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EGA61
Quick Start Guide
Issue 2.0
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Quick Start Guide to your

EGA60 Series, Model **EGA61**

Multi-sample CO_2/H_2O Analysis System

Example application: Soil Respiration

Contents

Introduction

Welcome to your new EGA60 Series, Model EGA61. We refer to this as **EGA61**. 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 EGA61 will enable you to follow the comprehensive, technical manual to use and maintain your EGA61 long term.

A friendly team at ADC BioScientific Ltd. are also on hand to answer any queries you may have: sales@adc.co.uk

Getting to know your EGA61

Included with your EGA61

One power adaptor cable, an SD card, soda lime column, PVC caps on all gas connections, technical manual, stopper removal tool (M.SRS-114) and kit of spare parts, to include: 1 metre of PVC tubing (M.706-145) per channel (5 metres for 5 channels and so on). Parts are listed in the main manual.

Optional accessories:

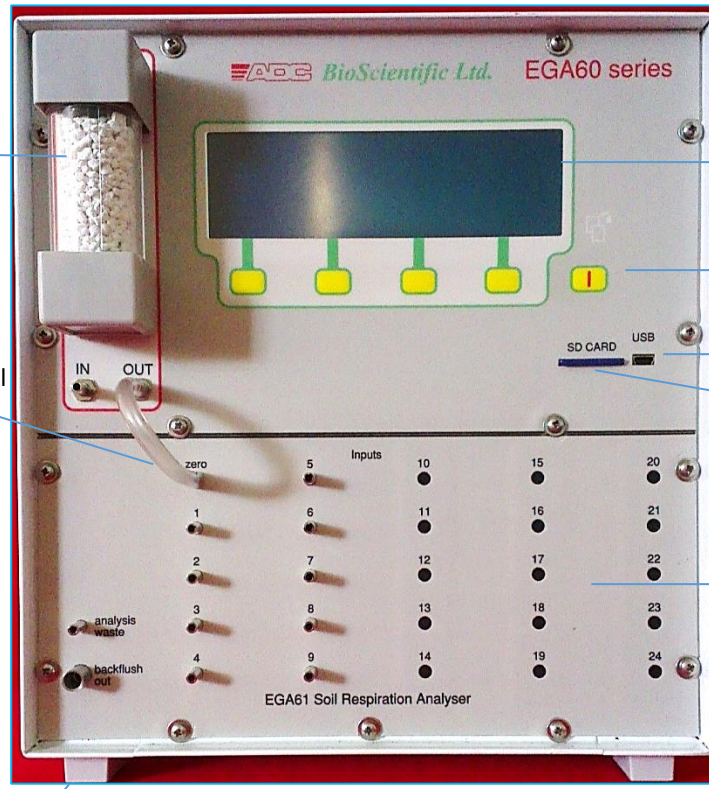
A number of acrylic sample columns (standard 30cm long) with optional, foam filter inserts. Sample racks to hold up to 5 columns of 30cm length, or to hold up to 24 smaller columns. "T" pieces, Elbow connectors and 4mm I/D PVC tubing.

Overview

The EGA61 is a complete CO_2 analyser and gas multiplexer system, designed to measure several CO_2 sources in sequence. A primary application is to measure the evolution of CO_2 from within soil samples. To determine soil respiration rates in several samples over time, data can be easily analysed to provide mass of CO_2 produced per unit of soil per unit of time.

