



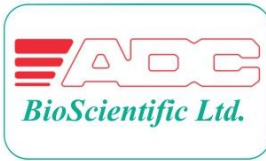
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SRS2000 T
Quick Start Guide
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Analysing the carbon cycle

SRS2000 T

Portable Soil Respiration System

QUICK START GUIDE



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Introduction

Welcome to your new SRS2000 T. This short guide aims to provide you with a point of reference whilst you are familiarising yourself with the features and functions now available to you. Reading this quick start guide as you set up and try out your SRS2000 T will enable you to follow the comprehensive, technical manual to use and maintain your SRS2000 T long-term. A friendly team at ADC BioScientific Ltd. are also on hand to answer any queries you may have: sales@adc.co.uk

Overview

The SRS2000 T performs measurements of soil CO₂ and H₂O exchange, and calculates soil respiration parameters, whilst automatically controlling the soil chamber climate.

The SRS2000 T leaf chamber analyses both CO₂ and H₂O. The single infrared gas analyser performs CO₂ measurements. H₂O measurements are made by two water vapour sensors.

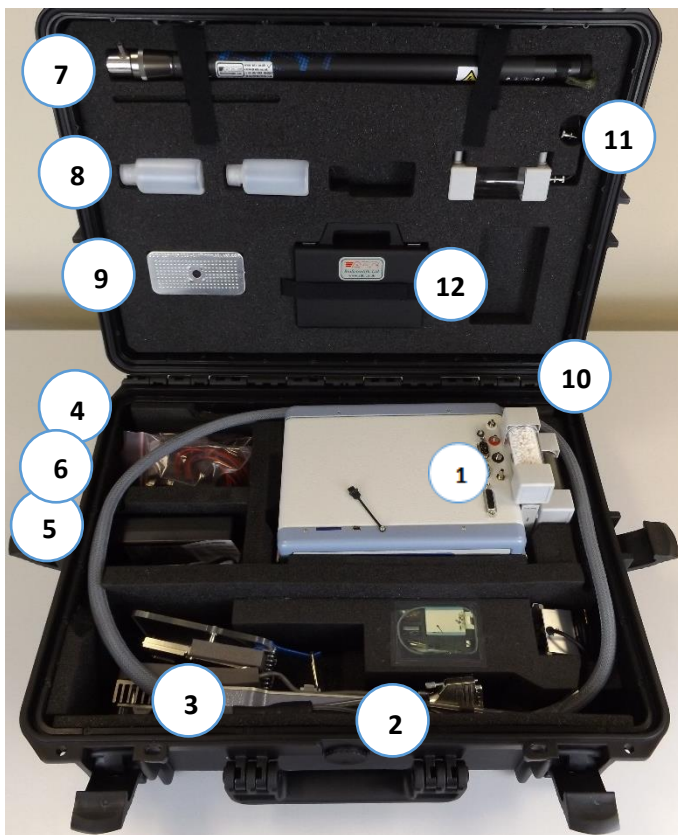
The SRS2000 T can be programmed to automatically control the leaf chamber climate. CO₂, H₂O, light and temperature can all be controlled at constant or sequential levels, either individually or in any combination. All measurements, calculations and experimental programs can be stored in files on SD cards. Data may be reviewed on the SRS2000 T touch screen LCD, or downloaded to a PC via the USB port.

