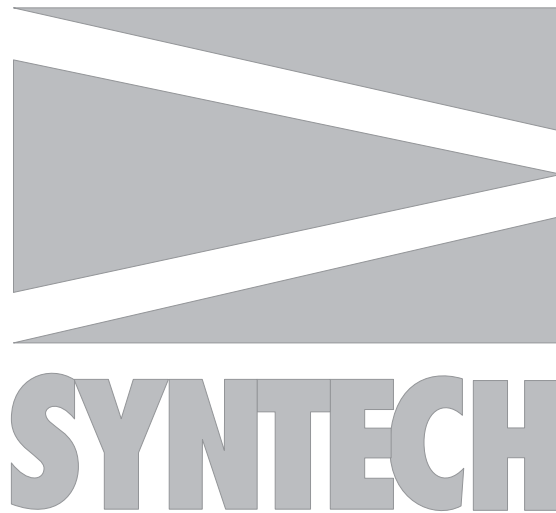


# **2-CHANNEL SIGNAL AQUISITION INTERFACE IDAC-2 INSTRUCTIONS**



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Buchenbach, Germany

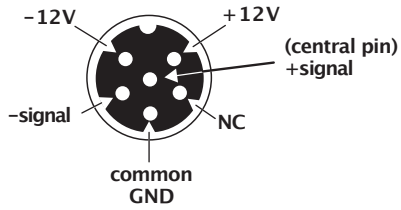
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IDAC-2 with EAG PROBE

## IDAC-2 FRONT and REAR PANEL RECEPTACLES

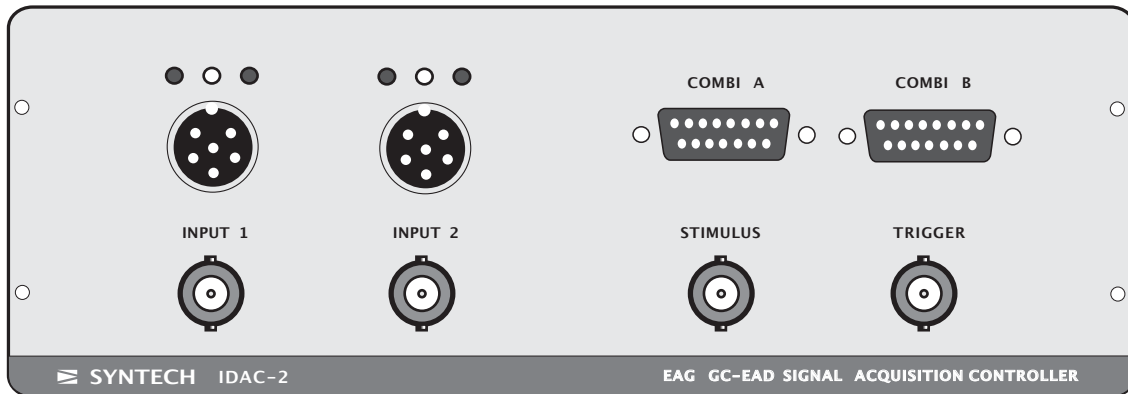
INPUT for PROBES etc.



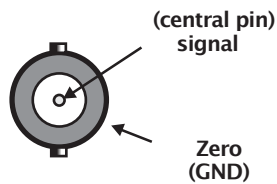
3-LED INPUT RANGE INDICATOR

DIN INPUT RECEPTACLE

15-Pin D receptacles  
for COMBINED 2-signal input devices



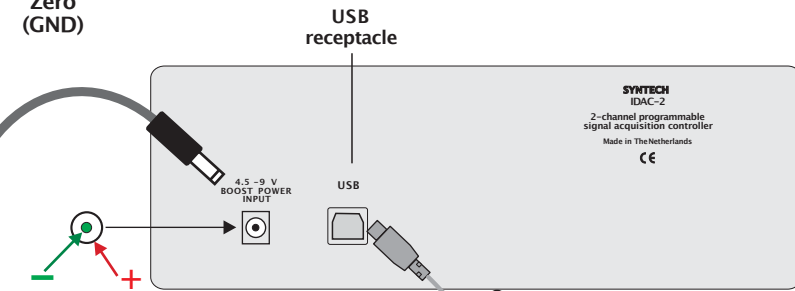
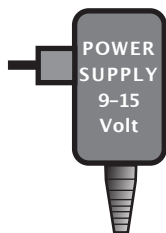
BNC INPUT



INPUT  
for Stimulus Signal

INPUT  
for Trigger Signal

Boost power supply  
only needed if USB  
power not sufficient



PC

USB  
cable

## GENERAL

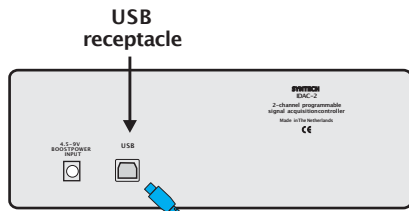
The IDAC-2 is an Intelligent Data acquisition Controller specially developed for the recording of low frequency signals (0-20 Hz) from biological preparations, such as Electroantennograms (EAG), Electroolfactograms (EOG), Retinograms, Electropenetograms (EPG) and signals from analysis instruments like gas chromatographs.

The hardware of the serial IDAC-2 system consists of a signal acquisition interface designed for use with an IBM compatible personal computer (PC). The interface is exclusively produced by Syntech. It contains 16-bit analog to digital converters, software controlled precision amplifiers, filter circuits, and control logic. The interface takes care of signal conditioning, amplification, analog-digital conversion, filtering and data transfer to the PC via the USB port. The system can handle two analog signals simultaneously: 1) Electroantennogram (EAG) signals; and 2) low frequency DC signals like the electrometer output of a gas chromatograph (GC) for coupled GC/EAD. In addition, inputs are provided for a stimulus indication and trigger command signal.

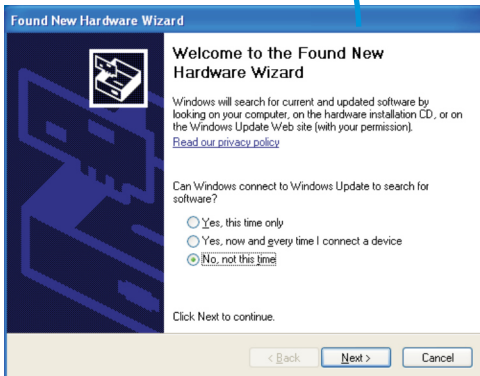
The software provides programs for EAG and GC/EAD recording and analysis. Signals are presented on the screen in real-time mode, which makes use of an oscilloscope superfluous. Acquisition of data can be started from the keyboard or from an external signal (stimulus generator, remote GC start command, etc). Data are stored during recording, and can subsequently be analyzed on any PC containing the software; the IDAC-2 is only necessary for the acquisition. Signals are interactively evaluated and the operator maintains full control over the analysis. Results are graphically and numerically presented, and can be printed, exported in ASCII format, or stored.

Operation of the system is rather straightforward, and the user will easily find out how to operate the various functions and options. However, some basic experience with electrophysiological experiments and preparation handling is necessary. The quality of electrophysiological recordings is for a great part dependent on the quality of the preparation, the condition of the experimental animal, and the skill of the experimenter. However, there are situations in which the signal to noise ratio is poor, or the signal is superimposed on hum, which is sometimes unavoidable. In such cases the Syntech system is still able to extract relevant information out of the noise, but this may take some more time and dedication.