Finding your way around your EGA61

Front Panel



Soda Lime Column

Backlit LED Display

5 Keys

USB Port

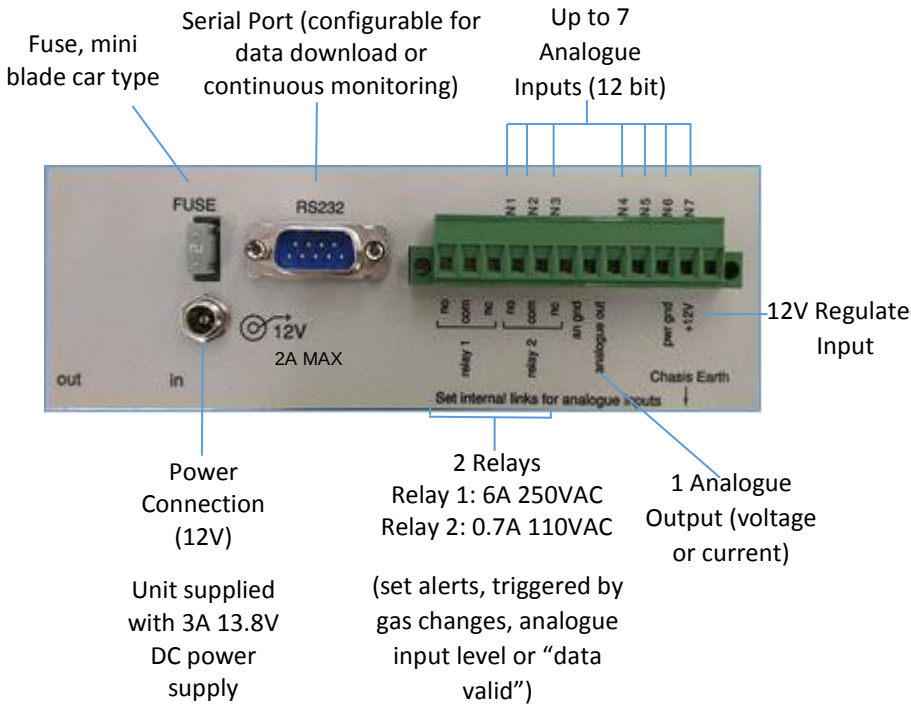
SD Card Slot

Zero Channel (connect soda lime to 'strip' air of CO_2)

Gas Multiplexer (with 5,10,15,20 or 25 channels including Zero)

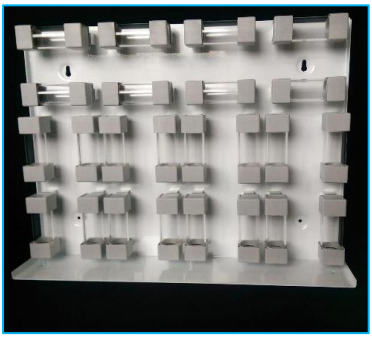
Flip Down Feet

Rear Panel


Fuse, mini blade car type
Serial Port (configurable for data download or continuous monitoring)
Up to 7 Analogue Inputs (12 bit)
FUSE
RS232
AN1
AN2
AN3
AN4
AN5
AN6
AN7
no
com
nc
no
com
nc
an gnd
analogue out
pwr gnd
+12V
relay 1
relay 2
12V
2A MAX
out
in
Chasis Earth
Set internal links for analogue outputs
12V Regulated Input
Power Connection (12V)
Unit supplied with 3A 13.8V DC power supply
2 Relays
Relay 1: 6A 250VAC
Relay 2: 0.7A 110VAC
(set alerts, triggered by gas changes, analogue input level or "data valid")
1 Analogue Output (voltage or current)

Soil Column Options and Applications

Our standard 30cm columns, held in racks of up to 5, can be linked together to give you a maximum of 24 samples (and one zero channel).



ADC recognise that every application of our instruments is unique.

We are always willing to make bespoke systems where possible or to advise you on making your own modifications.

Smaller, 10cm length columns are supplied with one rack to hold as many as 24 samples. For use with smaller volumes of soil (or pieces of fruit, invertebrates, insects etc).

Using your EGA61 for the first time

Connecting columns and samples

1. Remove all PVC caps from the gas connections (it is useful to keep these in the carry case).
2. Position your EGA61 unit and any column racks in place, (this may be with column racks fixed to a wall or the whole system free-standing). Flip down the feet on the EGA61 unit.
3. Fill the soda lime column with fresh white chemical, supplied, and push into position on the front panel.
4. Cut a length of tubing to connect the zero channel to the soda lime column “OUT” channel. We recommend a longer tubing of around 20cm here, hanging downwards in a U bend, to avoid any condensation entering the EGA61.
5. Cut lengths of tubing to the required length, to reach from the channel input connectors to the top of each soil sample column (leaving a little extra length will allow you to re-cut ends of tubing in the future). Connect your first sample column to channel 1, your second to channel 2 and so on, in sequence.
6. Mark or label each tubing with the channel #.
7. Connect your EGA61 to the mains power by inserting the connector of the cable into the port on the back panel.

