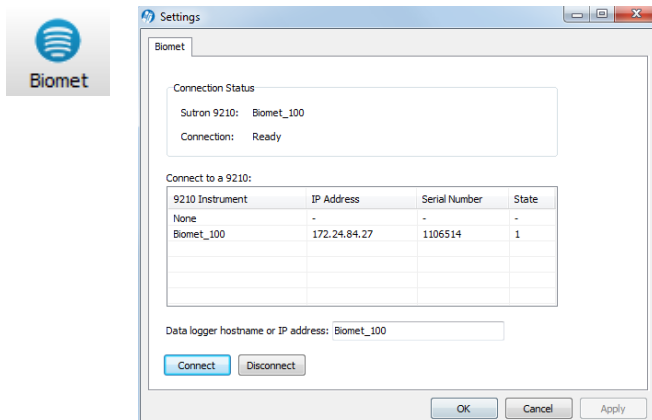


Note: An eddy covariance system that includes an LI-7700, Biomet System, and the SMARTFlux System will occupy all of the Ethernet ports of the LI-7550. In this scenario, temporarily disconnect the LI-7700 or the SMARTFlux System and connect your PC to the vacant Ethernet port. Or, use an Ethernet switch in the Biomet System.



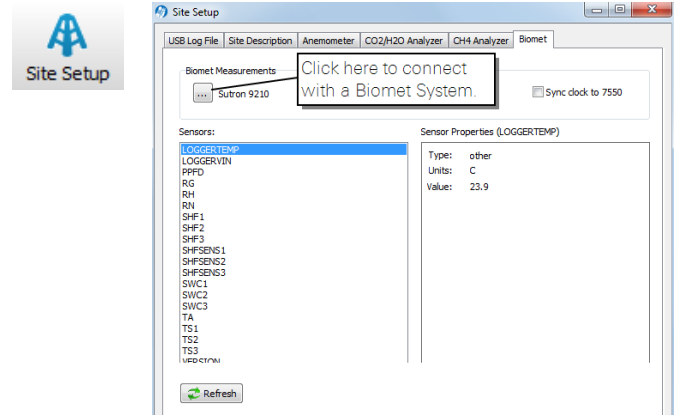
2 Connect with a Biomet System in the LI-7200RS or LI-7500RS software.

In the software, click the **Biomet** button, select a Biomet System and connect to it.




3 Synchronize the Clocks


Click **Site Setup** and select the **Biomet** tab and check the **Sync clock to 7550** box.



Upon a successful connection, the software will display a list of sensors that are in the Biomet system.

4 Turn on Data Logging

To turn on data logging, click the **Start** button () at the bottom of the **Site Setup** window. Data logging will begin automatically when a suitable USB drive is inserted into the LI-7550 USB port and any time the instrument restarts.

Verify the connection under the **dashboard** of the gas analyzer software. Here the software indicates connection errors with a warning symbol () and provides guidance to resolve the errors.

Connecting to FluxSuite

Any internet-connected LI-COR eddy covariance system that is running the SMARTFlux System can be connected to the FluxSuite Software. FluxSuite provides:

- Online results computed by your system in real time.
- Email alerts based on thresholds you set. Emails are sent once per day.
- The ability to assign collaborators to each site.



To configure FluxSuite:

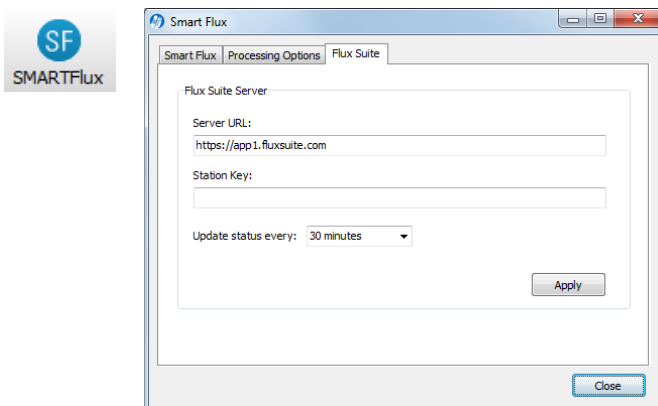
1 Register for an account

Go to www.fluxsuite.com to register for a free trial.

