# GSR-200 Galvanic Skin Response Amplifier

## Technical Note



**GSR-200**

## Overview

As a person's psychological state changes in response to events in the environment, the electrical properties of the person's skin change due to minute changes in perspiration. These electrodermal responses can be detected by the GSR-200. Since human skin is a good conductor of electricity, a weak electrical current applied to the skin can determine the resistance of the skin, or its reciprocal which is conductance.

The GSR-200 applies a constant, imperceptible voltage between two electrodes attached to the skin. Since the voltage is constant, the current flowing between the electrodes is proportional to the skin conductance, or inversely proportional to the skin resistance. The GSR-200 is able to detect the current flowing between the electrodes and convert it to a voltage that can be recorded. Using a conversion factor, the recorded voltage is easily converted into conductance units known as microSiemens (μS).

## How to Use the GSR-200

**Equipment Setup:**
Plug the DIN8 cable into a transducer input of an iWorx data acquisition unit or amplifier.

**Start the Software:**

1) Open LabScribe by clicking on the LabScribe desktop icon.
2) When the program opens, select **Preferences** from the **Edit** menu (or from the **LabScribe** menu on a Macintosh computer).
3) Select the **Channel** preferences dialog window. Name the channel to which the GSR-200 is connected. Set the **Mode/Function** for this channel to **DIN8**. Also, set the sampling rate and display time. Click **OK**.

## Calibration and Units Conversion

The GSR-200 is factory calibrated so that an output of 1 Volt is equal to 5 microSiemens (µS).

The basis of this conversion factor follows:
The GSR amplifier records changes in skin conductance. Conductance (G), as expressed in units known as Siemens, is the inverse of Resistance (R):

$$G = 1/R$$

The GSR-200 applies a voltage of 200mV across the resistance being measured, so that the Current (I) flowing across the skin from one electrode to the other is equal to applied voltage divided by the resistance:

$$I = 200mv/R = 200mV*G$$

In the GSR amplifier, the Current (I) flows through a 1megOhm feedback resistor to produce the Output Voltage ($V_{out}$), so that:

$$G = V_{out} / 0.200V * 1megOhm$$

Since 1 megOhm is the reciprocal of 1 µSiemen, the Conductance (G), in µSiemens, is equal to 5 times the Output Voltage:

$$G \text{ (in µSiemens)} = 5 * V_{out}$$

Therefore, 1 Volt of output equals 5 µSiemens. This relationship along with the Units Conversion function of the iWorx data acquisition system can be used to convert the voltages recorded from the subject to conductance (measured in µSiemens).

To apply this conversion factor to your recording:
1) Right-click in the recording window of the GSR-200. Select **Units** from the right-click menu and select **Simple** from the **Units** submenu.
2) Select **2 point cal** from the pull-down menu in the upper-left corner of the **Units Conversion** dialog window.
3) Enter "zero" in both the upper data boxes. Enter "1" in the left lower data box and "5" in the right lower data box.
4) Enter the name of the units, **µSiemens**, in the **Unit Name** box. Click **OK** to activate the unit conversion.

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## Operating the GSR-200

1) Attach the conductivity electrodes to the subject. Use the Velcro straps to secure the metal discs to the pads of two adjacent fingers.
2) Attach the other end of the electrode cable to the BNC input of the GSR-200. Begin recording.
3) It may be necessary to adjust the offset to zero in LabScribe.

## Experiments

LabScribe experiments using the GSR-200 include:

- **Experiment HP-2: Galvanic Skin Response and Emotion** (found in the **Human Psychophysiology** category of the LabScribe **Settings** menu as **GSR-A**)
- **Experiment HP-3: The Galvanic Skin Response, Deception, Cognitive Complexity, and Vigilance** (found in the **Human Psychophysiology** category of the LabScribe **Settings** menu as **GSR-B**).
- **Experiment HP-8: The Galvanic Skin Response (GSR) and Investigation into "Cheating"** (found in the **Human Psychophysiology** category of the LabScribe **Settings** menu as **GSR-Investigation**)
- **Experiment HP-7: Interference of Stimuli on Associative Tasks - The Stroop Effect** (found in the **Human Psychophysiology** category of the LabScribe **Settings** menu as **StroopEffect**)

## Technical Data and Specifications

| SPECIFICATIONS | |
| --- | --- |
| Input Impedance | 10 gigohm |
| Input Connector | BNC |
| Working Voltage | 200 mV |
| Output Connector | DIN8 |
| Output Voltage Swing | +4 Volts |
| Bandwidth | DC to 3 Hz |
| Noise | 1 mV p-p |
| CMR | 100dB @ 60 Hz |

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