8. Attach shorter lengths of tubing to the base inlets on each sample column, to reach between the columns.
9. Connect in series using T Pieces and Elbow Joints:

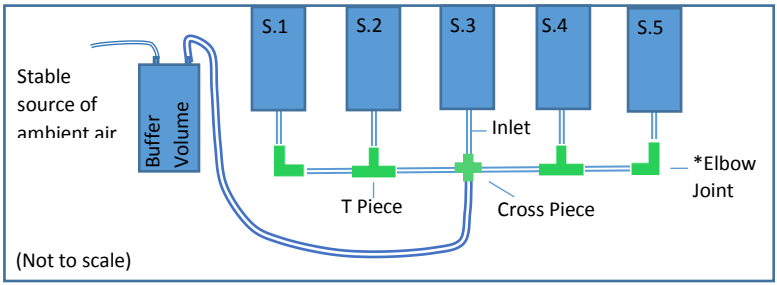
Your options for setup:

Diagrams based on standard 30cm column setup

A. Samples purged with ambient air:

To optimise gas flow, connect a length of tubing M.708-101 (6mm inner diameter) between the middle column in a rack and an ambient air "buffer volume". This is an airtight, 10 or 20L PVC container. It is best to have all columns supplied by the same buffer volume.

Drill into the lid of the container, an entry hole for each rack of columns (maximum 5) plus an additional 1 for air entry. Into this one, push a length of tubing down to the base inside. The other lengths of tubing will be connected at one end to the column entries, as below.

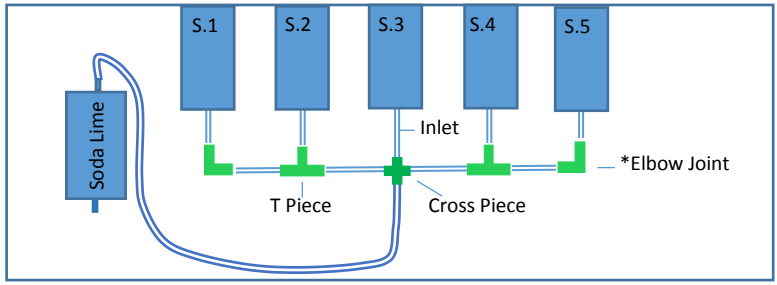


*Elbow joints are not strictly needed at each end. You may use a single length of the flexible tubing instead.

Additional T pieces can be added to the buffer volume tubing, to connect to further sets of sample columns in the same way. The other option is to use one buffer volume per rack, if you have the space, to ensure an even flow of air to each rack.

B. Samples purged with air stripped of CO_2 (via soda lime):

Replace the buffer with a soda lime column. If your sample columns are mounted on a wall, the soda lime column will also need to be mounted, below:

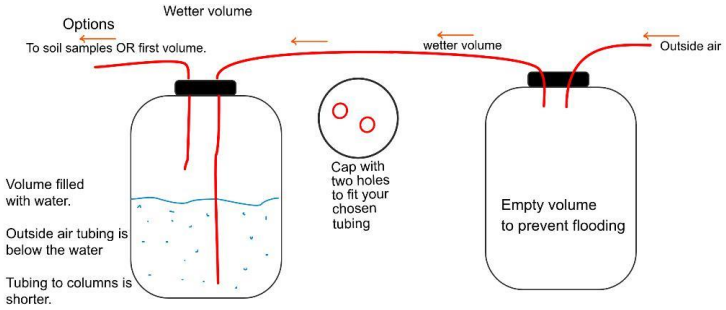


* You may use a single length of the flexible tubing instead of an elbow joint.

This column should be large enough to sustain the stripping of air entering the samples, for a good length of time before requiring the soda lime to be replaced.

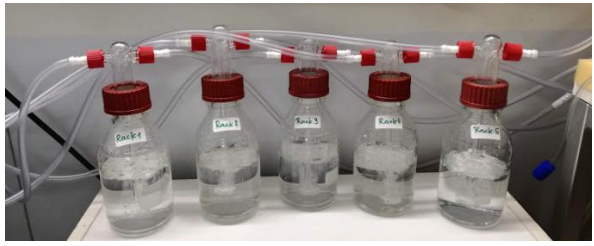
Wetting the reference air

To keep soil samples moist over a long measurement period, you may need to use this, proven system or similar:



Pyrex “Dreschel type, Gas Washing Bottles” are designed to bubble air through a gas line. Different styles and sizes are available from suppliers of laboratory glassware. Dreschel Gas Washing Bottles fit to our tubing M.708-101. A 3m length is supplied with each rack of 5 columns purchased.

Connect one, filled Dreschel bottle to the central column air inlet of each rack of columns. A second, empty bottle may also be connected in series to prevent flooding if the pump pressure is reversed for any reason.