Included with your SRS2000 T

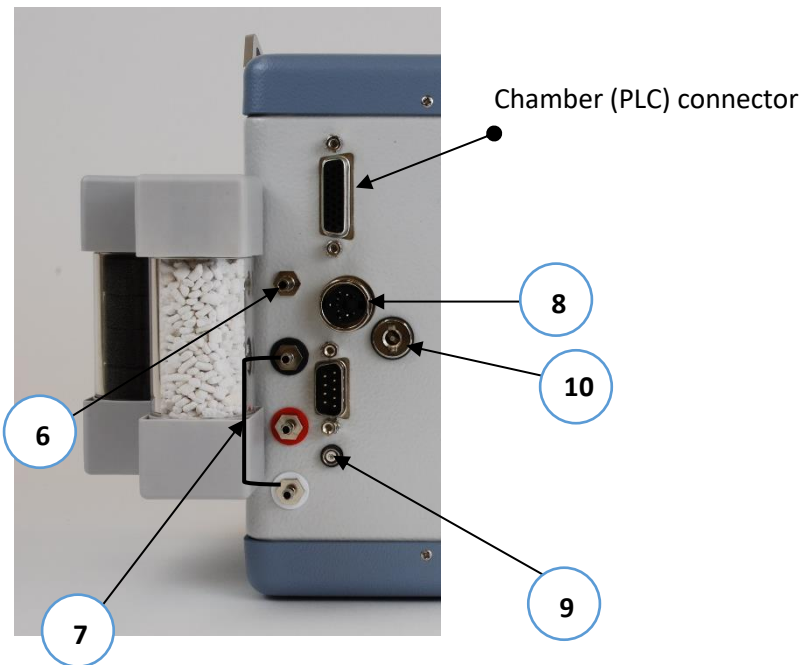
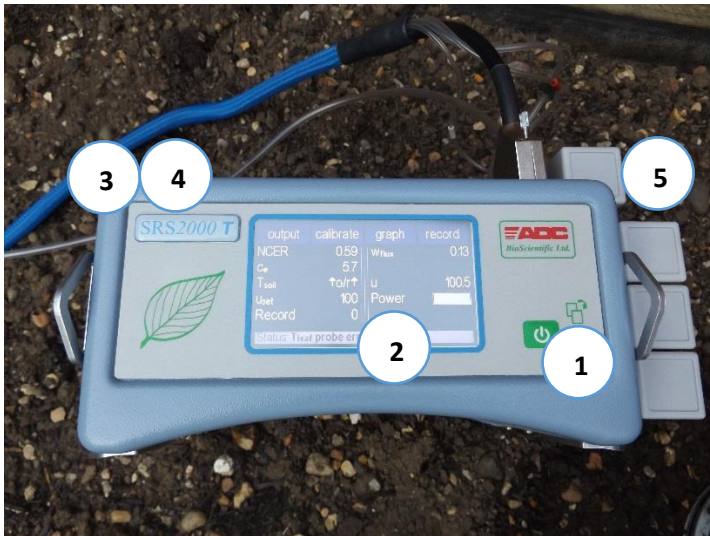
1. SRS2000 T Analyser “Console”
2. SRS2000 T Analyser “Handle”
3. Two-part Soil chamber: collar and chamber head. The photograph below shows a leaf chamber fitted instead (optional, separate purchase). All chambers fit into the case.
4. Battery charger and “mains lead”, to operate from 90V to 260V/AC.
5. Carrying strap
6. An RS232 cable and a USB cable to download data to a computer.
7. Air probe to supply stable ambient air to your SRS2000 T.
8. Two small plastic bottles, to hold a replacement set of chemicals.
9. Tin of dessicant to keep the case dry inside.
10. Additional soda lime chemical column (fitted to console).
11. Humidifying “Wetter” column with co-axial lead.
12. Tool box containing: Ground spike for use with the air probe, a ‘pot adjustor’ calibration tool, stylus for calibrating the SRS2000 T touch screen, ‘CO₂ discharge tool’, ‘jaw adjustment tool’ and SD card to store your data and experimental protocols.

A menu structure card, “User guide” manual, and this quick start guide are also included in the case.

With the carrying case is a **spares kit**, which includes all required chemicals, CO₂ cartridges, a selection of spare parts and the “installation plate” for the soil collar.



SRS2000 T layout and external functions



1. On / Page button

Turns instrument on/off and scrolls through the 3 main menus. Also functions as a 'confirm' and returns you to the previous page when viewing the sub-menus.

2. Touch screen, colour LCD

All programming of the SRS2000 T is via the touch screen.

3. SD card drive

For storage of data logs, graphs and sequence files.

4. USB port

Connect a computer to transfer files to and from the SD card.

5. Chemical columns

Used to condition the system gas.



Column **1** should always be filled with Soda lime.

Column **2** should always be filled with Drierite.

Column **3** should either be filled with ferrous sulphate when in use, or the foam inserts should be placed inside the column, as shown.

Column **4** an additional soda lime column, which we recommend filling with an indicating Soda Lime when controlling CO₂ at elevated concentrations.

6. Air supply

Fresh reference air is taken in here. It is vital that incoming CO₂ concentrations are stable. Air drawn directly from occupied rooms, adjacent to vehicle traffic or a heavily populated canopy can result in unstable "reference C" and "delta C" data. The supplied air probe and tubing can be used here.

7. Soil chamber connections

Connect the soil chamber to console using the three, colour-coded entries to match the gas tubing.

8. Power supply

To connect to battery charger.

9. Column temperature probe socket

Connect only when controlling water vapour.

10. CO₂ regulator filter assembly and discharge valve

For CO₂ filter replacement and cartridge discharge.

SRS2000 T battery compartment

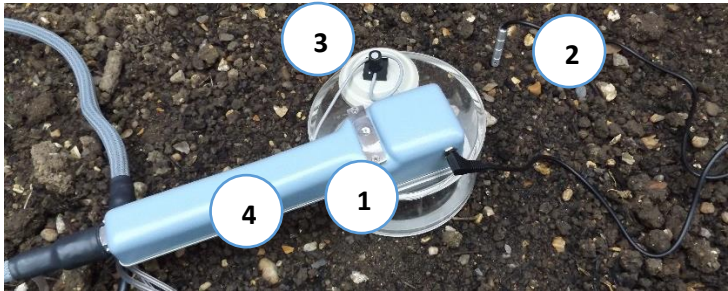
Located underneath the SRS2000 T console and containing:

Battery To maximise battery life, never store fully discharged.

