BioStim

General Overview of the BioStim Universal Biological Stimulator System

User's Manual

SUPERTECH

The parts of the BioStim universal biological stimulator system

The **BioStim** system is divided into two functional parts. The time parameters are generated by the fully digital **BioStim Controller**, and the analogue voltage and current sources are implemented in the **End-stage**s. The parts of the system are manufactured as independent equipments. On one hand it results a more flexible and variable system, because the similar parts (e.g. the **End-stage**s) are compatible, and they can be changed easily. On the other hand the divided system meets the special experimental requirements much better, because the analogue **End-stage**s can be located close to the biological objects in the shielded environment, but the digital **BioStim Controller**, can be placed anywhere else. **BioStim Computer Interface** is an alternate of the **BioStim Controller** in special cases. You can find detailed descriptions about each elements of the **BioStim** system in the appropriate manuals.

There is a few drawings of the typical interconnections of the **BioStim** system in the Appendix.

BioStim Controller

BioStim Controller is a dual-processor system. There are two independent RISC microcontrollers built into one cage. One of them, the **Repetition Cycle and Gate Controller** can be used to generate the periodical repetition trigger events, or it can be used as a gate generator to enable, or disable the output pulse sequence. The other microcontroller is the **Pulse Pattern Generator**. It is used to generate the different output pulse sequences (as listed below).

The accuracy of the time parameters in **BioStim Controller** are guaranteed by internal crystal pacers. All the programmed time parameters are stored in built-in non-volatile memories. They hold the previously used values during switched off periods. Easy programming operations are carried out in menu system, with 4-button keypads. The displays of the microcontrollers are 4 x 20, and 2 x 16 character alphanumeric models with backlight to provide good visibility.

BioStim Controller (together with one of the **End-stage**s) can be used as a stand-alone stimulator, but both of its microcontrollers have got bi-directional digital control capabilities: Start Input, Gate Input, and Synchron Output. These TTL-compatible control bits offer a huge versatility in the different applications. **BioStim Controller** can be started externally (with rising edges at Start Inputs) from another equipment (for instance a PC), or it can be the master synchron generator (if the external equipments are triggered from its Synchron Outputs), as well.

BioStim Controller has got nonvolatile memories to store all parameters of the functions. If you use the equipment in a fixed application, you should program it one time only. If you switch the **BioStim Controller** on, it checks, which function was used last time. After it the parameters used by the actual function are checked. If the parameters have got valid values preset, the last used function will be started automatically.

BioStim Computer Interface

There is an alternate equipment, **BioStim Computer Interface** in our choice to substitute the **BioStim Controller** in that cases, when a computer software is used to generate the sequence of stimulating pulses. **BioStim Computer Interface** has got a universal connector to connect any our **End-stage**s, a power supply unit to supply the **End-stage**, and two TTL-compatible digital input connectors. Its TTL inputs are configured in logical OR function internally. Basically **BioStim Computer Interface** realizes the **DC via Control** function (see later in this description) of **BioStim Controller**. If a sophisticated software is used, it is not necessary to install the **BioStim Controller**, it is enough to use the **BioStim Computer Interface**. The disadvantage of this arrangement is, that a fast computer, and an appropriate software is always necessary to be used. An independent, universal, stand-alone stimulator can be formed only by using of the **BioStim Controller**.

Universal Floating End-stage

It can be used in human body surface, and microelectrode experiments. There is a Constant Current generator, and a Constant Voltage generator built into this **End-stage**. The output of the **End-stage** can be switched between Constant Current and Constant Voltage modes on-the-fly, during the experiment. It is a very useful feature, because the first stimulating trials can be carried out in the secure Constant Voltage mode. If the experiment is qualitatively working, the **End-stage** can be switched immediately into Constant Current mode, where the electric charge can be defined exactly. The Constant Voltage mode has got two ranges: 10 V, and 100 V of full scale. The Constant Current mode has got two ranges: 100 μA, and 10 mA of full scale. The output amplitude in the selected range can be set using a 10-turn calibrated helical potmeter on the front panel. The nonlinearity (total amplitude error) of the **End-stage** is less than 5%. The floating output circuit of this **End-stage** is supplied by an internal high frequency power source. The isolation capacitance between the mains plug and the floating output is less than 10 pF. It is good enough for most of the microelectrode experiments. The output leakage current is internally trimmed to absolute zero. A special feature of this **End-stage** is, that it does not generate any detectable electric noise. According to this feature it can be placed close to the experimental object even in a shielded environment.

