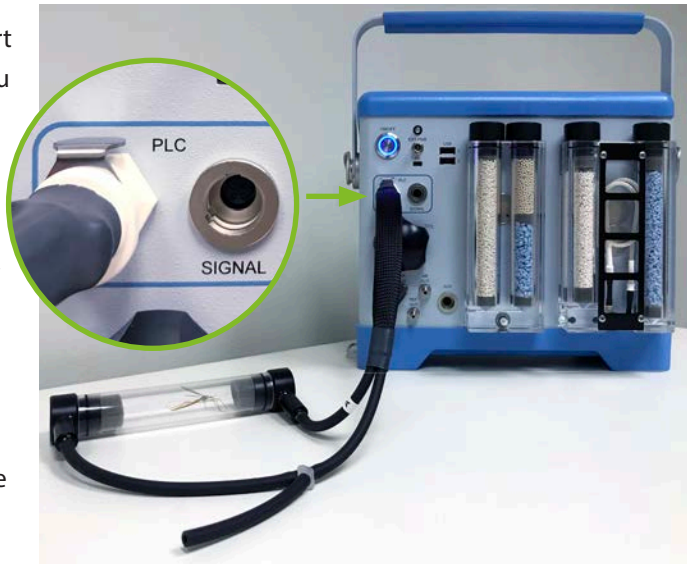
Measuring Insect Respiration with CIRAS-3

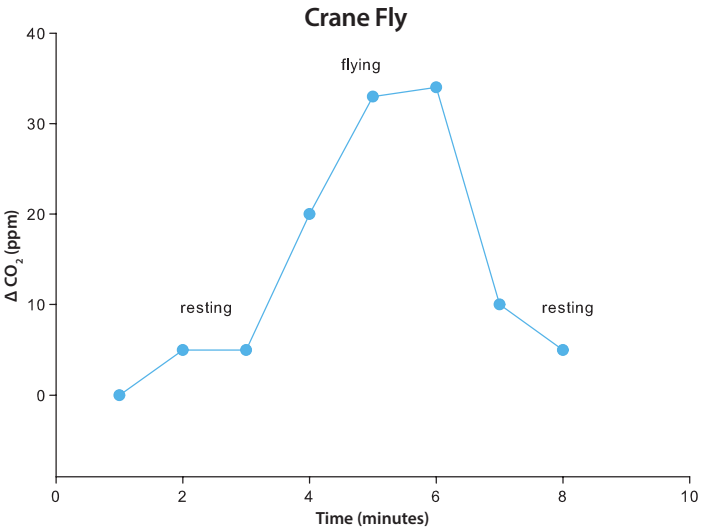
Small insects give off CO_2 in respiration, as do plants. The rate of CO_2 efflux can be quickly measured with the CIRAS-3 Portable Photosynthesis System and PP Systems' Insect Respiration Chamber Kit (Part No. STD566) . A clear plastic tube with an inside diameter of 2 cm, and a length of 12 cm, the insect is confined to the center of the tube by air-permeable foam and end caps, providing 7 cm length of space within the tube in which to place the insect. Snap the chamber directly into the **PLC** port on the CIRAS-3, select the **Insect Respiration** setting and you can control and measure the air flow rate and measuring the change in CO_2 concentration caused by respiration.



CIRAS-3 Portable Photosynthesis System utilizing the Insect Respiration Chamber to measure CO_2 efflux

You can select the CO_2 concentration, air flow rates between 100-300 cc min^{-1} and set inlet humidity between 0-100% of the ambient room humidity. Temperature is not controlled by the instrument, but would be equivalent to the ambient air temperature.

Using a flow rate of 150 cc min^{-1}, six small ants enclosed in the chamber (with a total dry mass of 0.0120 g) produced a CO_2 differential of about 8 ppm, for a respiration rate of 191 µg CO_2 min^{-1} g^{-1} dry mass.



Time course of Δ CO_2 for the crane fly as it went from resting to flying and back to resting, with corresponding changes in the Δ CO_2.

A single crane fly with a dry mass of 0.0056 g produced a CO_2 differential of about 5 ppm when resting, and about 34 ppm when flapping its wings, giving respiration rates of 286, and 1964 µg CO_2 min^{-1} g^{-1} dry mass. This example reflects the importance of animal activity to rates of respiration, something that is familiar to all of us! These measurements were all conducted at approximately 20 °C.

Note: Respiration rates can also be expressed per individual rather than per mass. The rates of respiration and other measurement parameters can be graphed in real time, and data recorded as usual with the CIRAS-3.

If you would like to learn more about this application or speak with one of our experienced technical staff, please feel free to get in direct contact with us via any of the contact information listed below:

110 Haverhill Road, Suite 301
Amesbury, MA 01913 U.S.A.

Tel: +1 978-834-0505
Fax: +1 978-834-0545

support@ppsystems.com
ppsystems.com

@pp_systems
company/pp-systems
ppsystems.intl
ppsystemsinc

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