CO₂ cartridge compartment Unscrew (when empty) and place in new cartridge. Never remove a cartridge that is not fully spent. If you need to empty a cartridge rapidly, fit the CO₂ discharge tool LCM-039 for an hour before removing.

Fuse A bayonet fitted cartridge, 3.15A, 20mm glass T type fuse.

Soil Chamber



- 1. Upper Soil chamber:** Connecting to the lower collar installed in the soil.
- 2. Soil temperature sensor:** Fitting to jack socket in handle.
- 3. PAR sensor:** 'Photosynthetically Active Radiation' sensor.
- 4. Record button:** Pressing initiates an instant data record.

Additional chamber options

The SRS2000 T can be reconfigured using the touchscreen for use with any other ADC chamber.

Available chambers are: **Broad**, **Narrow**, **Conifer** or **Small leaf**, or the **Versatile** chamber. The versatile chamber fits a standard soil collar but allows more light through the upper chamber, with a larger surface area. This chamber may be used for whole, small plants or for soil respiration.



Optional Accessories

The following options are available for purchase.

ADC part numbers are written in bold:

Additional round soil respiration collar **M.POT-052**

Adaptor for 4" (110mm) PVC piping **M.POT-030**

Adaptor for 6" (160mm) PVC piping **M.POT-031**

Sealing base to convert soil collar to large chamber for laboratory soil samples **M.POT-054**

Using your SRS2000 T for the first time

Connecting things up

1. Connect the soil chamber handle to your SRS2000 T console, using the colour-coded gas connections and the electrical connection. When assembling the system for the first time, we advise you not to insert a CO₂ cartridge as yet.
2. Connect a stable supply of air to the air supply inlet, using the length of tubing supplied. This is essential to provide stable CO₂ readings. Without a stable air supply connected to the SRS2000 T, your CO₂ readings will not be stable.

Using a stable air supply

You may use the air probe, supplied, when outdoors. Extend the probe fully and secure in the ground using the ground spike provided. Attach the tubing, with the metal filter close to the probe end). Position the probe around 1m away from your sample area.

Alternatively, you may construct your own buffer volume (this can be portable, attaching to a belt or back pack) using a plastic or glass container with a screw top lid.

Drill two holes into the lid and glue in place 2 x air entries, provided in the spares kit.



One entry carries “air in” (connected to a length of PVC tubing, supplied, which can be hung out of a window) and the other carries “air out” (connected to a tube which is connected to the console “air in” entry).

The “air in” entry on the container should also have a length of PVC tubing connected to it, which hangs down inside the container and extends to the bottom of the container. This piece of tubing ensures that the air is drawn out of the container from the top, so that air is fully “volumised”.



The same method can be repeated to make a smaller volume from a glass bottle with a screw-top lid.



3. Fill and attach the chemical columns as previously directed.
4. Insert an SD card into the drive.

Switching ON


Switch the SRS2000 T on using the ON / PAGE button:



Initially, the SRS2000 T will display the software version and instrument serial number.

It takes just a few minutes for the SRS2000 T to warm up after switching on. During this time, CO₂ related data will not be presented. If fresh chemicals and a stable air supply are in place, up to 30 minutes may be required to achieve stable gas readings.

Switching OFF

To turn the unit off, hold down  continuously OR press 'power off' on main menu 3. The SRS2000 T will then power down.

The assembled system



SRS2000 T must always be attached to the 'air probe' provided (A), or connected to a buffer volume (B):


(A) Connected to the air probe



(B) Connected to a buffer volume



The Main Menu Structure

There are 3 Main Menu pages. Press  or swipe horizontally across the LCD to move between them.


Main Menu 1

Displays the CO₂ / water vapour reference, analysis and differential readings, together with PAR, soil temperature, atmospheric pressure and chamber temperature.

climate	sequence	logging	record
C _{ref}	697	e _{ref}	11.0
C' _{an}	698	e' _{an}	11.0
Δc	-1	Δe	-0.0
Q _{soil}	10	p	1026
T _{ch}	24.3		

Main Menu 2

Includes all calculated parameters such as soil respiration rate, net carbon exchange rate (NCER) and water vapour flux rate. Leaf temperature, set flow and actual flow rate are also displayed. A power bar indicates the level of battery charge. A count within the selected record file is also displayed.

output	calibrate	graph	record
NCER	-0.01	W _{flux}	0.00
C _e	-0.1		
T _{soilm}	20.2	u	100.9
U _{set}	100	Power	
Record	0		