# USB DRIVER INSTALLATION

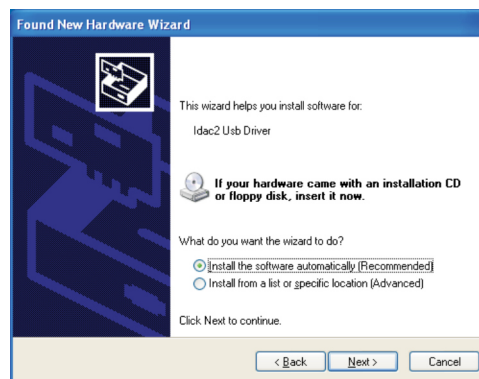


1. Connect the USB cable between IDAC2 and PC



2. Windows finds the new hardware  
Click: No, not this time (No web connection)  
Click: Next

3. Insert the Installation CD ; Click next

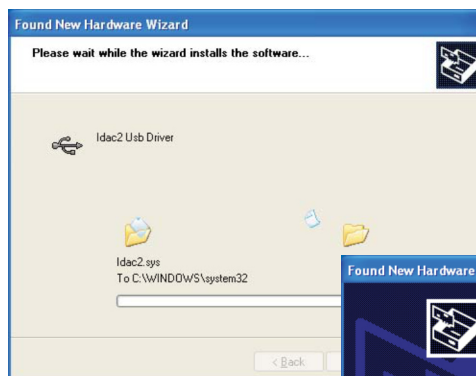
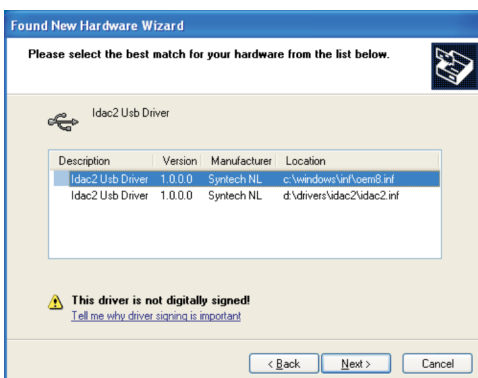


If Windows does not find the driver on the CD, select the second option and browse to the path on the CD: Drivers/Idac2

4. Click Continue Anyway (the IDAC is not a Windows device)



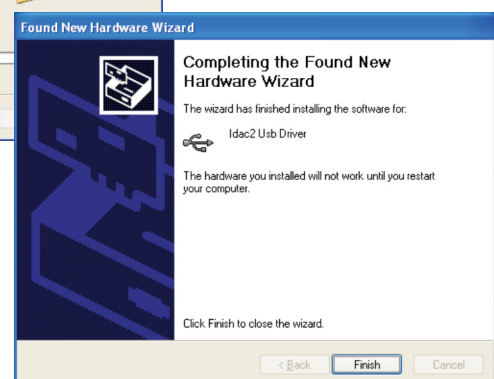
5. Click Next



6. Click Finish to leave the installation wizard.

7. Re-insert the CD to install the Device Interfaces and the Program software.

If the CD does not start automatically, open Windows Explorer and install the Device and the Programs by activating 'setup.exe' in the Drivers/Idac2 and Programs directories.



## SOFTWARE INSTALLATION

### Read this section before connecting the IDAC-2 to the computer

The software for the IDAC-2 consists of 3 modules:

- 1) **USB driver** (to handle the USB communication)
- 2) **Device Interface** (to control functions and settings of the IDAC2)
- 3) **Program** software (EAG, GC-EAD, Autospike)

#### 1. USB DRIVER INSTALLATION

Operation of the IDAC-2 via the USB port requires the installation of the USB Driver for the IDAC-2. This driver is located on the software CD supplied with the IDAC-2. It is necessary to install the USB driver to operate the IDAC-2.

The USB Drivers is installed as follows:

- 1) Start the computer running Windows (version 98 to XP)
- 2) Connect the USB cable between IDAC-2 and the USB port on the computer.
- 3) Windows responds to the connection of the IDAC-2 with the message:  
“ New hardware found”  
**If this message does NOT appear : connect a power supply to the ‘ boost power’ receptacle at the rear panel of the IDAC-2 box.**
- 4) Follow the Windows instructions wizard
- 5) Insert the program CD
- 6) If Windows does not succeed in locating the driver software, select the Option: ‘ Install from a list or specific location (Advanced)’ and enter the path for the USB driver on the CD (in the drivers/idac2 directory)
- 7) Neglect Windows ‘ warnings’ related to compatibility: Continue Anyway. (The IDAC software is not a Windows product)
- 8) Click ‘ Finish’ to close the installation wizard.

**Note:** If the USB driver for the IDAC-2 has not been properly installed it is not possible to operate the IDAC-2. In case the USB driver installation fails, disconnect the IDAC from the USB port, re-boot the computer and repeat the installation procedure.

Once the USB driver is properly installed it is permanently stored in the Windows system directory and activated automatically after connection of the IDAC-2.

## DEVICE INTERFACE AND PROGRAM SOFTWARE INSTALLATION

Insert installation CD

If CD does not auto-start:

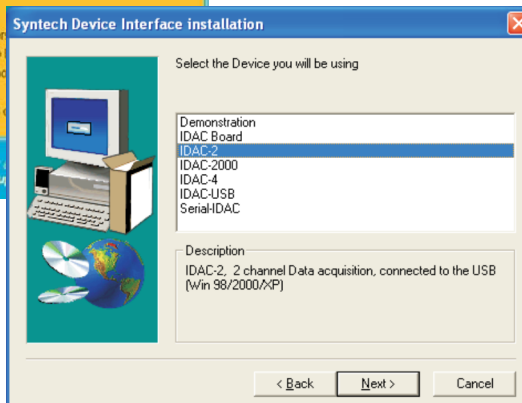
- 1) open Windows Explorer
- 2) go to CD directory
- 3) open directory Drivers
- 4) run the file "EsRun.exe"

Click on  
Device

STEP  
1



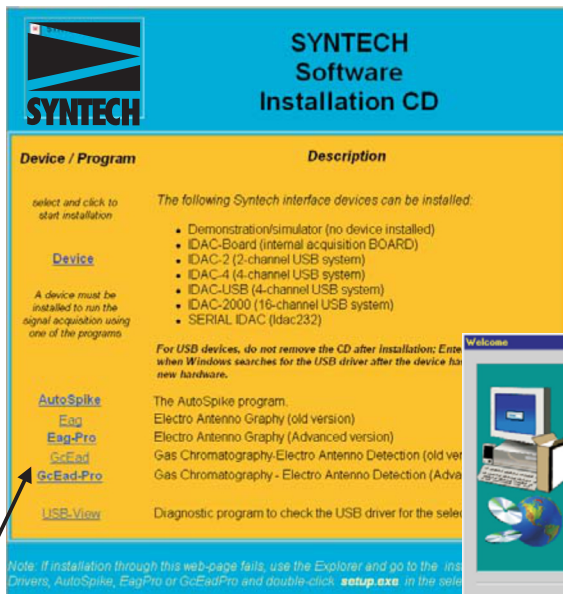
Installation menu



Select "IDAC-2"

Installation menu

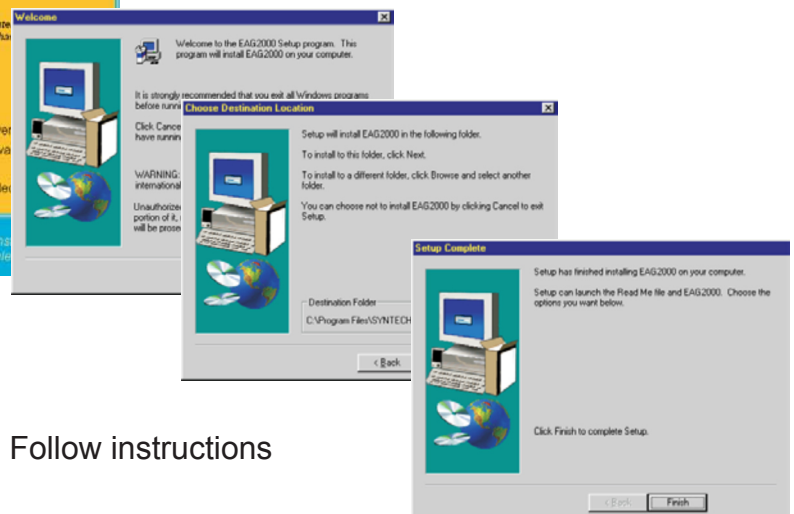
STEP  
2



Click on  
Program button

If Installation menu does not appear:

- 1) open Windows Explorer
- 2) go to CD directory
- 3) open Program directory
- 4) run the file "Setup.exe" in the program directory
- 5) follow the instructions



Follow instructions



## 2. DEVICE INTERFACE INSTALLATION

Apart from the USB driver, which handles the communication between PC and IDAC-2, software must be installed to control the functions of the IDAC-2 . This ' device interface' software is used by the signal recording programs (EAG and GC-EAD, and Autospike) to set the recording parameters and display options.

The device interface is installed as follows:

- 1) Insert the Syntech program CD.
  1. The CD starts automatically and the software installation MENU appears
  2. The CD does not start automatically; proceed as follows:
    - Run Windows Explorer
    - Select the CD station
    - Run the file: EsRun.exe (or Install.exe)
- 2) In the menu select ' Device'
- 3) In the device list select: IDAC-2
- 4) Follow the instructions

**If the installation menu does not appear:**

- 1) Open Windows Explorer
- 2) Select the CD station
- 3) Open the directory: ' Drivers'
- 4) In this directory activate the file: ' Setup.exe
- 5) In the menu select 'Device'
- 6) In the device list select 'Idac2'
- 7) Follow the instructions

**Note:** Each Syntech interface system (IDAC-2, IDAC-4, and IDAC-16) is controlled by a dedicated device interface. If another device is used on the same computer, both the USB driver (see previous section) and the device interface for that particular device must be installed. Only a single device can be running at the same time on the same computer, and the proper device interface must be selected. The USB driver for the device (once it has been installed previously) is automatically activated by Windows (these drivers are permanently stored in the Windows system directory).



