TASTEPROBE
Type DTP-1

Pre-amplifier for recording from contact chemosensilla

INSTRUCTIONS

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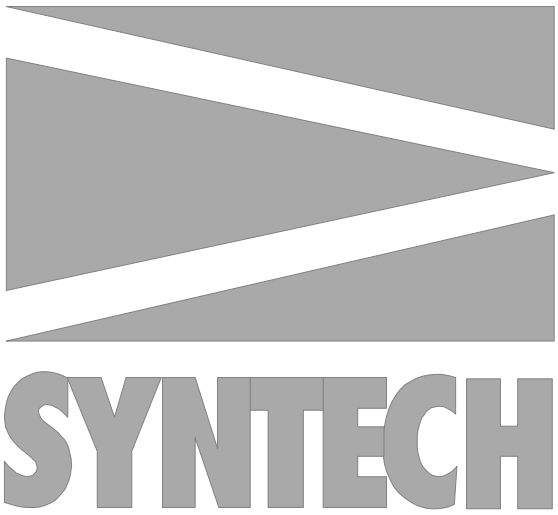

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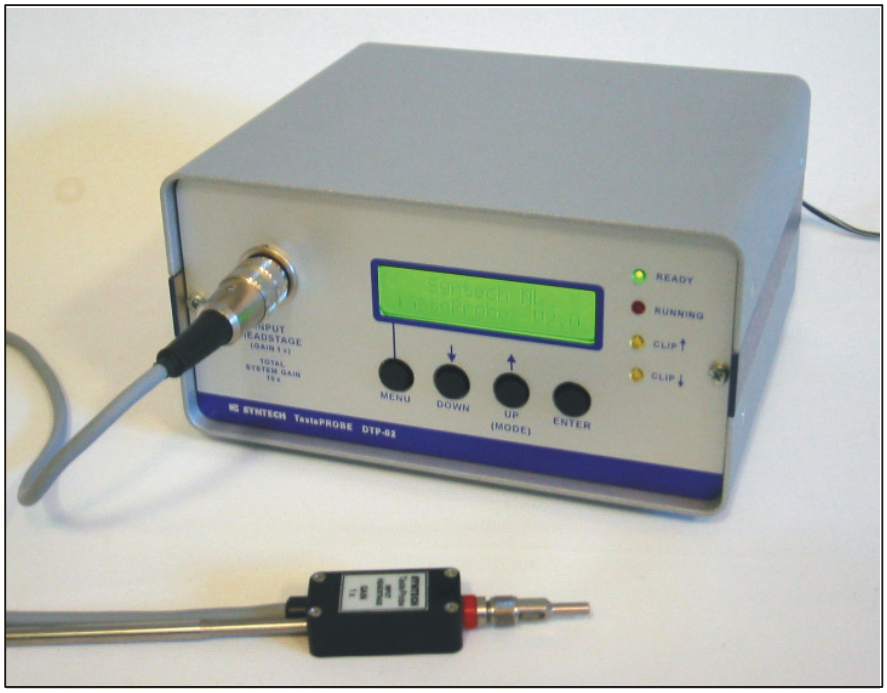

TastePROBE

Type DTP-1

with high input impedance headstage and electrode holder

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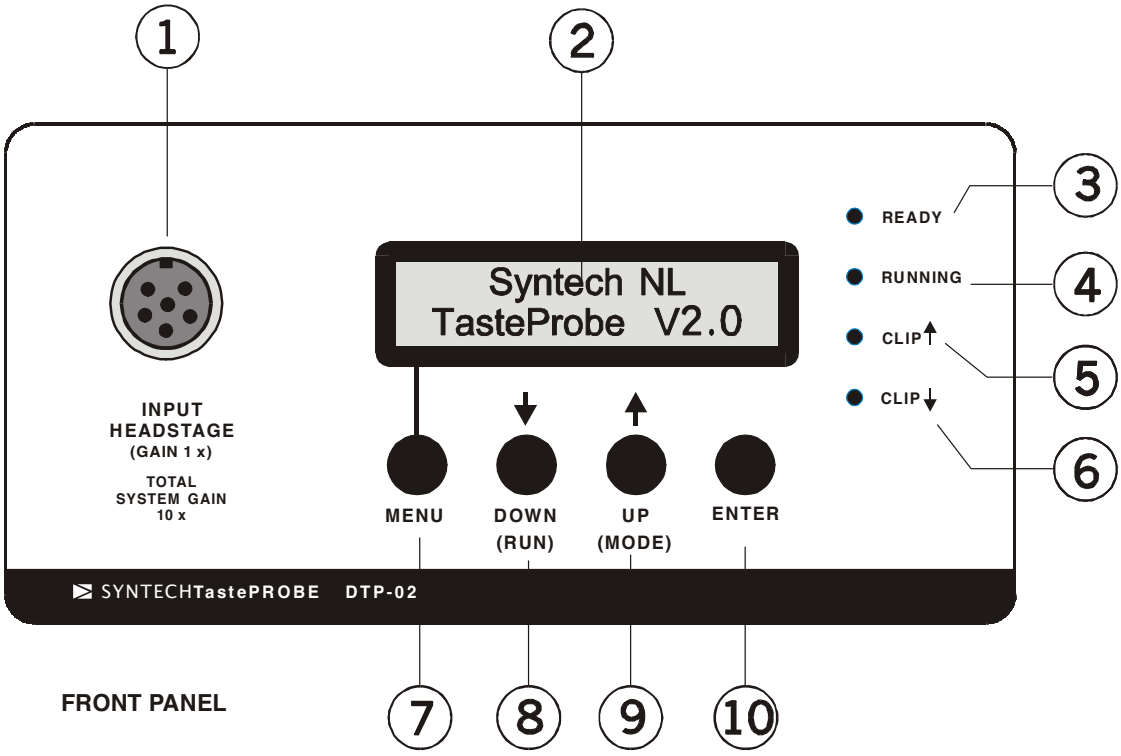