Main Menu 3

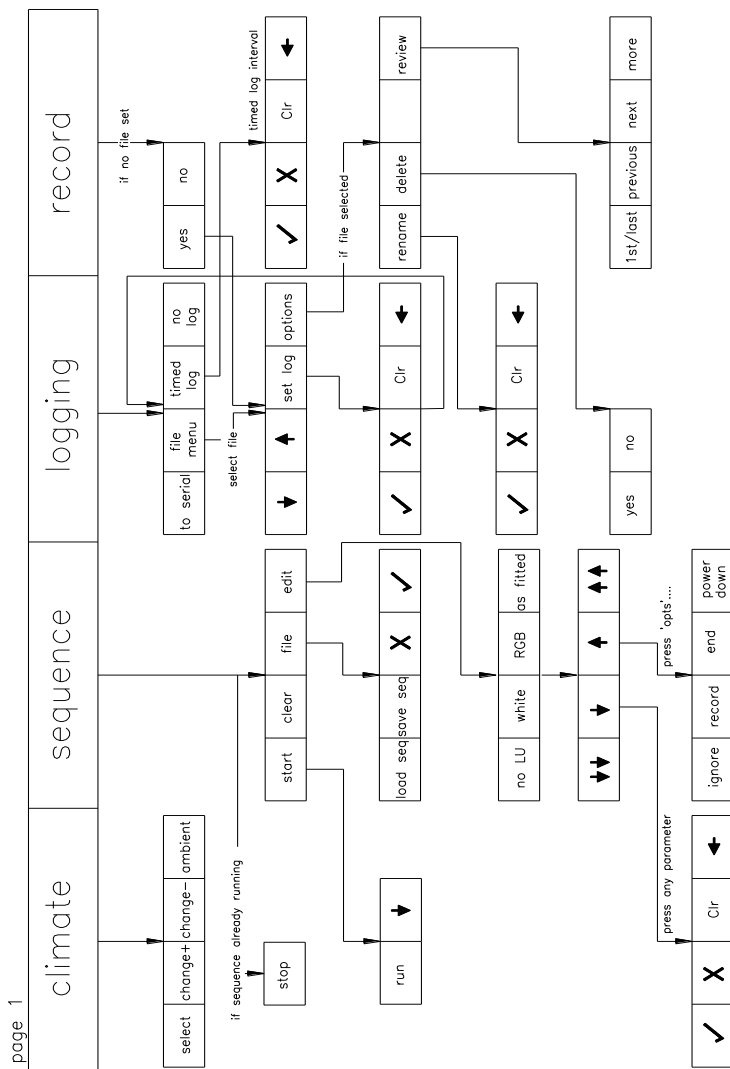
The configuration menu, **configure**. Here you can select which leaf chamber head is being used. Your SRS2000 T will have been delivered pre-set to Soil. Also on this page is the setting for the flow rate **uset**, pre-set at $200 \mu\text{mol m}^{-2} \text{s}^{-1}$.

The method chosen to measure temperature is shown (pre-set to “calculated”) – please change this to “measured” to connect and use the soil temperature probe.

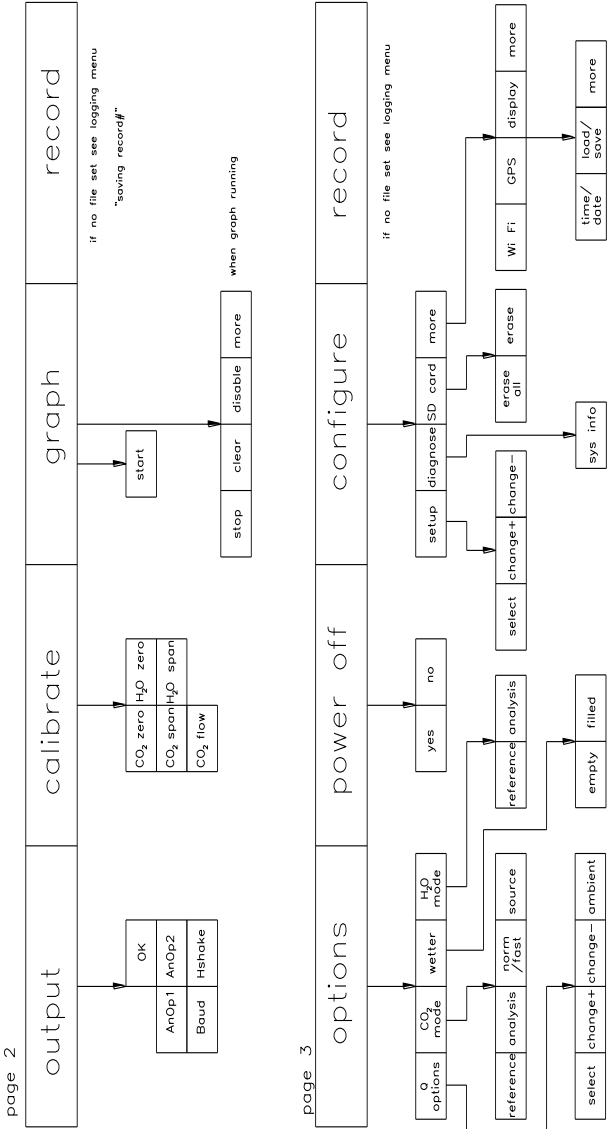
Pressing  again returns you to Main Menu 1.

options	power off	configure	
log:	test1	ChCfg	soil pot
U _{set}	100	area	97.50
T _{soil} mt	meas.		
dec pt	1.23		

Menu 1 Structure Flow Chart





Menu 2 and 3 Structure Flow Chart



Setting the date and time

Your SRS2000 T will have been set to your local time. If you need to change these settings, follow these steps:

1. Go to the Main Menu 2 and touch **configure**
2. Touch **more**
3. Touch **select** to underline the desired value:
Time (24hr): HOUR: MIN: SEC and
DATE (dmy): DAY: MONTH: YEAR
4. Use **change +** and **change-** to edit values
5. Use **change +** and **change-** to edit values
6. Once date and time are correct, press  to return to **configure** menu. Press  again to return to Main Menu 1.