2 Log into your account and create a station key.

- a. Log into your account at www.fluxsuite.com.
- b. Go to the **Stations** view and click **Add Entry**.
- c. Enter a station name and the additional information about the station, then click **Save**.
- d. Click the **Information** button for the station you added, then click **Generate Station Key**.

3 Enter the server information and station key into your gas analyzer



- a. In the gas analyzer PC software, click the SMARTFlux button.
- b. Click the tab called FluxSuite.
- c. Enter the server (www.app1.fluxsuite.com) and station key.

4 Check out the results online

Your system will update the flux results online every 30 minutes.

5 Configure your notification settings

You can adjust alert thresholds for each variable.

Cellular Communication for Eddy Covariance Stations

Although LI-COR® provides cellular communication systems that are certified for many regions of the world, you may need to provide your own cellular modem in some situations. If you provide your own cellular modem/router (referred to as gateway henceforth), this technical note will help you configure the cellular gateway and instruments in your LI-COR eddy covariance (EC) system.

Gateway Specifications

The basic specifications for compatible cellular gateways are given below.

- Operating temperature and humidity range suitable for outdoor environments.
- Ethernet socket (female RJ45 terminal).
- TCP/IP communication and port forwarding (DNAT).
- Input voltage range compatible with power supply at site.

To use the your modem with the 7900-731 or 7900-732 packages, the modem must fit in a 20.3 cm x 15.2 cm x 10.2 cm space with room to connect the antenna, power, and Ethernet cables.

Data Plan Requirements

You must arrange a data plan with a cellular service provider that has **coverage at your station**.

- The cellular service provider should provide a public static IP address.
- The data plan must support machine-to-machine (M2M) communication.
- If a public IP address is not available, you can get data service through a mobile virtual network operator (MVNO).
- If you get a dynamic IP address, use a Dynamic Domain Name Server (DDNS) to resolve the IP address.

Your data plan should cover the amount (GB) of data that you will transfer over the cellular network. For example, do you want to view small summary files showing the overall performance of your system, or do you want to transfer all your raw data files over the cellular network?

Table 1. Suggested data volume for LI-COR eddy covariance systems.

Sensors	Files to Transfer	Data Plan
Basic EC System	Status Reports and Final Flux Results	<1GB per month

Table 1. Suggested data volume for LI-COR eddy covariance systems. (...continued)

Sensors	Files to Transfer	Data Plan
Basic EC System	Raw Data	<2GB per month
EC System with LI-7700 or Biomet System	Raw Data	<3GB per month

7900-731 Package for Basic EC Systems

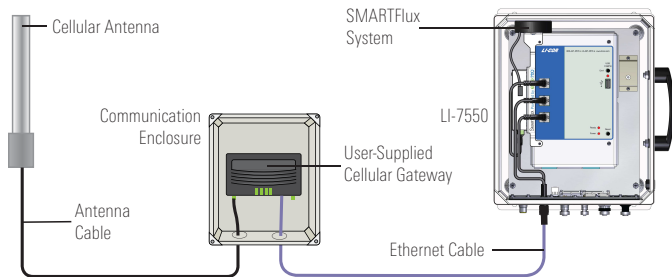


Figure 1. Cellular communication setup for a basic EC system.

For a basic EC station that includes an LI-7500RS or LI-7200RS, sonic anemometer, and the SMARTFlux System, we recommend the 7900-731 package (see Table 2).