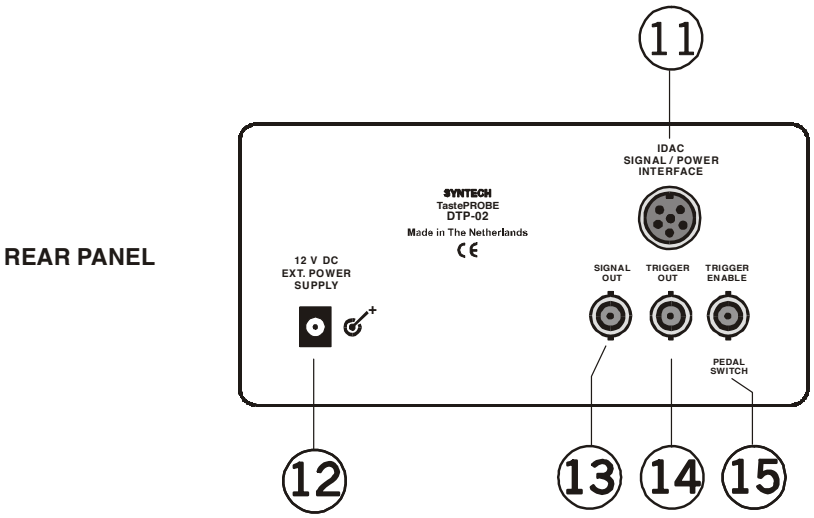

Fig. 1 TASTEPROBE FRONT and REAR PANEL

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INTRODUCTION

The SYNTECH Tasteprobe, Type DTP-1, is a further development of the prototype of the special amplifier described by Marion-Poll and Van der Pers (1996) that permits reliable DC recordings from insect taste receptors using the Hodgson (1955) technique.
The present model can operate in DC or in AC mode. In DC mode the complete signal, slow (DC) and fast (AC) fluctuations are recorded and amplified. In AC mode the slow (DC) fluctuations are out-filtered and only the fast (AC) components of the signal (like Spikes) are amplified. In both recording modes the DC initial offset at the onset of the recording (before contact is made between the recording electrode and the preparation) is cancelled automatically.

DESCRIPTION

(The numbers refer to the encircled numbers in Fig. 1)

FRONT PANEL

1 Input receptacle for the headstage (Probe) containing the high input impedance pre-amplifier. The pipette electrode holder is mounted directly on the headstage.
2 Display showing the settings and the modes of operation
3 LED indicating the 'ready' status of the device
4 LED showing the 'running' status
5 LED indicating a positive over-voltage at the input
6 LED indicating a negative over-voltage at the input
7 MENU button
8 Selection button ; also: ENABLE button
9 Selection button ; also: PASS-THROUGH operation
10 Enter button to leave the menu and to return to ready

REAR PANEL

11 Receptacle to connect the Tasteprobe with a Syntech IDAC interface
12 12 V Power input (not needed with Syntech IDAC interface)
13 Signal output (10 x amplified)
14 Trigger signal output
15 Enable switch (pedal switch) input