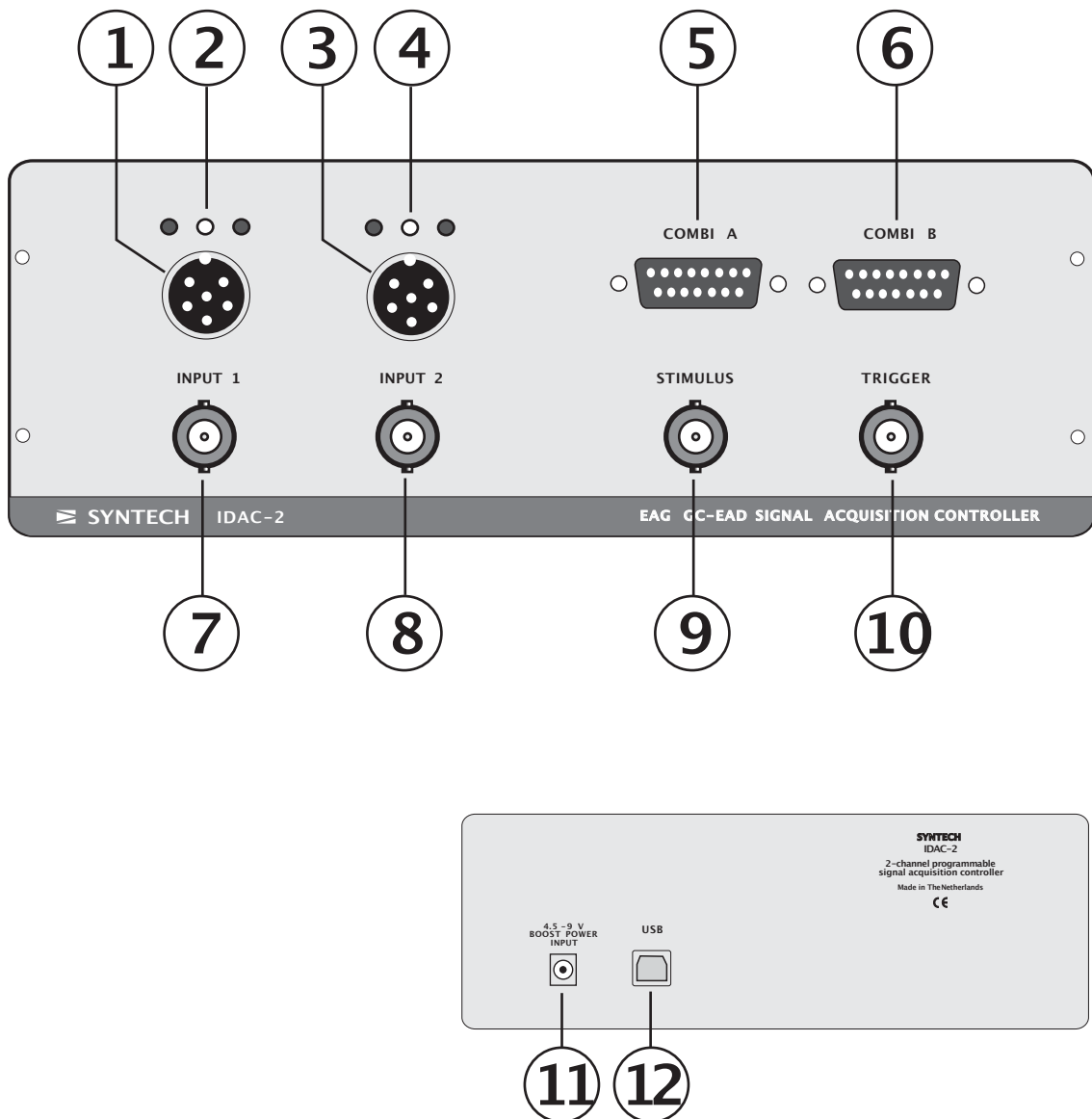
### 3. PROGRAM SOFTWARE INSTALLATION

- 1) Insert the Syntech program CD.
  1. The CD starts automatically and the software installation MENU appears
  2. The CD does not start automatically; proceed as follows:
    - Run Windows Explorer
    - Select the CD station
    - Run the file: EsRun.exe (or Install.exe)
- 2) In the menu select any of the programs (EAG, GC-EAD, Autospike)
- 3) Follow the instructions

If the installation menu does not appear:

- 1) Open Windows Explorer
- 2) Select the CD station
- 3) Open the directory with the program name
- 4) In this directory activate the file: ' Setup.exe
- 5) Follow the instructions

**Note:** Most of the programs can operate with all the Syntech interface devices: IDAC-2, IDAC-4, and IDAC-16. Only the proper device interface must be installed to run a certain interface.  
The programs recognize the connected device and adapt the setting options to the hardware features offered by the device connected.



## FRONT

1. Channel 1 signal input. For single or differential signals and power supply.
2. Signal indicator for channel 1. (Red LED: signal is out of range)
3. Channel 2 signal input. For single or differential signals and power supply.
4. Signal indicator for channel 2. (Red LED: signal is out of range)
5. Input for devices processing more than 1 signal
6. Same as 5.
7. BNC input for channel1; for single ended signals
8. BNC input for channel 2; for single ended signals
9. Input for 'Stimulus' signal ( positive going signal from stimulus controller, etc)

## REAR

10. Input for 'Trigger' signal (negative going signal, closing switch, etc)
11. Input for ' boost power' supply ( 9-15V, DC) In case the USB port of the PC does not provide sufficient power to run the IDAC-2. Central pin negative.

## SIGNAL CONNECTIONS

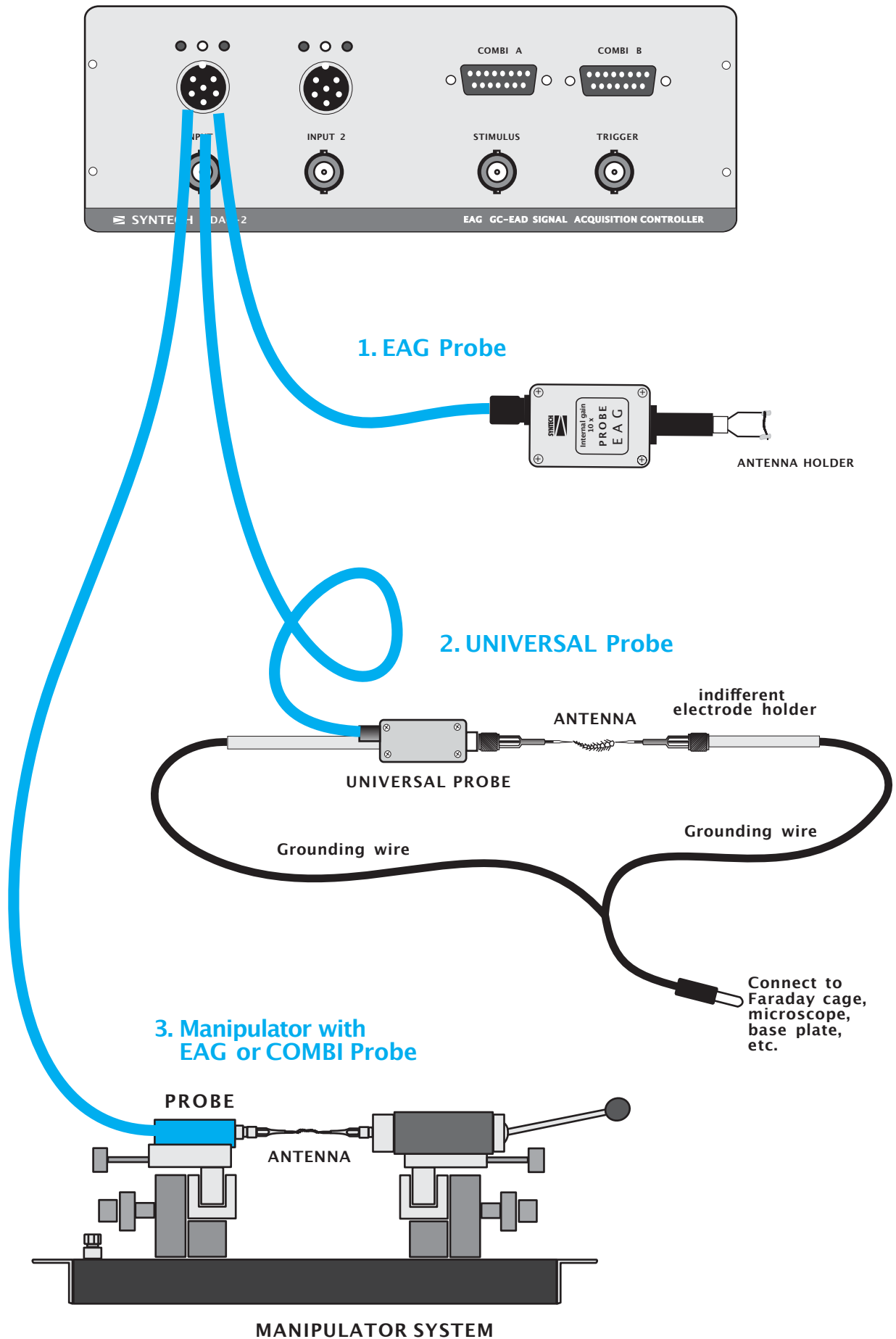
### FRONT RECEPTACLES

(bold numbers refer to the figure of the IDAC-2 )