Before taking measurements on an area of soil:

1. **12 to 24 hours before taking measurements**, install 1 or more of the “soil collars” into your chosen areas of soil. This allows the ground to settle around the collar and prevents errors due to disturbance.



Install the collar using the rigid, circular plate provided. Position the plate on top of the collar and use your foot or a rubber mallet to push the collar into the ground. Push the collar into the soil until the soil level within the chamber is just below the top of the chamber.

2. Switch on the SRS2000 T and allow it to finish 'warming up' for 5-10 minutes. If message appears: 'analyser condensation risk', it is likely due to the SRS2000 T being taken into a warmer environment than it was stored in. If so, simply leave the SRS2000 T switched on for 1 hour in the ambient sampling environment, before taking a measurement.

3. Enter the **configure** menu and select '**Tsoil mtd**' until '**measured**' is displayed. Now connect the Soil temperature probe to the jack socket on the chamber handle.

4. Check the chamber sensors. With the chamber closed, view the **CO₂ ref** and **CO₂ anl** readings on Main Menu 1. These should stabilise in seconds to give similar CO₂ concentrations.

5. The H₂O concentrations **e ref** and **e anl** should also be checked for similarity. Check also that the PAR and chamber temperatures (Tch) readings match ambient conditions.

6. Once values are stable, a **record** may be taken via the touch screen or chamber handle, or timed data logging may be set (see [Recording Data](#)).

Changing the soil chamber parameters

The configuration menu allows you to set up the SRS2000 T for different experiments/applications. From this menu, you can edit certain measured parameters within the chamber, also the airflow rate through the chamber.

1. To select a parameter to be changed, touch **configure** then **set up**.
2. Touch a parameter directly to select (any blue box).

setup	diagnose	SD card	more
log:	log-504	ChCfg	soil pot
U _{set}	100	area	97.50
T _{soilmt}	meas.		
dec pt	1.23		

Soil chamber settings:

Cfg: Check that this is set to Soil pot. This will automatically set the AREA, rb, Hfac and Trw values for that chamber.

AREA: Represents the total area of the chamber.

Tsoilmt: The method by which you want to measure soil temperature. Touch to switch between:

Calculated: by 'energy balance equation'. Preferred method for broad leaves filling the entire chamber area.

Measured: by soil temperature sensor. Once the plug-in thermistor is plugged into the jack socket, measurements will automatically switch to this sensor.

(Q given: Allows a Q level from an external PAR sensor from another source to be input into data sets. It overrides the PAR sensor value.)

Setting the flow rate

Uset: Changes air supply flow settings. The default and most commonly used value is $200 \mu\text{mol m}^{-2} \text{s}^{-1}$. When measuring samples with a high level of gas exchange, flow rate should be increased. When measuring samples with a low level of gas exchange, flow rate should be decreased.

Alternative method for additional leaf chambers:

Before taking measurements on a leaf:

1. Hold the chamber as steadily as possible during the measurement. The underside of the chamber has an attachment site for any standard tripod.
2. Check the chamber sensors. With the chamber closed, view the **CO₂ ref** and **CO₂ anl** readings on Main Menu 1. These should stabilise in seconds to give similar CO₂ concentrations.
3. The H₂O concentrations **e ref** and **e anl** should also be checked for similarity. Check also that the PAR and chamber temperatures (Tch) readings match ambient conditions.
4. A leaf, once enclosed in the chamber, may take two minutes (or less) to re-adjust to the new microclimate.

Watch for the Ci (sub-stomatal CO₂) value to stabilise, as a good indicator of leaf adjustment. We prefer to use 'Ci', rather than 'A' as the indicator. This is because 'A' mainly responds to changes in CO₂ concentration, which tend to be faster than changes in H₂O vapour, 'e' values. Therefore, 'Ci'

is normally the last value to settle. It is especially useful if you are interested in water vapour parameters.

Once values are stable, a **record** may be taken via the touch screen or chamber handle (see RECORDING DATA).

Leaf chamber settings:

Cfg: Select the type of leaf chamber that is being used: Broad, Narrow, Conifer or Small. This will automatically set the AREA, rb, Hfac and Trw values for that chamber.

AREA: Represents the total area of the chamber. If your leaf does not fill the whole of the leaf chamber, determine and enter a value for the exposed area.