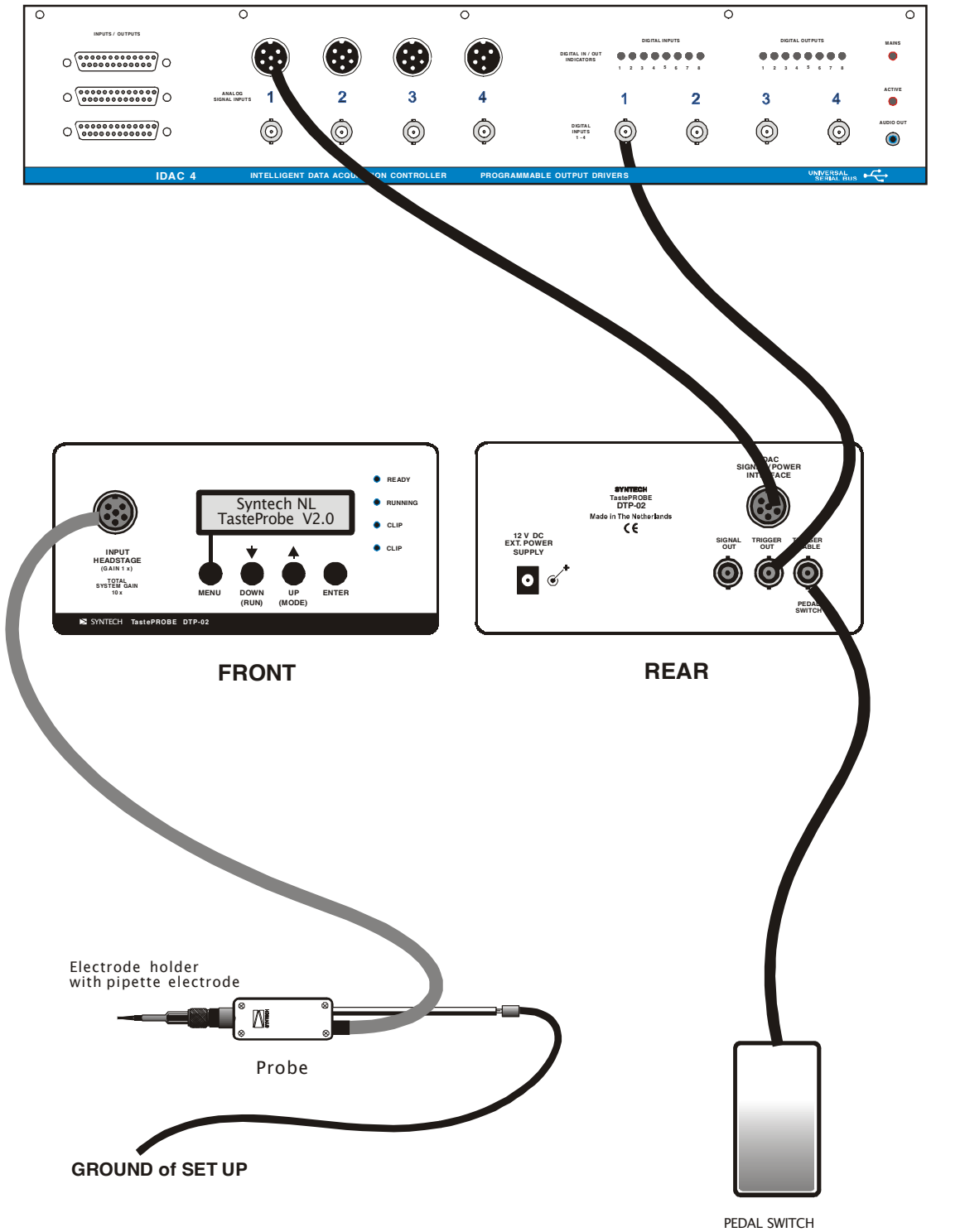

Fig. 2 CONNECTIONS FOR USE WITH SYNTECH IDAC-4

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OPERATION

USING THE INITIAL SETTINGS

The instrument can be operated without changing the settings as entered by the manufacturer. These setting are suitable for a first test and to become familiar with the system.
After the device has been connected the settings can be checked by pushing the MODE button repeatedly; push ENTER to return to the READY state.

CONNECTIONS to Syntech USB-IDAC (Fig. 2)

1 Connect the **headstage** (probe)
2 Connect the **pedal switch**
3 Make the connection between the **IDAC interface** using the special cable supplied (see figure). Connect to the Analog 1 input of the USB-IDAC (Fig. 2).
(Power is supplied by the USB-IDAC through this cable).
4 Make the connection for the **Trigger :** connect the Trigger out at the rear of the Tasteprobe to the Digital 1 input of the USB-IDAC.
5 Configure the **Autospike** program to record at least Channel 1, enter the ext. ampl. factor to **10**; set the high Filter at **3000 Hz**, the low Filter to **100 Hz**, and set the Digital channel 1 to **trigger** at the highest sample rate (Fig. 7).
Connect an **Audio monitor** amplifier to the Audio output of the USB-IDAC, and enable the Audio output for Channel 1 (Fig. 7).

CONNECTIONS to any DATA ACQUISTION SYSTEM (fig. 3)

1 Connect the **headstage** (probe)
2 Connect the **pedal switch**
3 Connect the **SIGNAL OUT** receptacle at the rear of the Tasteprobe to an analog signal input of a suitable **DATA ACQUISITION** system.
4 Make the connection for the **Trigger :** connect to the **Trigger out** at the rear of the Tasteprobe to the trigger input of the DATA ACQUISITION system
5 Provide the **12V power** at the rear of the Tasteprobe using a suitable power supply (12 V DC, regulated ; min. 200 mA)
6 Configure the Data Acquisition software for recording of the analog signal, and select a NEGATIVE trigger input. (If only a Positive trigger input is available, change the Trigger setting in the Tasteprobe menu to Positive (Fig. 6).