1. Channel 1 universal signal input for 6-pin DIN connector. Provides single and differential signal inputs and power (+12 and -12 V) for active probes and transducers. Maximum signal range -5V to +5V.
2. Signal indicator for channel 1. Signal is within acceptable range: green LED lights; if the signal is out of range one of the red LEDs lights up.
3. Channel 2 universal signal input for 6-pin DIN connector. Provides single and differential signal inputs and power (+12 and -12 V) for active probes and transducers. Maximum signal range -5V to +5V.
4. Signal indicator for channel 2. Signal is within acceptable range: green LED lights; if the signal is out of range one of the red LEDs lights up.
5. Connector for devices processing two signals and/or trigger and stimulus signals in a single device. Provides also +12 and -12 V power.
6. Same as 5.
7. BNC input receptacle for channel 1. Only for single ended signals.  
This receptacle is connected in parallel with the + signal pin of the DIN connector above it.  
If a probe (or other input device) is connected to the DIN receptacle the + output signal of that probe is available from the BNC connector.
8. BNC input receptacle for channel 2. Only for single ended signals.  
This receptacle is connected in parallel with the + signal pin of the DIN connector above it.
9. Input for a 'Stimulus' signal. This input is normally zero (TTL low) and is activated by a positive (TTL High) voltage.
10. Input for a 'Trigger' signal. This input is normally +5V (TTL high) and is activated by a zero (TTL Low) voltage. This input is suitable to pick-up commands of a closing switch, like a pedal switch or the remote start command from a gas chromatograph.

### REAR RECEPTACLES

11. Input for 'boost power supply' : 9 - 15 V DC. In case the USB port of the PC does not provide sufficient power to run the IDAC-2 an external power supply (9- 15V DC) must be connected here.  
Note that the central pin is the NEGATIVE
12. USB receptacle.



## CONNECTING THE EAG INPUT DEVICE

### 1. EAG PROBE

The EAG probe does not require a special ground connection, as the input circuit is closed by the antenna mounted on the antenna holder between the two electrodes, one of which is the reference (ground) electrode, the other one the 'recording' electrode.

The probe contains a very effective filter against 50/60 Hz noise. The use of a Faraday shielding cage is not needed.

### 2. UNIVERSAL AC/DC PROBE

Connect the probe cable to the Channel 1 input of the IDAC-2.

The probe must be used with an indifferent electrode, and a connection must be made between the ground of the [robe and the indifferent electrode holder to complete the input circuit.

The mounting shaft of the probe serves as ground. A 2 mm miniature connector fits into the end of this shaft. The probe shaft must be connected to the same ground as the indifferent electrode. Both the probe shaft and the indifferent electrode are to be connected to the common ground of the set-up, usually the ground plane of a Faraday cage or metal shield.

This ground connection is very important, it is necessary for the establishment of a proper input circuit.

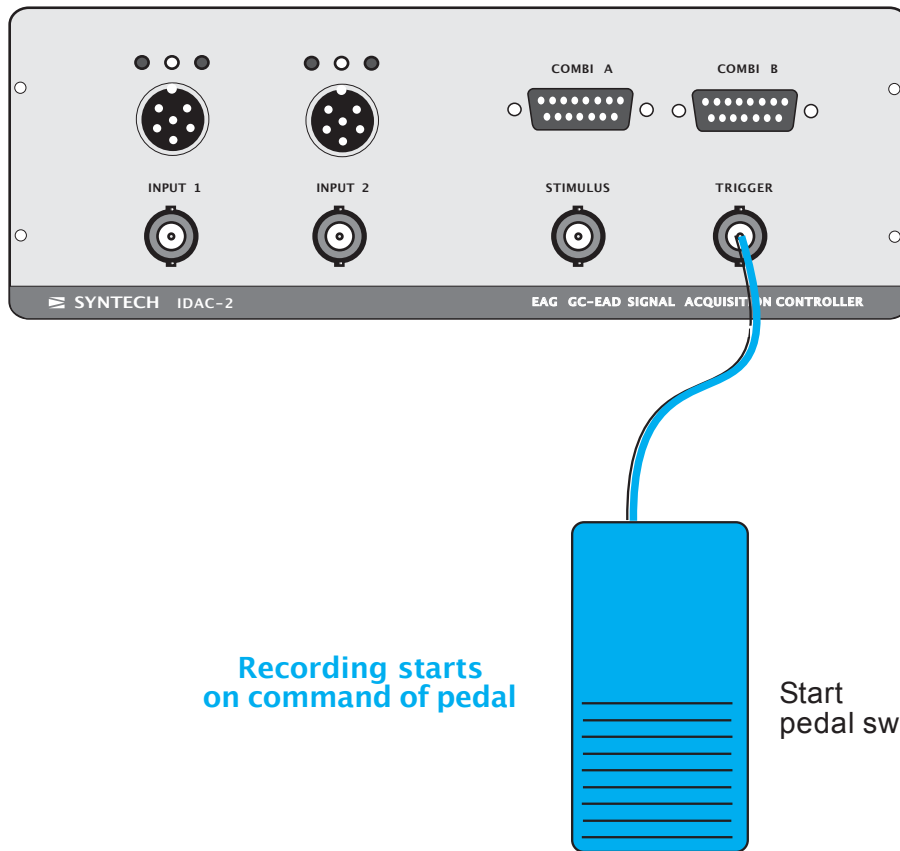
### 3. MICROMANIPULATOR SYSTEM MP-15 with COMBI EAG PROBE

The combi probe is used as the EAG probe.

When using glass pipette electrodes, the antenna is mounted between the electrode on the probe and the indifferent electrode.

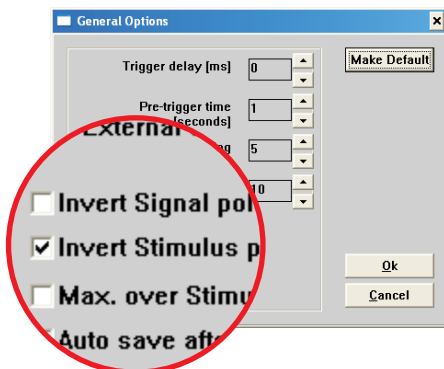
The input circuit is completed by the metal construction of the manipulator; no additional ground wiring is needed.

The noise filter in the probe makes a Faraday shield superfluous.



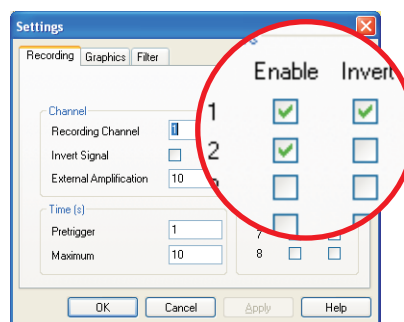
## Corresponding Settings for Digital Signals in Software: ( for EAG, EagPro, and GcEadPro)

Invert Stimulus polarity



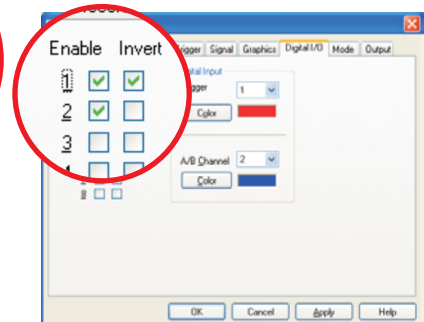
**EAG**  
(standard version)