Switching ON

1. Insert SD card into the slot on the front panel.
2. Connect the EGA61 unit to mains power with the 3A, 13.8V DC power supply provided, using the port on the back panel. Hold down the | button for 2 seconds until an introductory message appears showing the Instrument Serial Number.

3. This is the normal, opening screen once you have switched the EGA61 on:

The analyser is cycling through all of the 'inlet valves' for only around 10 seconds each. Allow the instrument to finish this process, then the menu screen will appear again.

The message will then appear: 'SD Card Inserted…' telling you the size of the card. This message will clear after a couple of seconds, or you can select 'OK' with the soft key underneath, allowing you to continue.

A final message: 'Analyser Warming Up' will then show until it is warmed up, typically for 10 seconds. You can now use the buttons (see main manual for option to bypass warming up, at a later stage in use).

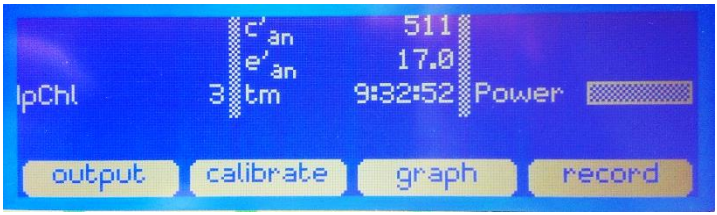
Switching OFF

To turn the unit off, hold down | continuously OR press until the | menu page showing 'power off' is reached and selected. The unit will then power down.

The Main Menu Structure

There are 3 Main Menu screens. Press | to move between the 3 screens. Detailed descriptions of each screen can be found in the main manual.

Main Menu 1



Main Menu 2

Main Menu 3

Setting the date and time

Date and time have been set in the UK. This may be the first function that you want to change.

1. Go to the Main Menu 2 and press ‘Configure’ option
2. Press button for ‘Configure’
3. Select ‘Setup’
4. Press ‘Select’ until **tm** (time) is underlined or **dt** (date) is underlined.
5. Press ‘change +’ OR ‘change-’ to bring up ‘Set date & time’ screen
6. Pressing ‘select’ switches between:
   Time (24hr): HOUR: MIN: SEC and
   DATE (dmy): DAY: MONTH: YEAR
7. Once date and time are correct, press  to return to the ‘configure screen’ and a second time to return to ‘menu 1 screen’.

‘Configure’ menu

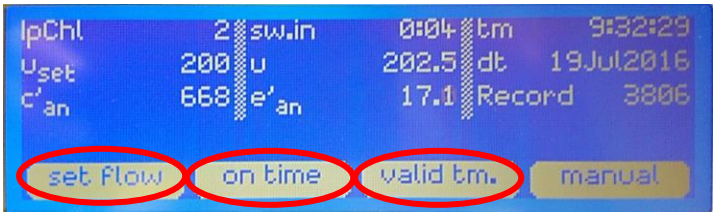
The configuration menu is concerned with the way the EGA61 is set up for different experiments. It shows you the current channel being measured, the set flow and dwell time (time the EGA61 spends analysing one channel before switching to the next). Step by step instructions for changing these functions are found on the following pages.

CONTROLLING CHANNELS

The EGA61 allows you to control; which channels (samples) are measured, the length of time that each channel is 'on', also to record data from each sample at certain points in a measurement cycle and to set the total number of cycles.

Setting flow rate to channels

Select Menu 3 screen. Options for channel control:



Select 'Set Flow' to view this screen:

Flow is automatically set to default value: **200 µmol/sec.**
The **'Z'** is for zero channel (connected to soda lime column).
1,2,3,4 are the sequential channel numbers.
'on' tells you which channel is currently being measured.

1. Select a channel using the arrow keys (down, across).
2. Set flow for each with 'set flow'.
3. Change flow value with '+' and '-' keys. Quick press will increase value by 1 unit. Hold the key to increase by 10.
4. Use 'Copy flow' to quickly copy this value into several channels.

5. Use ‘on/off’ to switch a channel’s pump on or off (e.g. to connect an external pump or gas source). All channels will still be sequenced, even when ‘off’. This means that the analyser will remain on each channel for the specified ‘on time’.
6. Use  to go back one page and select another channel using the arrow keys.

Setting channel ‘on’ time

1. Main Menu 2. Select ‘on time’.
2. Select each channel using arrow keys (down, across)
3. Now press ‘on time’.
4. Change time using ‘+’ or ‘-’ keys.
5. To copy this time to several channels, use ‘copy time’.