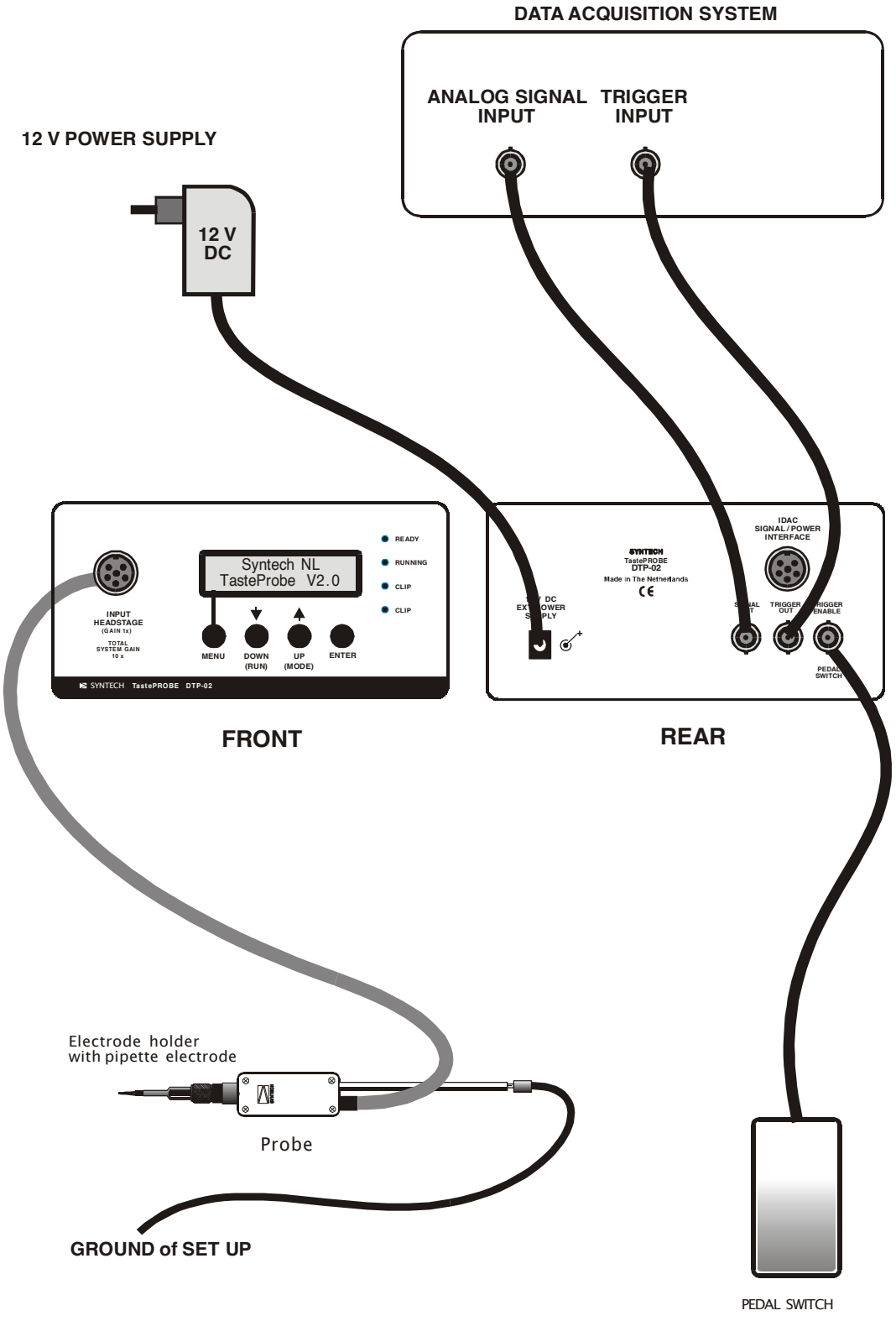

Fig. 3 CONNECTIONS FOR USE WITH DATA ACQUISITION SYSTEM

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INPUT CONFIGURATION (Fig. 4)

7 Prepare the **pipette electrode** (Fig. 5).
8 Select and prepare a suitable **insect preparation**.
Connect the preparation to the central (common) **GROUND** of the recording set up.
9 Connect the shaft of the headstage also to the central **GROUND**
10 Connect the Faraday cage and other metal devices to the central **GROUND**

PASS-THROUGH RECORDING

11 Start the Syntech **Auto spike** program.
Check the Recording properties and the Filter settings (Fig. 7)
or start another suitable **Data Acquisition** program.
12 Press the **ENTER** button of the Tasteprobe.
The **READY** Led should go ON.
13 Check the **baseline** on the display of the recording system.
Adjust the vertical **scale** (sensitivity) of the recording display between **1 mV - 10 mV**.
14 Press the **UP (MODE**) button:
The Tasteprobe is now in **PASS-THROUGH** mode.

In this mode the system operates as a normal 10x amplifier.

15 Establish **contact** with the preparation.
Record the resulting signal trace.

If the data acquisition system and software settings all are properly adjusted the signal from the preparation should be visible on the signal display.

*The characteristics of the recorded signal should be the same as expected from a **normal 10x amplifier** with a high-pass filter of 100 Hz.*
***Offset** voltages are **NOT compensated** in the PASS-THROUGH mode! (Signals from taste sensilla may NOT come through!)*