Trigger  
1. Enable Invert  
2. Enable

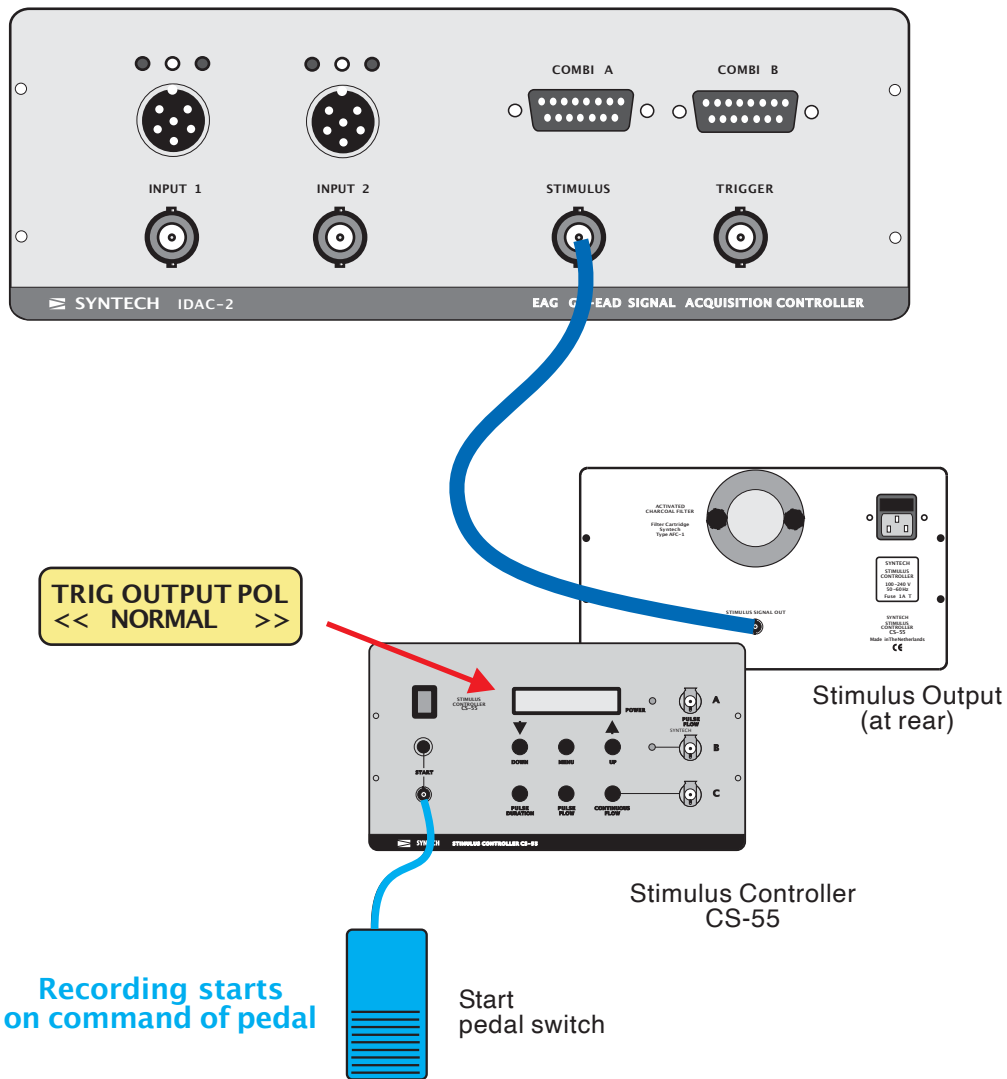


**EagPro**

Trigger  
1. Enable Invert  
2. Enable

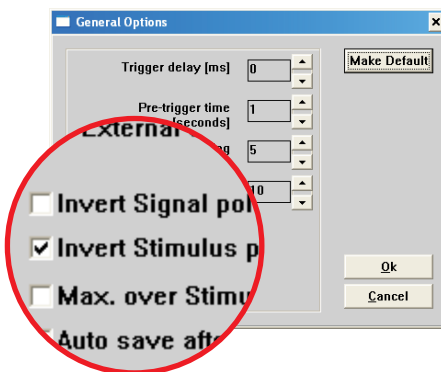


**GcEadPro**



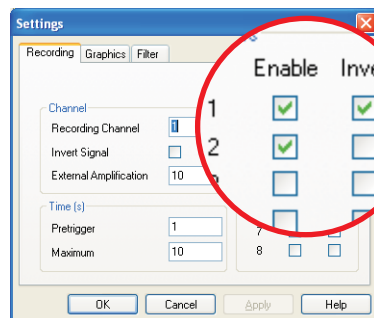
## Corresponding Settings for Digital Signals in Software: ( for EAG, EagPro, and GcEadPro)

Invert Stimulus polarity



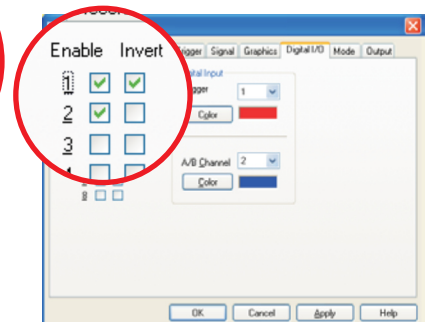
**EAG**  
(standard version)

Trigger  
1. Enable Invert  
2. Enable



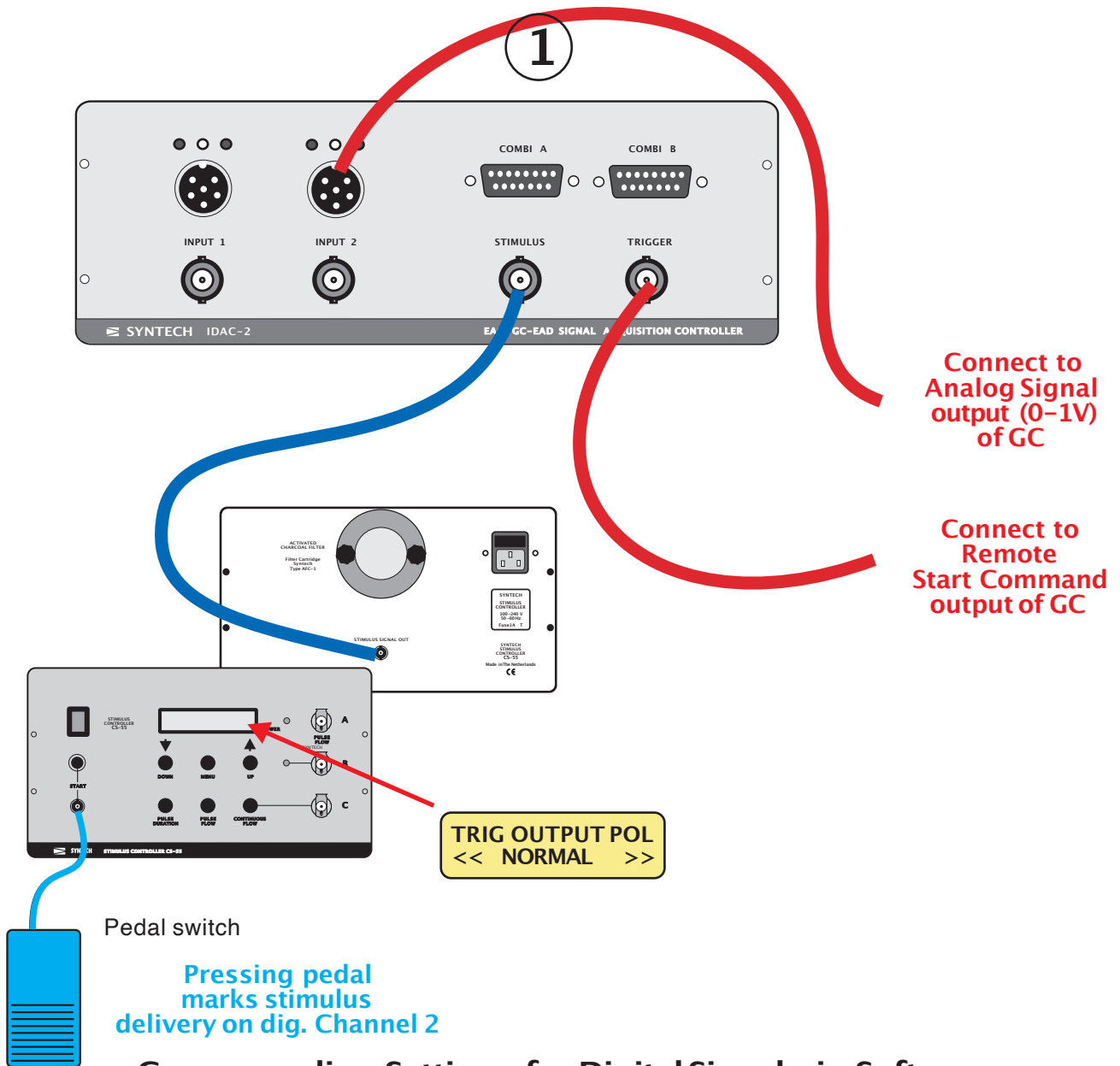
**EagPro**

Trigger  
1. Enable Invert  
2. Enable



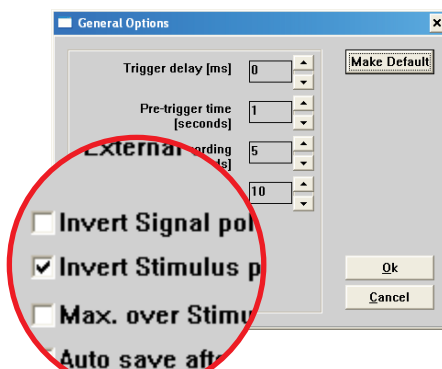
**GcEagPro**





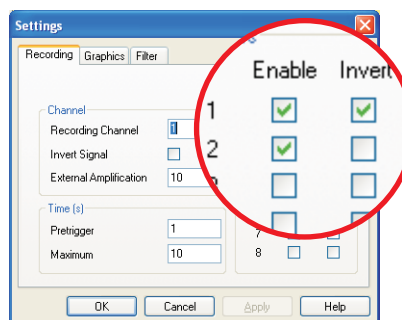
## Corresponding Settings for Digital Signals in Software: ( for EAG, EagPro, and GcEadPro)