Rb: Boundary layer resistance.

Hfac: Leaf chamber energy transmission factor.

Trw: Chamber window transmission factor.

Tl mtd: The method by which you want to measure leaf temperature. Touch to switch between:

Calculated: by 'energy balance equation'. Preferred method for broad leaves filling the entire chamber area.

Measured: by leaf temperature sensor. For the broad and narrow chambers, this defaults to the self-positioning sensor fixed inside the chamber. Once the plug-in thermistor is plugged in to the jack socket, measurements will automatically switch to this sensor.

(Q given: Allows a Q level from an external PAR sensor from another source to be input into data sets. It overrides the PAR sensor value.)

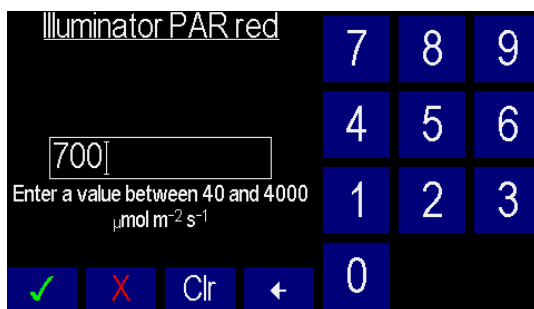
Setting Light, Q or PAR (irradiance) levels

Additional, leaf chambers are supplied with a choice of either White or Colour (RGB) light unit. When the SRS2000 T is configured to leaf chamber, you are given two options by which to adjust/set the light condition within the chamber.

The blue button at the top right corner will switch between “%RGB” and “PAR” to display two different editing pages.

First, explore the PAR page. The top right button shows “%RGB” as the other option, *not* the current page.

1. Press **Qset** on the climate menu to display all options for setting the total **Qtot** Irradiance from a light unit fitted onto a chamber.
2. Touching one of the blue boxes brings up a keypad for direct value input.



3. **Qtot** is the total output from either White or RGB light units, or, press **Qred**, **Qgrn** or **Qblu** to change the output from different coloured LEDs in the RGB light unit.

select	change +	change -	%RGB
Q _{red}	525		
Q _{grn}	330	Q _{tot}	1500
Q _{blu}	645		
Light unit PAR levels			

4. Touch '%RGB' to edit the ratio of red to green to blue LEDs.
The total will always recalculate to 100%.

select	change +	change -	PAR
Q% _{red}	33		
Q% _{grn}	33	Q _{tot}	2400
Q% _{blu}	33		
Light unit RGB ratios			
Status: Using Q from climate control			

NOTE: Set 1) Q%Red then 2) Q%Green then 3) Q%Blue **in this order** to allow the automatic recalculation of the other two colours, whilst keeping your set values as entered.

Recording Data

When will the SRS2000 T record measurements?

A record can be taken by either of two methods:

A. Press the record button on chamber handle

- Press (and release quickly) the black button beneath the red lever, on top of the leaf chamber.
- Beware: Hold this button down to delete the last record.
- Touch 'record', found on any of the Main Menu pages.

B. Automatic data recording/logging - To automatically take records at user selected time intervals.

Recorded data can be stored in named files. These can be accessed at any time for additional data storage, reviewing and downloading data.

What is recorded?

Parameters are listed below, in the order in which they appear in the data log file for Soil configuration:

Record

dt, Date

tm, Time

eref, reference H₂O (mBar)

Δe, ΔH₂O, difference between e_{ref} and e_{an} (mBar)

eset, H₂O as set by user (mBar)

Cref, Reference CO₂ (vpm)

ΔCO₂, difference between C_{ref} and C_{an} (vpm)

cset, CO₂ as set by user (ppm)

PAR, 'Photosynthetically Active Radiation', taken from the PAR sensor on top of the Soil chamber.

Tch, Chamber Temperature (°C)

Tset, Leaf chamber temperature set by user (°C)

Tsoilm, Soil Temperature (measured) (°C)

Tsoilmt, Method for soil temperature (meas. only)

U, Air flow (μmol s⁻¹)

Uset, user set flow rate (μmol s⁻¹)

P, Pressure (mBar)

Ce, Soil Respiration (μmol s⁻¹)

Wflux, Net H₂O Exchange Rate (mmol m⁻² m⁻¹)

NCER, Net CO₂ Exchange Rate (μmol m⁻² m⁻¹)

Area, of chamber (cm²)

Lat, Latitude, **Long** Longitude and **Alt** Altitude (DMM)


GPS Fix (0-2)

Chcfg, Chamber Configuration.

A different set of parameters are recorded when SRS2000 T is configured and used with a leaf chamber. These are detailed in Appendix 1 of the main manual.

Where is data recorded?

Create a data 'log' file

1. Swipe across the screen or press  to arrive at Main Menu 1.

2. Touch **file menu**, **set log**. Use keys to name log file with your choice of 7 digits (letters and numbers).


Log: Indicates where the recorded data will be stored.