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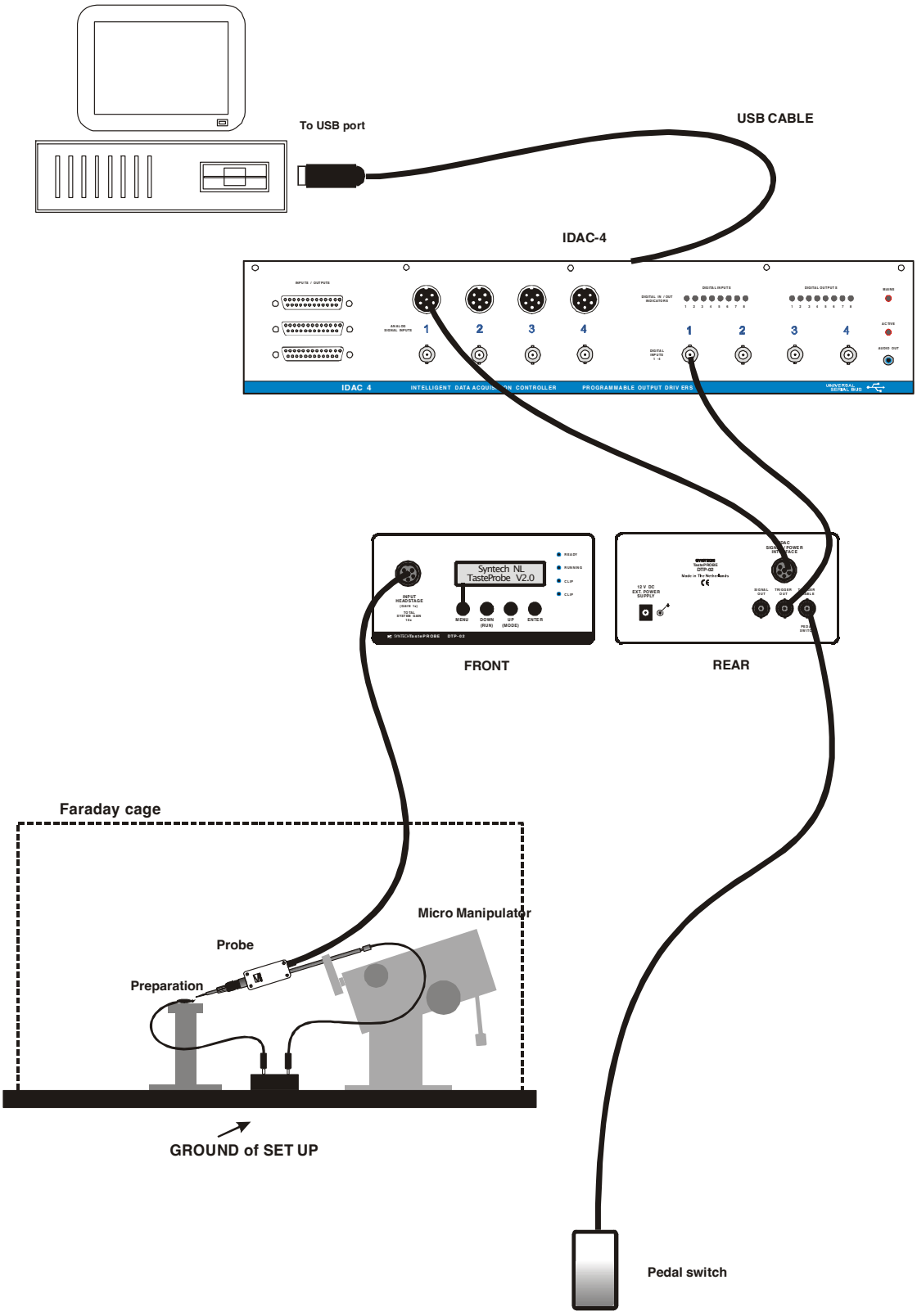

Fig. 4 GENERAL RECORDING ARRANGEMENT

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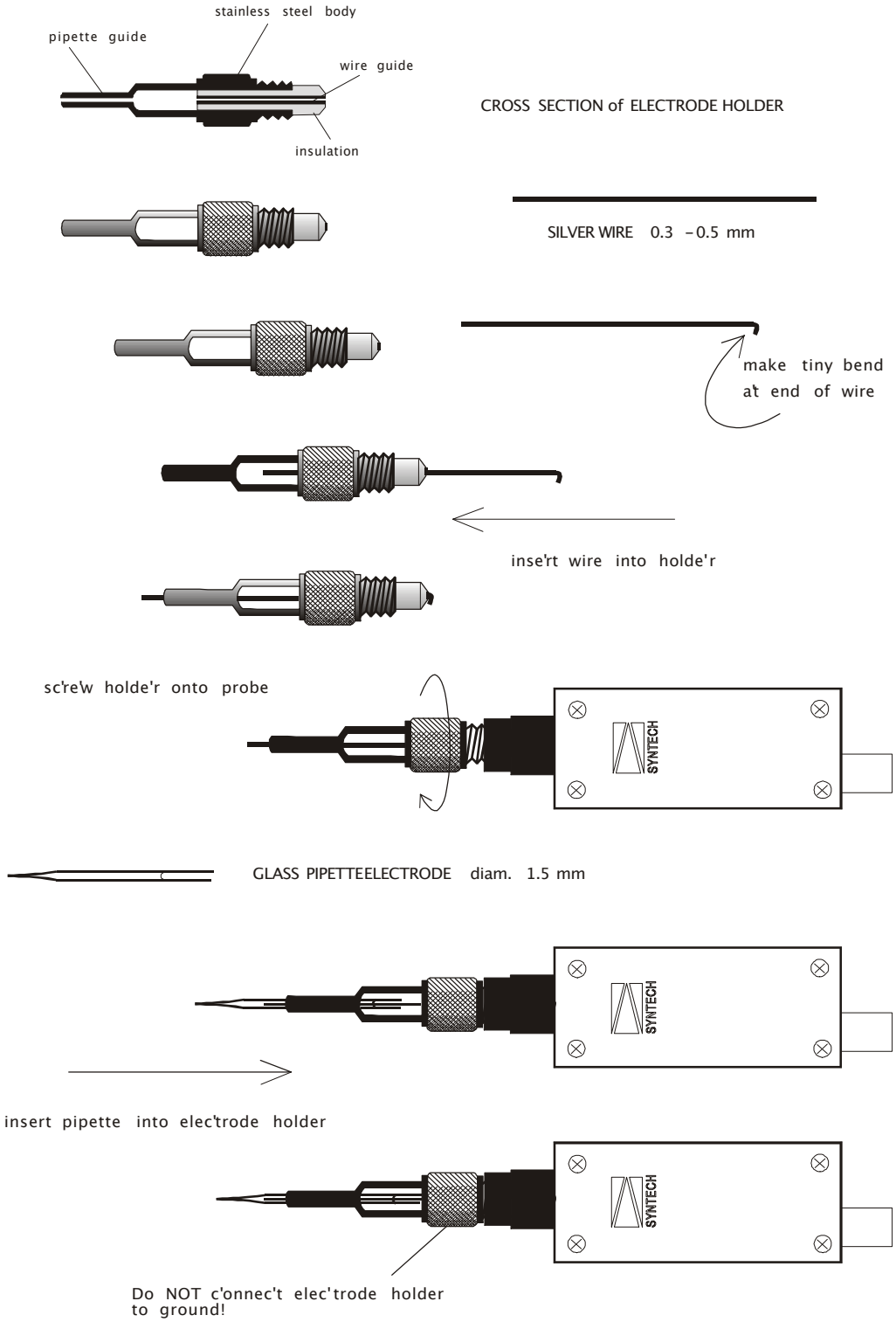