Invert Stimulus polarity



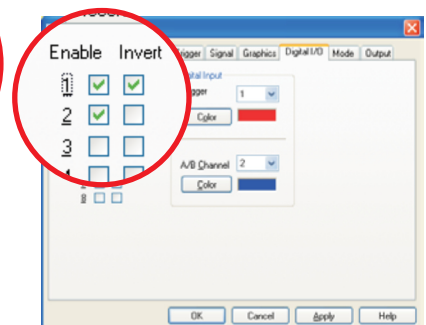
**EAG**  
(standard version)

Trigger  
1. Enable Invert  
2. Enable



**EagPro**

Trigger  
1. Enable Invert  
2. Enable



**GcEadPro**

## EAG RECORDING using the EAG Program

Activate the EAG program by a double click on the EAG icon.  
If an ERROR message appears check the following:

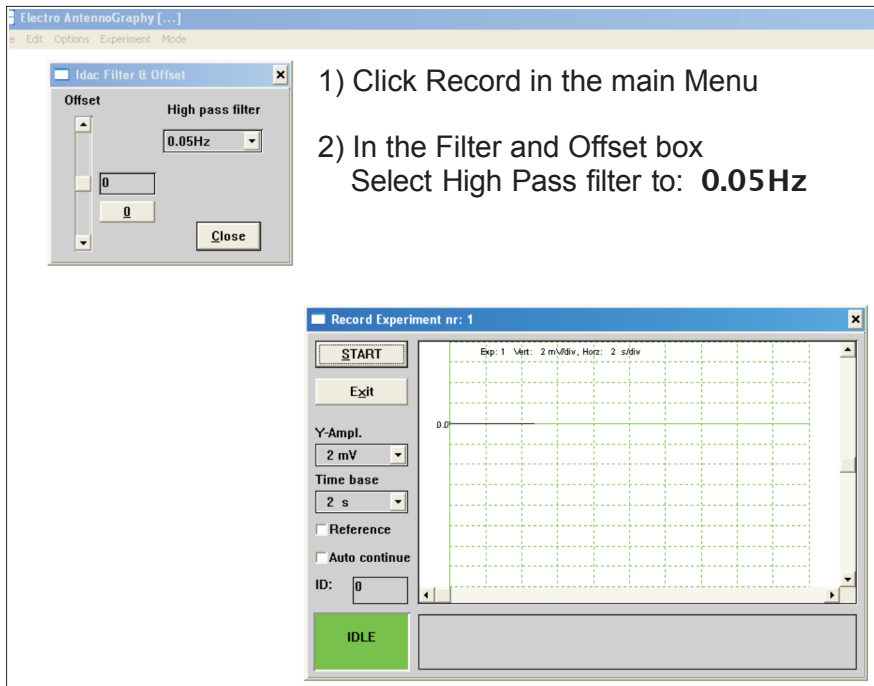
- \* Is the proper device (IDAC-2) interface software installed?
- \* Is the interface cable connected to the USB port of the computer?
- \* Is the boost power supply - if necessary - connected?

### GENERAL OPTIONS

Open the General Options dialog box under the OPTIONS menu.  
The following options can be changed:

<b>Pre-triggertime (seconds)</b>	This value determines how much of the signal before the triggercommand will be recorded. Set to 1.
<b>Max. Recording (seconds)</b>	This is the duration of the total recording, including the pre-trigger time. Set to 10
<b>External ampl. factor</b>	The gain of the external amplifier is entered here. If a <b>PROBE</b> is used enter the value <b>10</b> .
<b>Invert input polarity</b>	The polarity of the signal can be inverted; This function has to be used if the EAG signal is positive going instead of negative. Only a negative EAG can be properly evaluated by the software.
<b>Max. over Stimulus</b>	If this button is activated the software uses only the section of the EAG during the presentation of the stimulus for calculation of the maximum value. This option only works if the stimulus signal is recorded together with the EAG signal.
<b>Auto save after recording</b>	If selected each EAG is stored on the hard disk immediately after recording; this option prevents loss of data in case of a power failure during a recording session

## RECORDING SETTINGS EAG (standardprogram)

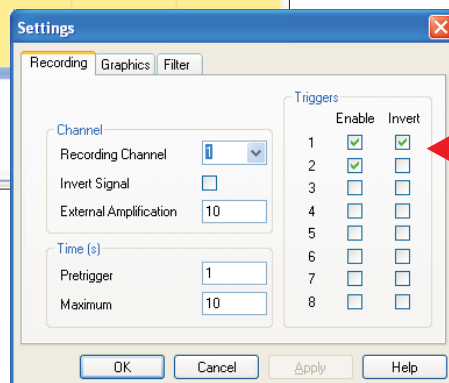
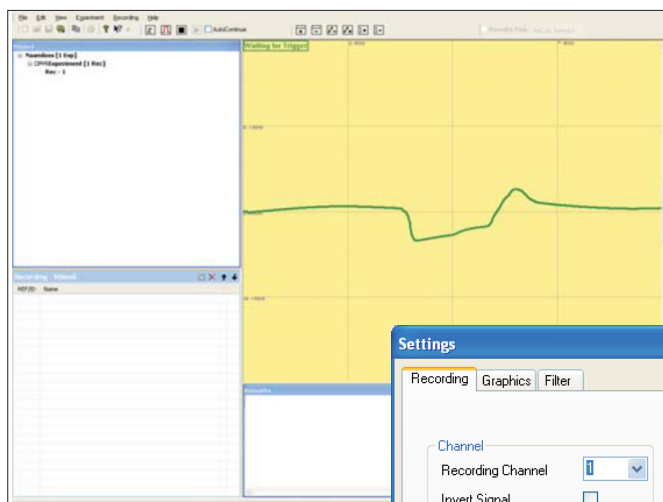


Only select DC if signal levels need to be recorded.

Use the offset slider to adjust the signal trace in the center of the screen.

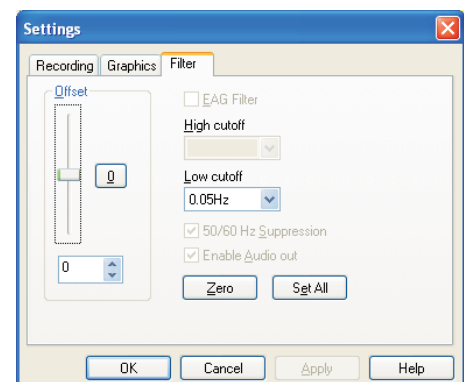
**For normal EAG recording do NOT select DC mode!**

## RECORDING SETTINGS EAG Pro (AdvancedEAG program)



**Set Trigger buttons as indicated !**

Adjust Maximum Time if required



## RECORDING

**Before recording** make sure that all electrical connections are properly made and that the stimulus delivery system is functioning. Prepare all test stimulus sources previous to the actual recording session and have a number of reference sources available.

Make fresh pipette electrodes and select an experimental insect. Connect the antenna between the recording electrodes and take care that the electrodes make a stable contact with the antennal tissue.

Connect a Syntech Probe to the probe receptacle

## RECORDING PROCEDURE

- 1) Select **Record** from the Experiment menu:

The **Record window** appears. There might be a signal trace visible, but this is not always the case as it depends on the initial settings.

Set the **High pass filter** at 0.05 Hz.

- 2) Adjust the **vertical scale**: start with a high value (10 mV) if no signal trace is visible.