3. To change the where the data will be stored, touch **logging**.

4. Then select either **To Serial** (directly via RS232), **File Menu** (a file name on the SD card), **Timed Log** or **No Log**.

5. Touch 'TimeLog' to enter a time interval in minutes, between 1 and 100, using the keypad.

Alternatively (less often required), press 'anl.cycles' to enter between 1 and 100 analysis cycles. The analysis cycle of measurements lasts for around 20 seconds, so a data point will be logged every 20 seconds.

6. Press  twice to return to Main Menu 1. Automatic logging will now take place.

No changes can be made or saved whilst logging is set to Timed. Ensure that "no log" is selected in the logging menu before making, saving or changing sequence files OR when controlling the chamber climate.

Stop a data 'log' file


To stop a log file, for example at the end of a sequence, enter the logging menu:

1. Press 'no log'
2. Press 'log:' until it reads 'off'.

Access a saved data 'log' file

1. Touch **logging** on Main Menu 1.
2. Touch **file menu**. Use arrow keys to select the log file required. Then press **set log**.


How to review data

1. Press  to go to the first main menu screen.
2. Touch **logging, file menu**. Touch the arrows to select the data file for review.
3. Touch **options, review**. You now have access to the stored data in that file.
4. To review different data sets, use **1st**, **last**, **previous** and **next**. Use **more** to review different data pages of the file.

How to download data

1. Connect up the SRS2000 T with the USB cable provided. Alternatively, remove the SD Card (when not logging) and insert into a card reader.
2. The SD Card will appear as a mass storage device.
3. Files appear in Comma Delimited format .csv.
Save in suitable format (e.g. save as Excel™ Workbook) to preserve data.

Deleting data files

1. Press  to go to Main Menu 2.
2. Select 'Logging/File Menu' use arrow keys to select data file to be deleted.
3. 'Options' then 'Delete'. Confirm or NO to abort.

Controlling the soil chamber climate

The SRS2000 T allows you to automatically control the climate within the leaf chamber. You can control CO₂ and H₂O for single or multiple parameter experiments.

Chamber temperature control is available when a leaf chamber is fitted and corresponding configuration set.

Setting up

To control H₂O: Ensure that the Drierite is filled to reduce H₂O levels below ambient. Ensure that the wetter column is filled with ferrous sulphate to increase levels above ambient.

To control CO₂:

1. Ensure that CO₂ chemical columns (**1** and **4**) are filled with fresh Soda lime.
2. Place a new CO₂ cartridge in the CO₂ cartridge compartment in the battery box. **Please read Section 6.6 in the "LCpro T user guide" main manual, for instructions and safety advice before doing this.**

Single level control

1. Enter Main Menu 1.
2. Touch **climate**. You are now in the single level environmental control set-up screen.
3. Touch or select the chamber climate parameter that you wish to edit first: Cset (CO₂) or e'set (H₂O).
4. Use the number keys to set the parameter. To return to ambient concentrations, touch **ambient**. Touch the tick symbol to confirm changes. The parameter will remain as set until next changed.

select	change +	change -	ambient
T _{set}	amb.	T _{ch}	22.0
		Q	18
C _{set}	amb.	C _{ref}	668
e _{set}	amb.	e _{ref}	12.6

Automatic climate sequence

This function allows you to set up an automatic experiment that runs through a sequence of user-selected environmental conditions. You can control the concentrations of CO₂ and/or H₂O within the soil chamber. (Additional, leaf chambers will allow the control of temperature and light also).

1. Enter Main Menu 1.
2. Touch **sequence**. If you have not used this function before, "No climate sequence file is loaded" will appear. Otherwise, **load sequence** to view an existing file.

Create a climate sequence file

1. Touch **edit**.

2. Select 'No light unit fitted' (this will be recognised by the SRS2000 T) to create a new sequence file. (This feature allows any other leaf chamber and light unit to be used with the system).

2. Confirm **yes** you want to create a new sequence. You are now presented with a table to program the environmental conditions of your sequence.

2. Step #1 can now be edited. Underlined will be **dwel**. This determines the length of a step, or dwell time. Touch **dwel** to edit. Use the pop-up keypad to set the time in minutes. Confirm changes and exit the menu by touching the tick symbol.

3. Set environmental parameters for the first step in the sequence by touching directly onto each parameter to edit it in the same way. Pressing **amb** returns the parameter to the ambient, uncontrolled condition. Confirm changes using the tick symbol. Clear or edit values using **Clr** or the arrow.

4. To select the environmental conditions of the second step of your sequence, touch ↓ to create a new step. Touch each parameter to edit, as before.

5. Continue to program each step of your sequence. Use the arrow keys ↓ ↓↓ ↑ ↑↑ to add new steps and to select subsequent or previous steps, for rapid editing.


To program other options into the sequence, press **opts**. By pressing the relevant key, the various options will be activated:

Ignore: This will cause this step in the sequence to be ignored so the sequence jumps automatically to the next step.