Fig. 5 Electrode Preparation

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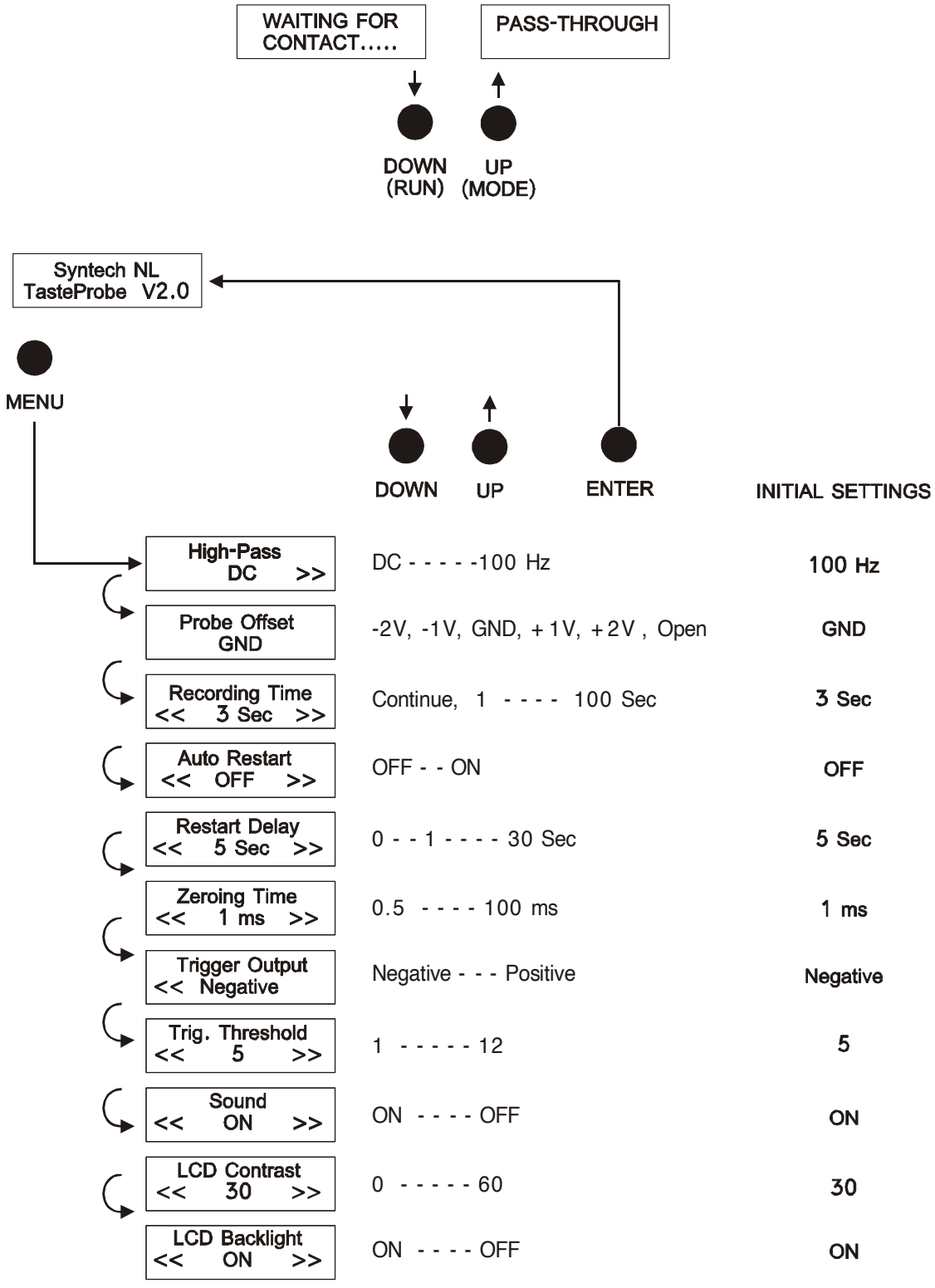