Set the **Time base** on 1 (second)

- 3) Press the **Z -key** on the key board. Pressing this key bypasses the base line control circuit in the interface box and forces the signal to zero.

Now a trace should be written on the display.

- 4) Before presenting a stimulus **comments** can be entered in the comments area below the signal display screen. Move the cursor using the mouse to the right hand side of this area and start typing via the keyboard.

The comments are saved together with the experiment.

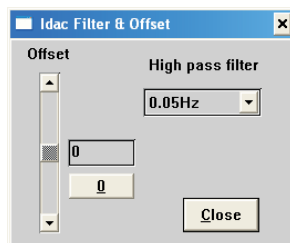
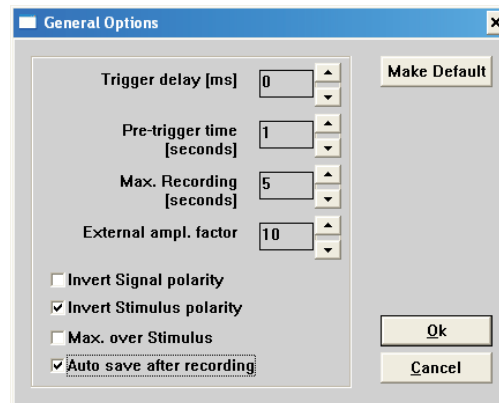
If the stimulus is a reference click the Reference button; also enter an Identification number (ID) if applicable. (These parameters can be also be entered or edited after the recording session in the **Entry Table**)

- 5) Select the stimulus source and bring it into position for application.

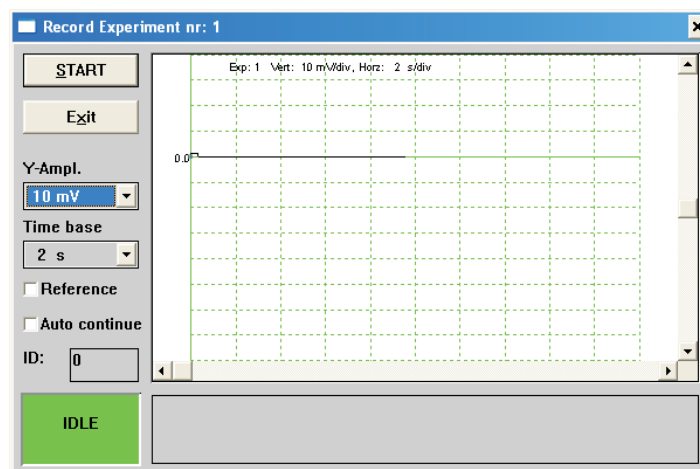


## GENERAL OPTIONS

For IDAC-2:  
Invert Stimulus Polarity



Set High pass filter at 0.05 Hz



6) Apply the stimulus.

This is done by activation of the **stimulus delivery system**, which produces a **trigger signal** or **stimulus signal** (depending on the type of system used). The Syntech Stimulus Air Controller, CS-55, is started by pressing a **pedal switch** to present the stimulus puff, and at the same time triggers the recording via the **stimulus signal** (if connected properly to the interface box). Note that due to the trigger signal the trace is automatically reset to the left side of the screen and also to the zero base line. Recording can also be initiated by clicking the **Start** button; however, the trace is only adjusted to zero properly if the Start button is pressed at exactly the same time as the stimulus is presented. Therefore, a delivery system provided with a trigger or stimulus output signal is highly recommended.

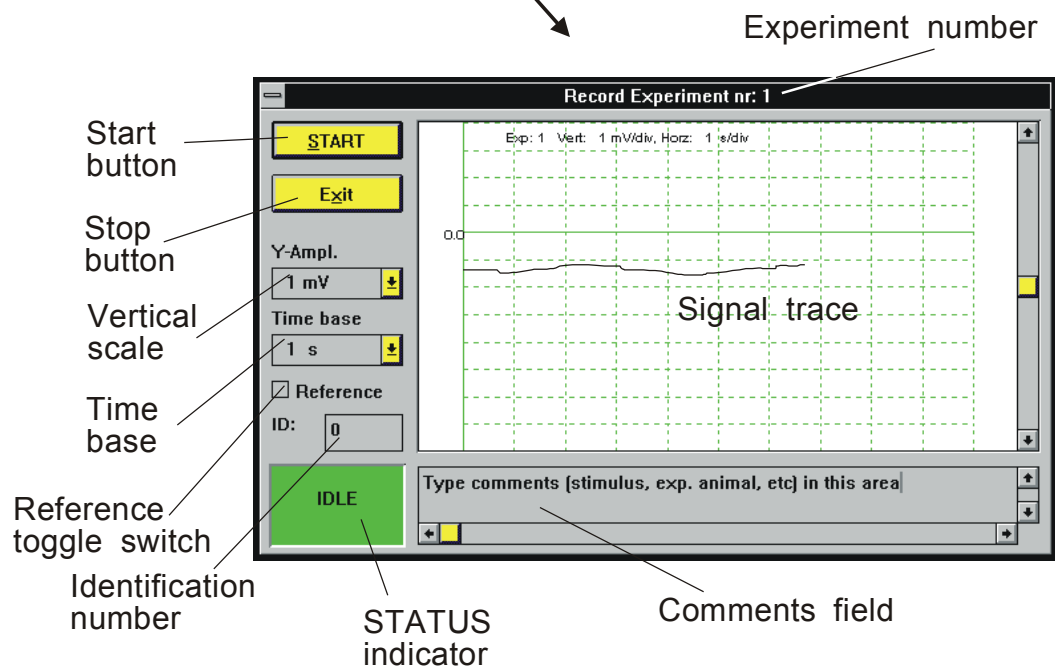
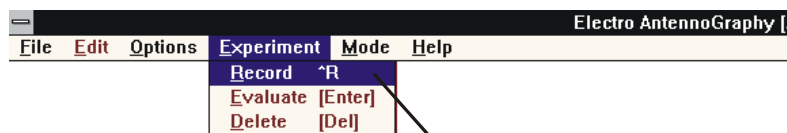
Recording **stops** after the time entered in the **General Options**. It can be terminated also using the STOP button.

7) After recording the trace can be **saved** or the recording can be **repeated** by clicking on **Redo**.

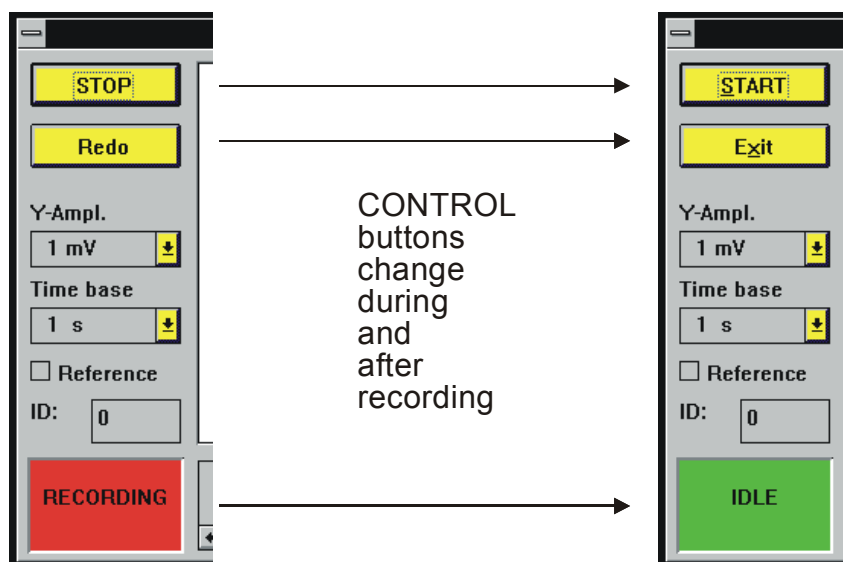
**Note 1)** The space-bar of the key board can be used to prepare the system for the next recording. Press the space-bar after each recording to accept the EAG trace and to prepare the screen for the next stimulus. This only functions properly if the last command of the mouse was performed on the Start button; if comments have been entered, or mV values and time base changed, the mouse cursor should be re-set to the start button first in order to enable the space-bar function again. For large series of routine recordings this option is advantageous, because only the space-bar has to be operated to save the previous recording and to prepare for the next.

**Note 2)** The recording session can be interrupted any time by clicking the **Exit** button. An overview of the previous recordings is presented by activating the **Graph** entry of the Mode menu. Maxima and **Normalized** graphs can be displayed also. The session is continued by activating Record (in the Experiment menu) again, and the session numbering is continued from the last recording.

8) The recording session is terminated by activating the **Save** or **Save as** command in the File menu.