You can switch channels ‘on/off’ here, which removes them from the timed sequence.

Setting ‘Data valid’ time

The EGA61 updates all parameters on the display, every 1 second. This means that the default ‘Data Valid’ time for a channel is 1 second. Therefore, the ‘data valid’ time must be set to less than the channel ‘on’ time by at least 1 second. Set ‘data valid’ time in exactly the same way as ‘on’ time.

RECORDING DATA

When will the EGA61 record measurements? 2 Options:

A. During the Data Valid time.

Set using the 'valid tm' menu. For example, a channel 'on' time set to 150secs, and 'data valid' time of 30secs, gives 30 seconds' worth of recorded measurements per channel. This allows for the column headspace to be purged through so that the EGA61 is detecting gas generated only by the selected soil sample.

B. Throughout the channel 'on' time.

Set using 'Timer en.' and 'Period'. Typically used to test and check settings, rather than to record during experiments. 'Timer en' and 'Period' are linked. Increasing the value of 'Period' will automatically switch 'Timer en.' ON. When 'Timer en' is OFF, Period will be ignored.

NOTE: IF you wish to log via Data Valid, make sure that 'Timer en' is switched OFF to avoid duplicating data! The two logging timings can interact if both Data Valid and Timer are ON.

Averaging Multiple Measurements

You are provided with the option of averaging all data points automatically after the data valid time.
Example: An 'on' time set to 150secs, and 'data valid' time of 30secs, gives 30 seconds' worth of averaged data).

1. Main Menu 1. Select 'Config'
2. Select 'Setup'
3. Select 'CO2ave'
   An additional menu gives the options:
   'Ave.', 'Raw' or 'Both' (explained in main manual)
4. Select the option that you require.

Recording Data

Where is recorded data stored?

Recorded data can be stored in user-named files and accessed again for reviewing, adding to and downloading.

What is recorded?

Record	(Record Number)
dt	(Date as day:Month:yy)
tm	(Time in hour:min:sec)
Input Channel	(IpChl)
C'an	(Analysis CO_2 in **ppm**)
E'an	(Analysis H_2O in **mBar**)
P	(Atmospheric Pressure, in mBar)
U	(Flow Rate in µmol s^{-1})
Temperature of the Analyser (Ttube in °C)	
Relay Status	(Relay number)
Vbatt	(Power Supply in Volts)
An IP	(Analogue input number)
CO2rdg	(Analysis CO_2 format: Raw or Average)

Logging conditions

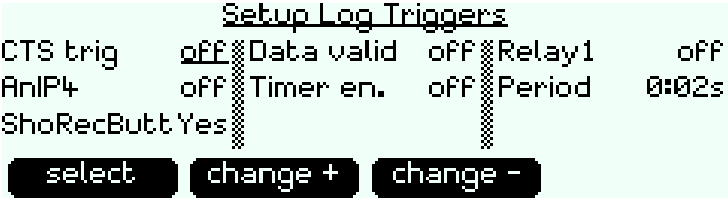
There are several conditions in which a 'Log' (a recorded measurement) is made. Typically, a log is made at the end of the channel 'on' time. This is set as 'data valid' time in the 'trigger conditions' menu, selected from the 'logging' menu. Further details can be found in Section 17.19 in the main manual.

NOTE: The logging Period and 'Timer en.' can be adjusted and used when in 'Ave.' (average) mode or 'Raw' mode.

'Period' and 'Timer en' *cannot* be adjusted in 'Both' mode, to avoid duplicating data.

If you see repeated rows of data in your downloaded (.csv or, consequently, Excel) file, please check the settings on the 'Setup Log Triggers' screen, accessed through 'Logging' and 'Condition' menus.

The frequency of a data point record is set by 'Period' in the logging conditions menu. See also Section 17.19 in the main manual.



Creating a new record file

1. Select 'logging' on Main Menu 2.
2. Select 'file menu' to save to SD Card
   (Selecting 'serial' saves directly to the RS232.
3. Select 'new file' using the up or down arrows.
4. Select 'set log' to create a new log file name.
5. Use keys to choose three letters and three numbers.
6. Press  to finalise the name and return to menu.

The status will now be 'Auto Mode'.