Fig. 6 MENU OPTIONS and SETTINGS

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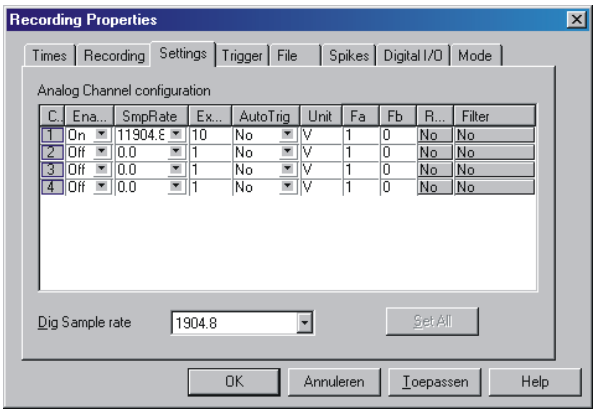
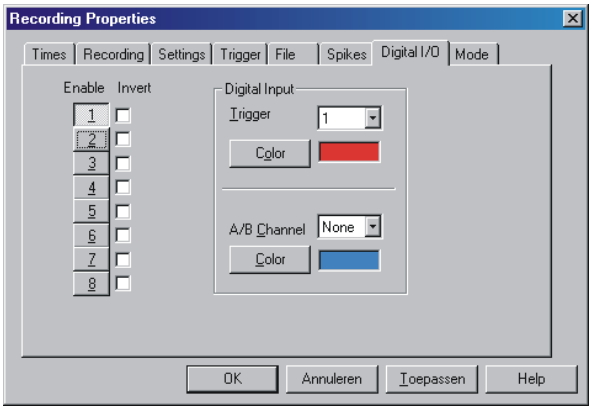
Recording Properties / Settings



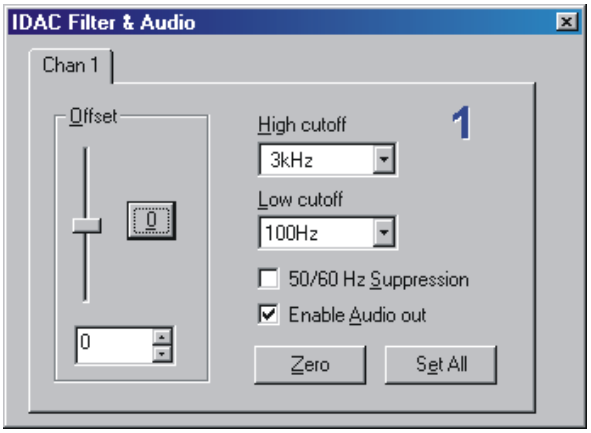
* Enable Channel 1
* Select Sample rate at 11904 or higher
* Set External Amplification to 10
* Set Digital Sample rate at 1904 (the maximum)

Recording Properties / Digital I/O



* Enable Channel 1
* Set Trigger to input 1
* Set A/B Channel to None

Filter Settings



* Set High cutoff at 3kHz
* Set Low cutoff at 100Hz
* Enable Audio out

Fig. 7 AutoSpike RECORDING and FILTER SETTINGS

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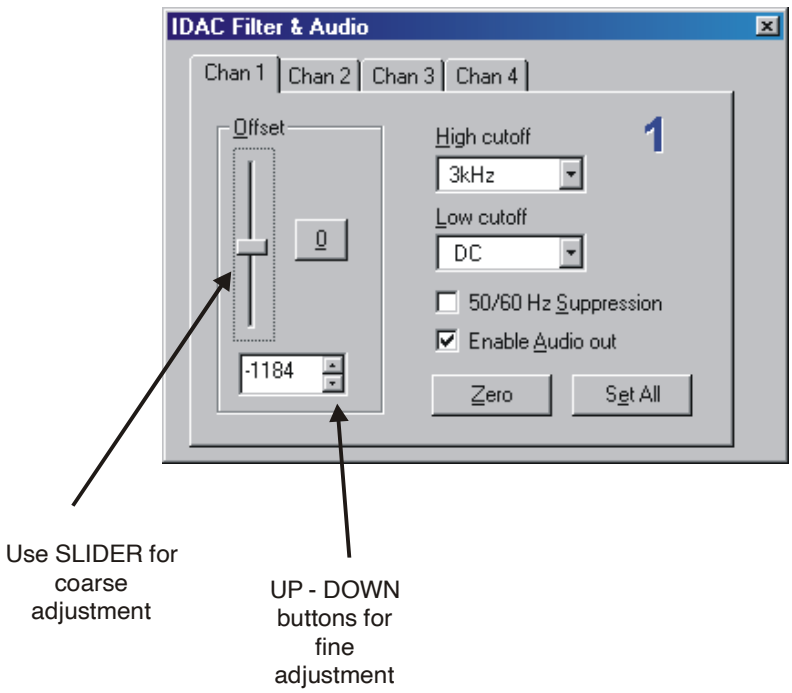
Filter Settings



* Set High cutoff at 3kHz
* Set Low cutoff at DC
* Enable Audio out

Fig. 8 AutoSpike FILTER SETTINGS and OFFSET CONTROL for DC RECORDING

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NORMAL (Offset-compensated) RECORDING

16 **Disconnect** the pipette electrode from the preparation
17 Press the **ENTER** button (The READY Led goes ON) if needed.