7900-732 for EC Systems with Biomet

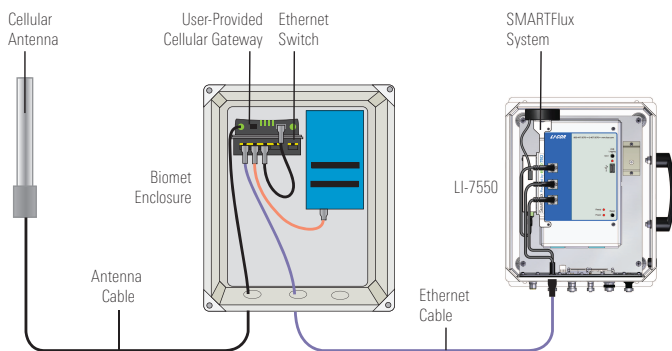


Figure 2. Cellular communication setup for an EC station with a biomet system.

For a station that includes a LI-COR biomet system, we recommend the 7900-732 package, which includes the components indicated in Table 2.

Table 2. Communication system components for basic (7900-731) and biomet EC systems (7900-732).

Description	7900-731	7900-732
Weatherized communication enclosure with mounting brackets and hardware	✓	
High-gain Cellular Antenna	✓	✓
Antenna Cable (4.6 m; 16.4 ft)	✓	✓
Antenna Mounting Post (1.5 m; 4.9 ft)	✓	✓
Standard Ethernet Cable (2.1 m; 7 ft)	✓	✓

Description	7900-731	7900-732
Basic Ethernet Cable (5 m; 16 ft)	✓	
Biomet Ethernet Cable (5 m; 16 ft)		✓
30 cm (12 inch) Ethernet Cable		✓
Stride 5-port Network Switch		✓
Gateway/Switch Mounting Bracket		✓

The bracket is used to mount the modem and Ethernet switch inside the biomet system enclosure. It is specific for AirLink® LS300 and Hongdian H7921 modems that are sold by LI-COR, but you can mount any modem with zip ties, adhesive mounting tape, or adhesive hook-and-loop; or install a DIN-mountable modem and switch to a segment of DIN rail (part number 6579-023).

EC System Network Configuration

Set unique IP address for each instrument in your system so it is compatible with your gateway (similar to the addresses given in Table 3)¹. Port numbers for EC instruments are pre-configured as shown.

Gateway Configuration

Use the software provided with the gateway to configure the gateway. Typically, the software is accessed through a web browser. The gateway must have **Port Forwarding** enabled for each instrument that is in the system². The port should be forwarded to the IP address that you set for each instrument in your system and the port given in Table 3.

Table 3. Example IP addresses and ports for instruments.

Sensor	Example IP Address	Ports
Personal Computer:	(optional) 192.168.1.200	N/A
LI-7500RS or LI-7200RS:	192.168.1.201	7200, 22
LI-7700:	192.168.1.202	7700
Biomet System	192.168.1.203	
LI-8100A:	192.168.1.204	1526

¹Refer to a LI-COR® Cellular Communication Manual (www.licor.com/env/support), section "Configure the Instrument Network Settings" for more details.

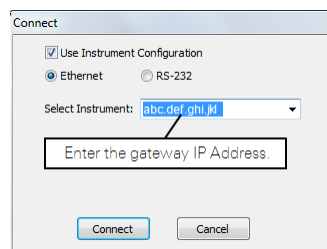
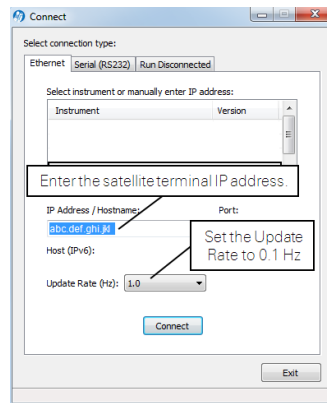
²Refer to a LI-COR® Cellular Communication Manual (www.licor.com/env/support), section "Configure the Modem-to-Instrument Communication" for more details.

Connecting with Instruments

After the gateway and instruments are properly configured, you can connect to your instruments from any networked computer by entering the IP address for your gateway into the instrument software.

To connect with an LI-7200RS or LI-7500RS using gas analyzer software, launch the software, enter the gateway IP address, and click **Connect**.

To connect with an LI-7700, launch the software, enter the gateway IP address, and click **Connect**.



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