Accessing or appending to an existing record file

1. Select 'logging' on Main Menu 1.
2. Select 'file menu'. Use arrow keys to select a log file. Then press 'set log'.

Reviewing data

1. Press  to go to Main Menu 2.
2. Select ‘logging’ then ’file menu’.
3. Use arrow keys to select data file to be reviewed.
4. Select ‘options’
5. Select ‘review’.
6. ‘1st last’ switches between the first and last record.
7. ‘Previous’ to go back through records in the log.
8. ‘More’ shows a second screen, detailing relays, analogue inputs and battery voltage at each record.

Downloading data

1. Connect up the EGA61 with the USB cable provided, alternatively, remove the SD Card (when not logging) and insert into card reader, if available.
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.

Manual and automatic modes

The ‘manual/auto’ button changes the mode of operation. In ‘auto’ mode, the channels change sequentially according to the time settings. In ‘manual’ mode the channel stays on the current channel unless you change it to another.

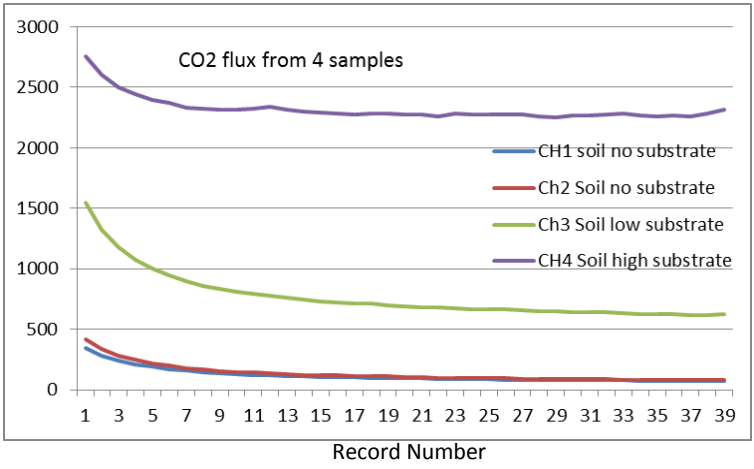
We recommend manually selecting all channels in turn, cycling through them once, to listen for the “click” of each valve. This “click” will indicate that the valve is functioning.

Initial experiment

Once you are all set up, we recommend running an **initial experiment** with soil samples, to fit your application and time available.

You may want to set up, say, 4 soil samples with one or more **varying conditions**: (soil moisture content, salinity, pH, or aeration) to be assured that you can see clear differences in CO_2 evolution.

For example, an experiment in which we simply added a nutrient substrate in different volumes to 4 samples, gave the following **results**:



Plotting a graph

Data can be viewed graphically on screen in real time.

To edit and begin a graph, press ‘graph’ on Main Menu 1.

Editing the X and Y axes:

1. Horizontal X axis appears first. Press ‘setup’ to edit.
2. Press ‘x axis’ to select either channel or time value.
3. Press ‘plot’ to change the timing of each data point (see main manual for advice on timings).
4. ‘Select Y’ opens the vertical Y axis for editing.
5. Use the down arrow  to choose from 8 options. Select an option with  .
6. Graph will then be displayed.

Pressing any key whilst the graph runs, bring up several options:

- ‘Copy’ to save a screenshot of the graph at that moment, as a bitmap image, to the SD card.
- ‘Pause’ whilst you change the tubing or samples. This avoids plotting unusual data values, which might cause the graph to auto-rescale to such an extent that useful data is compressed into a straight line.
- ‘Stop’ will freeze the graph display, to review data.
- ‘Clear’ will erase the current plot data ‘Yes’ or ‘No’.
- ‘Disable’ turns off and erases plot data ‘Yes’ or ‘No’.

Retrieving Data

Data can be downloaded in one of three ways:

1. Remove the SD card and insert into a reader on your PC, laptop device.

2. Use the USB cable between the front panel mini-USB port and a port on your PC, laptop device.

Files open in Excel™ in either comma or full stop separated format. The format depends on the setting you select during setup. The format of an existing, saved data file cannot be changed.

OR

3. Connect an RS232 cable between the port on back panel of EGA61 and your PC, laptop device (you may need to use a USB port to RS232 adaptor cable for your computing device).

Option 3 allows for direct, live data transfer through a Terminal Emulating Software. Free programs are widely available online, for example TeraTerm. Check for compatibility and of course security of any download with your computer operating system.

In combination with direct data transfer, you can program a macro in Excel™ to create a graphical display of the data, to allow visual monitoring of any experiment run with EGA61.