This is only necessary if the system is NOT already in the READY state.

18 Press the **PEDAL SWITCH** (or the DOWN (RUN) button).

The display now shows**: WAITING FOR CONTACT...**
and the **RUNNING** Led is **blinking**

*It is possible that the **RECORDING** is triggered, indicated on the display and by a **BEEP.** If this is the case, the TRIGGER threshold must be increased.*
*Press the **MENU** button several times until the **Trig. Threshold** appears; use the **UP** button to increase the value (max. is 12;Fig. 6)*

19 Make **contact** with the preparation.

A **BEEP** should be audible, and the display shows **RECORDING,** indicating that the ***offset has been compensated*** and the recording is started. During recording the **RUNNING** Led is ON.
The display counts down the recording time (in seconds) and the **end** of the recording time is indicated by another **BEEP**.

*If **NO Beep** is produced, and the system does **NOT** go into the Recording state, the **TRIGGER threshold** might be **too high**; Decrease the Trig. Threshold in the appropriate MENU box **(Fig. 6**).*

The system returns to the READY state automatically.

20 Check the recorded signal on the display of the signal acquisition system used.
Adjust scale and timing values if necessary

21 To make **another recording** disconnect the electrode from the preparation, and press the **PEDAL** switch (or the DOWN (RUN) button) just before making contact again.

DC RECORDING

For DC recording it is necessary to set all signal conditioning circuits in DC mode and to adjust the output baseline level exactly to zero.
The signal may contain large DC fluctuations; therefore, the signal recording interface (Syntech IDAC or any other acquisition system) output scale should be adjusted accordingly (10 - 20 mv) .
If full DC recording results in too large fluctuations the signal can be filtered (High-Pass 0.1 Hz - 10 Hz; see Fig. 6) until the signal fits in the recording amplitude window. The DC component of the signal is stronger suppressed at higher filter values.

For DC recording, the following settings and adjustments must be made:

* In the Tasteprobe: **High-Pass : DC** (Fig. 6)
* In the IDAC Filter settings**: Low cutoff: DC** (Fig. 8)
  The filter settings in any other acquisition system must be set to DC
* Set the signal display scale to 10 or 1 mV and bring the signal trace to the zero level (Fig. 8)

Operation of the Tasteprobe in DC mode is otherwise the same as for AC recording (steps **16- 21**)

ZEROING TIME

In DC recording the signals may show large irregular fluctuations at the onset , which are a result of instabilities during the initial contact with the sensillum. These large fluctuations may be suppressed by increasing the **ZEROING TIME**. However, any actionpotentials generated during the zeroing time will not be recorded. Therefore, the zeroing time should be as short as possible.

PROBE OFFSET and TRIGGER THRESHOLD

Normally the Probe Offset (Fig. 6) is kept at ground (= zero) potential by a shunt resistor of 1 Gohm inside the headstage.
This offset voltage can be adjusted from -2 to +2 V (Fig. 6) to test the sensitivity of the preparation to input offset transients or the improve the activation of the trigger. The input may also be left in the open state.

The **trigger threshold** is adjustable in 12 steps, and should be adjusted such that no 'false triggering' occurs before the pipette has been brought in contact with the preparation, but that the trigger does respond immediately after contact has been made.
The trigger can only be activated in the WAITING FOR CONTACT.... state.

AUTOMATIC INITIALISATION (AUTO RESTART)

It is not always necessary to use the pedal switch to enable the WAITING FOR CONTACT... state. If the recording situation is free of interference and there is no risk for activation of the trigger before contact has been made, or if repeated contact need to be made, the Tasteprobe can be set to **Auto Restart** by changing the appropriate setting (Fig. 6)
In the Auto Restart mode the system automatically returns to the WAITING FOR CONTACT.... after an adjustable delay. The delay can be entered in the Restart Delay box (Fig. 6). During the restart delay time the trigger cannot be activated, and the count-down time is indicated by a BEEP every second.
A few seconds before the end of the restart delay time the beep rate is increased.
The restart delay time allows replacement of the pipette without the risk of 'false triggering'.
For repeated stimulations the delay time can be set to zero.

TRIGGER OUTPUT

The trigger output is a TTL signal, which changes either from Low (0) to High (5V) during the recording time if set to Positive, or from High (5V) to Low (0) if set to Negative (Fig. 6).

The Syntech USB-IDAC responds by default to a Negative trigger; however, this can be inverted in the Digital I/O properties.

Make sure that for any other signal acquisition system the trigger polarity is set according to the trigger requirements of that system.

REFERENCES

Hodgson, E.S., J.Y. Lettvin & K.D. Roeder, 1955. Physiology of a primary chemoreceptor unit. *Science* **122**: 417-418

Marion-Poll, F. & J. van der Pers, 1996. Un-filtered recordings from insect taste sensilla. *Entomologia Experimentalis et Applicata* **80**: 113-11

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