## RECORD WINDOW



## CONTROL BUTTONS

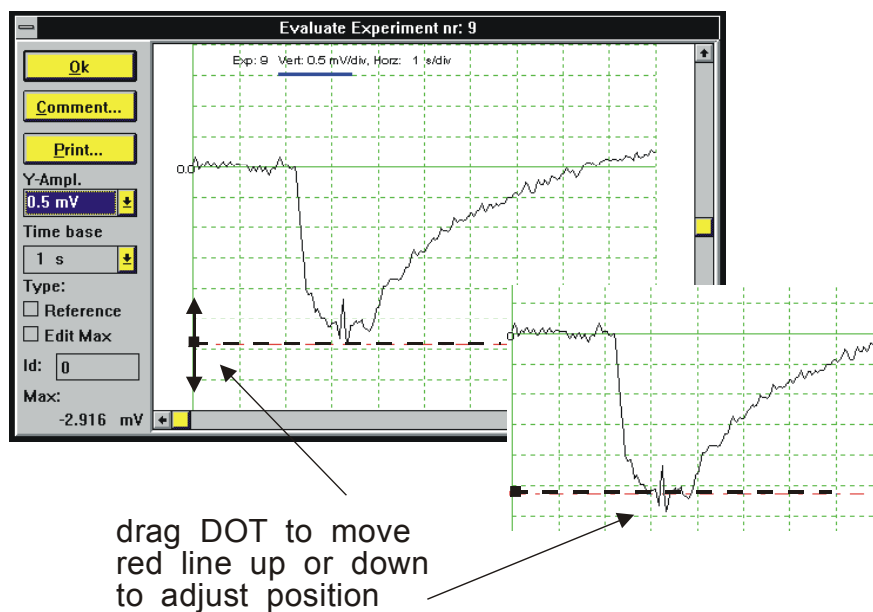


## REPLAY and EVALUATION

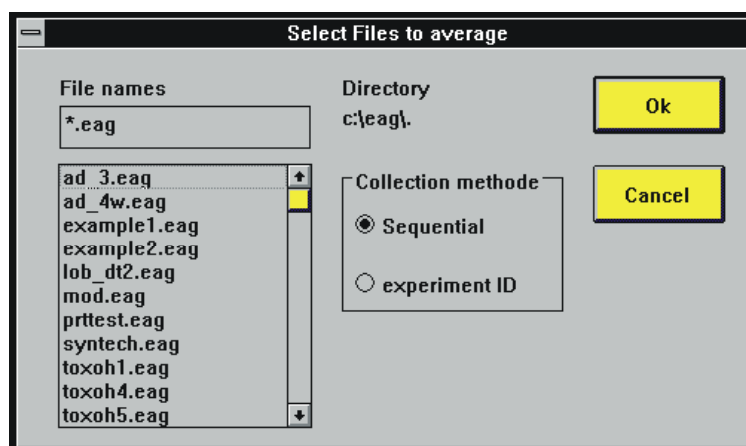
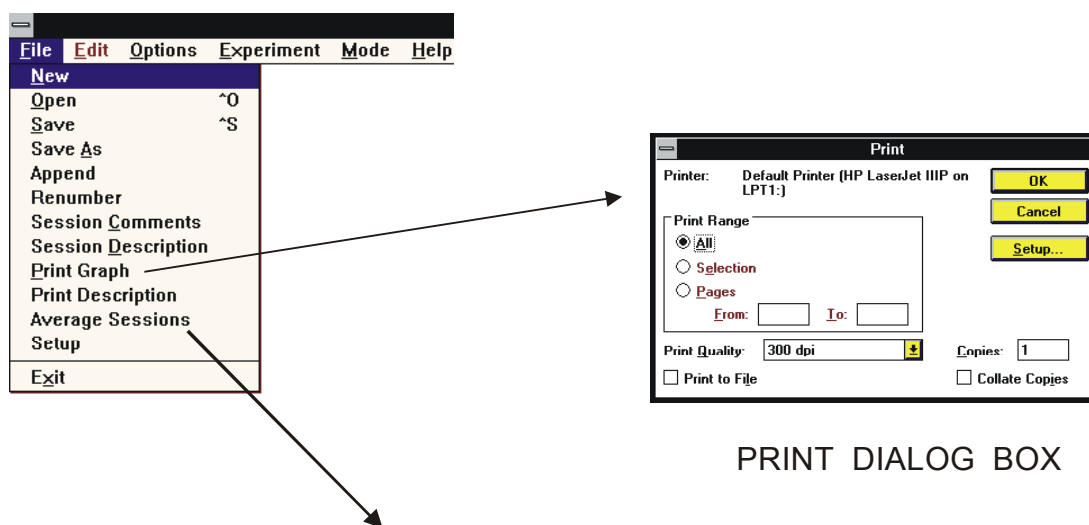
Recording sessions can be evaluated immediately after, or even during, recording, and after they have been saved on disk. Evaluation can also be done on a computer not containing the IDAC signal acquisition board, but with the EAG program installed.

Activate **Open** in the File menu to select a session for evaluation.  
The experiments can be presented in various ways as selected in the **Mode** menu:

- 1) As **graphs**. This mode displays an overview of all recordings in a session. The size, and consequently the number, of graphs on the screen is selected in the **View Option** dialog box (see figure) by entering the number of columns in which the individual EAG traces are to be displayed on a single screen.  
Each **individual EAG** recording can be selected for **full screen display** by a double mouse click on the selected graph, which is marked by a frame if selected. Comments, mV and Time base can be changed in this mode without affecting the stored numerical data.
- 2) **Maxima**. Shows a bar graph of the maximum (negative) EAG deflections in mV. The "colour" (only black and white colours and hatchings are used) is determined by the Identification Number (ID), which is entered in the Record window or in the Entry Table. Recordings marked as **References** (either in the Record window or in the Entry Table) are **black**.
- 3) **Normalized**. Shows a bar graph of the normalized values in % of the reference, which is by definition set at 100%. References are shown as black bars. Normalized values can only be calculated if at least two references are measured (if not an Error message is presented).
- 4) **Entry Table**. This table presents the recordings in numerical order with the Identification number (**Id** number) and the quality (**Ref, yes or no**) together first characters of the **Comments** text. All parameters are editable by selecting the row with the mouse and using standard Windows editing operations. Modifications are effective on all other applicable windows.
- 5) As a **List**. The values for Maximum and Normalized EAG traces are available as a numerical list. This list can be transferred to the Windows **clipboard** for use in other programs, or it can be printed directly. The List is presented on command of the **List** selection in the **Option** menu.



EDITING of MAXIMUM VALUE



6) In **ASCII** format. Data of a session can be exported in ASCII format using the **Save as..** command in the File menu, followed by selecting **ASCII data**.

(**\*.asc**) in the **Save File Type:..** selection box. This operation saves all recordings as digital data resulting in a rather long data file. The **Reduced data (\*.dat)** format does not save the original EAG traces but only the data belonging to the Maxima and Normalized graphs resulting in a considerably shorter file.

## EDITING MAXIMUM

The maximum (negative) EAG deflection is automatically measured from the stored EAG trace. The lowest value in an EAG trace is determined and presented as Maximum EAG value. However, this is not always correct, especially if the EAG signal is distorted by **noise** and the software selects to lower noise peak. The maximum value as determined by the program can be manually edited in the **Evaluation screen** by dragging the maximum indication line (dotted red line with a black dot at the left side) using the mouse. This action is immediately followed by a change in the numerical mV display box and all other tables and data are updated.

To “**undo**” the editing operation click on the **Edit Max** button to restore the original value.

## PRINTING

**Graphs** presented in any **active window** can be printed immediately.

Activate the desired display by selecting the appropriate window and select **Print Graph** from the File menu. The standard Windows print dialog appears, in which printers can be selected and options adapted.

The **List** can be printed directly using the Print button in the List window.

**Session Comments** are printed below each print-out.

**Session Description** text can be stored and printed separately.

## APPEND

This command allows sessions to be combined. It is useful if a session has to be interrupted , but continued later. In order to retain consistency of the data the same reference should be used in files that are appended.

## RENUMBER

**Deleting** a selected **experiment** using the **Delete** command in the Experiment menu does not affect the **sequential numbering** of the remaining recordings. The session can be renumbered in continuous order using the **Renumber** command. Do **not** renumber files that are to be averaged on numerical order.

## AVERAGING SESSIONS

Maxima and Normalized data of stored sessions can be **averaged** and **mean** values with **standard error** calculated and displayed.

The files for averaging are selected by clicking on the appropriate file names in the file list.

Averaging can be done on **sequential number**, or by collecting values from recordings with the same **Identification Number** (if applicable). The latter method enables presentation of stimuli in random order if each stimulus is characterized by an explicit identification number.

Averaging requires some degree of standardization of recording sessions.