Record: A data set is automatically recorded just prior to the end of that step.


End seq: The sequence will automatically stop at the end of this step.

Power dn: The sequence will automatically stop, and the SRS2000 T will switch off after this step.


6. Once you have finished programming your sequence, press  or swipe upwards to return to top screen of sequence programming.

7. Press **start, run** to start your sequence experiment.

[Saving a climate sequence file](#)

1. Your sequence may be saved by pressing  to return to top screen of sequence programming.

2. Press **file, save seq.**

3. Use keys to name file. Press  to save the sequence.

[Using a climate sequence file](#)

1. Enter the **sequence** menu. Touch **file, load seq.** Swipe downwards on the screen, or use the arrow key to select a program.

2. Press **load seq.** Your chosen sequence will now be loaded to either **start**, or, touch **edit** to create a new sequence from the existing sequence file.

What happens after a sequence file has run?

This message is displayed: “Climate sequence stopped. End of sequence reached at step #..”

You must exit a sequence by pressing “clear”, then select another file in order to edit or run a different sequence file.

Interpreting data file Q values (leaf chambers only)

The following settings apply only to leaf chamber configuration. They are not relevant for the soil chamber. Columns taken from a leaf chamber ‘timed log’ data file:

A. When Trw is set to 0.92

8	9	10	11	12	13	
Qleaf	Q mode	Qwhite	Qred	Qgrn	Qblu	QTotal
2155	climate	n/a	773	796	773	2342
2208	climate	n/a	800	800	800	2400
1949	climate	n/a	708	702	708	2118
Qleaf = Total x Trw of 0.92						

B. When Trw is set to 1.00 (no Trw factor)

Qleaf	Q mode	Qwhite	Qred	Qgrn	Qblu
21	climate	n/a	7	7	7
34	climate	n/a	21	2	11
71	climate	n/a	53	5	13
70	climate	n/a	23	34	13

8. **Qleaf**, PAR at the leaf plane ($\mu\text{mol m}^{-2} \text{s}^{-1}$) will be corrected for Trw factor (0.92 for Broad or Narrow, 0.91 for

Conifer chamber) if set by user in the “configure” menu, prior to setting data logging.

Otherwise, set Trw to 1.00 to ignore any correction in the data file (table B). If you do this, you then need to recalculate the Q values within the data file spreadsheet after logging.

With an RGB light unit fitted, QTotal is not recorded in data files. This value can be calculated by a sum of Qred, Qgrn and Qblu columns. This will be the output from the light unit, from which Qleaf is calculated (as QTotal x Trw).

With a white light unit fitted, the value for Qwhite is equal to the QTotal value.

Maximum achievable Q values at the leaf plane: The achieved Q values at the leaf plane level will be multiplied by a factor of 0.92 (Broad and Narrow) or 0.91 (Conifer).





A set Q value of 800 = 736 to the leaf (Qleaf)

A set QTotal value of 2400 = 2208 to the leaf (Qleaf)

Please remember this, when setting Q!

Plotting a graph

Data can be viewed graphically in real time.

1. Touch  to enter Main Menu 1.
 2. Touch **graph**
 3. The X axis is displayed for editing on the left. Touch **x axis** to view parameter options. Swipe the screen downwards or use  to view all.
 4. Touch the parameter to select it. Press **OK**. Now the parameter appears next to **x axis** inside the blue box.
 5. Set how often the graph updates, using **every**. Set between 2 and 30 seconds. On this screen, **log record** will trigger the graph to be plotted at every log record.
 6. Touch the tick symbol to confirm and exit.
 7. Touch **Y axis** on the right, to select parameter options. Swipe the screen downwards or use  to view all.
 8. Touch the Y axis parameter and **OK** to confirm. Repeat for the four available legends (or fewer), displayed as: Y1, Y2, Y3 and Y4.
- Four default colours: Blue, green, yellow and pink are provided. Each colour can be assigned to a particular parameter, according to preference.
5. Press **start**. The graph will now appear and be updated in real time.
 6. Swipe across the screen horizontally with one finger, or touch  to scroll between the graph and the other three main menus. Doing so will not affect the graph.

Example: X may set to plot time (e.g. logging every 60 minutes) and Y may be set to plot NCER and C_e , for a temporal study of one area of soil.

FAQ: How much data can be recorded on one graphing screen?

One graphing screen fills up in 12 minutes, if 'every' is set to 0:02 seconds. If 'every' is set to 0:30, 3 hours' worth of data are plotted in one screen.

FAQ: What happens when one graphing screen is filled? The graph will continue to scroll along and auto-scale, so that the first screen will be unavailable to 'save'.

Further graphing options

Swipe downwards when the graphing screen is active, to reveal 3 options:-

Copy: Saves a Bitmap image of the graph at that moment, to the SD card.

Pause: Freezes the graph until 'resume' is pressed.

Export: Saves a .CSV file containing all data points from the graph at the time of export.

These can be opened in Excel spreadsheet and graphed manually or analysed further.