Battery-supplied Floating End-stage

It can be used for the most sophisticated, noise-sensitive microelectrode experiments (for example multi-electrode patch clamp environments). It passes extremely small, practically zero hum noise into the biological tissue. This **End-stage** is supplied from its built-in rechargeable battery pack. This model has got an additional accessory, the **Battery Manager** unit, which is an automatic, and precision battery charger, and conditioner equipment. The nominal voltage of the internal battery pack is 120 V, and its nominal capacity is 170 mAh. The **End-stage** and the **Battery Manager** units are connected together with a high-voltage cable. The stimulating circuitry, and all its specifications are the same as described above at the **Universal Floating End-stage.** This version of **End-stage** is optimized for that aspect, that it does not generate any electric noise, because of this battery-powered scheme. According to this feature it can be placed close to the experimental object anywhere, even in a seriously shielded environment.

Constant Current LED Driver End-stage

It is used for Electro Retinography, and other light stimulating applications. It can provide calibrated current with 50 mA of full scale. Its internal construction is based on very high speed circuits for fast switching of the LEDs. Furthermore, there is an active current sink circuit to eliminate the parasite charge holding effect of LEDs.
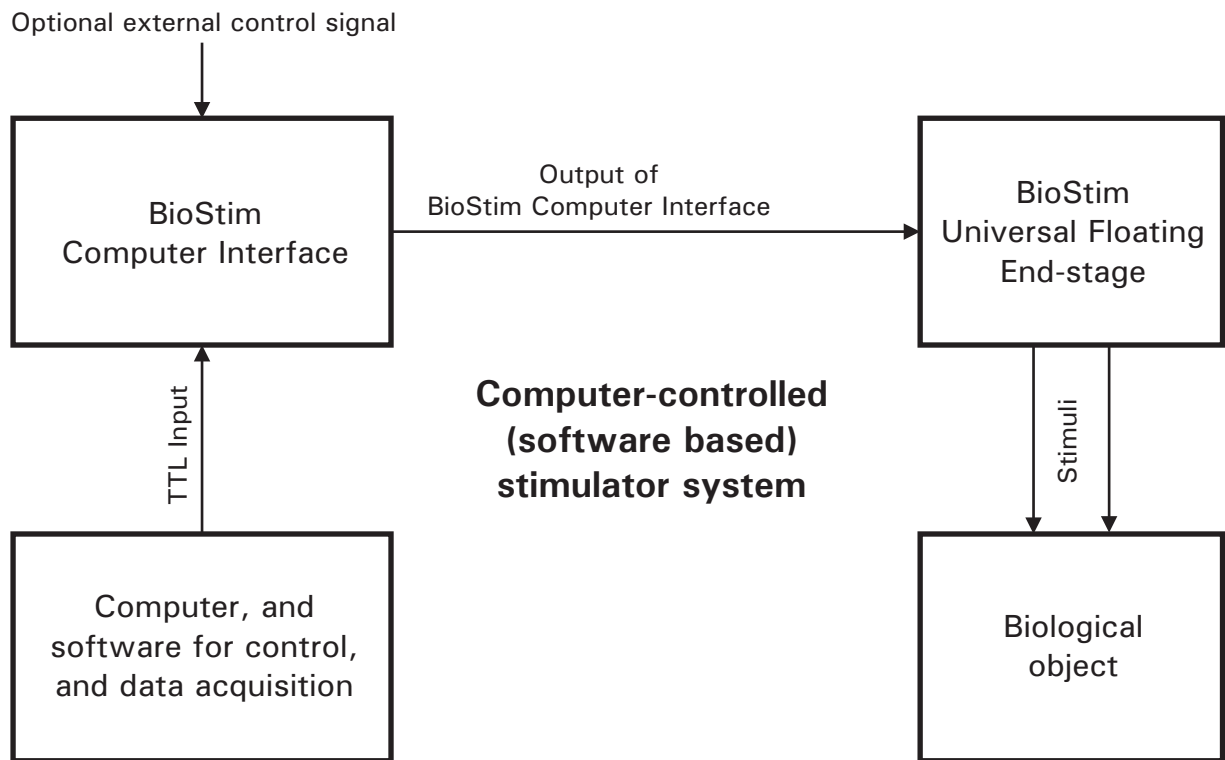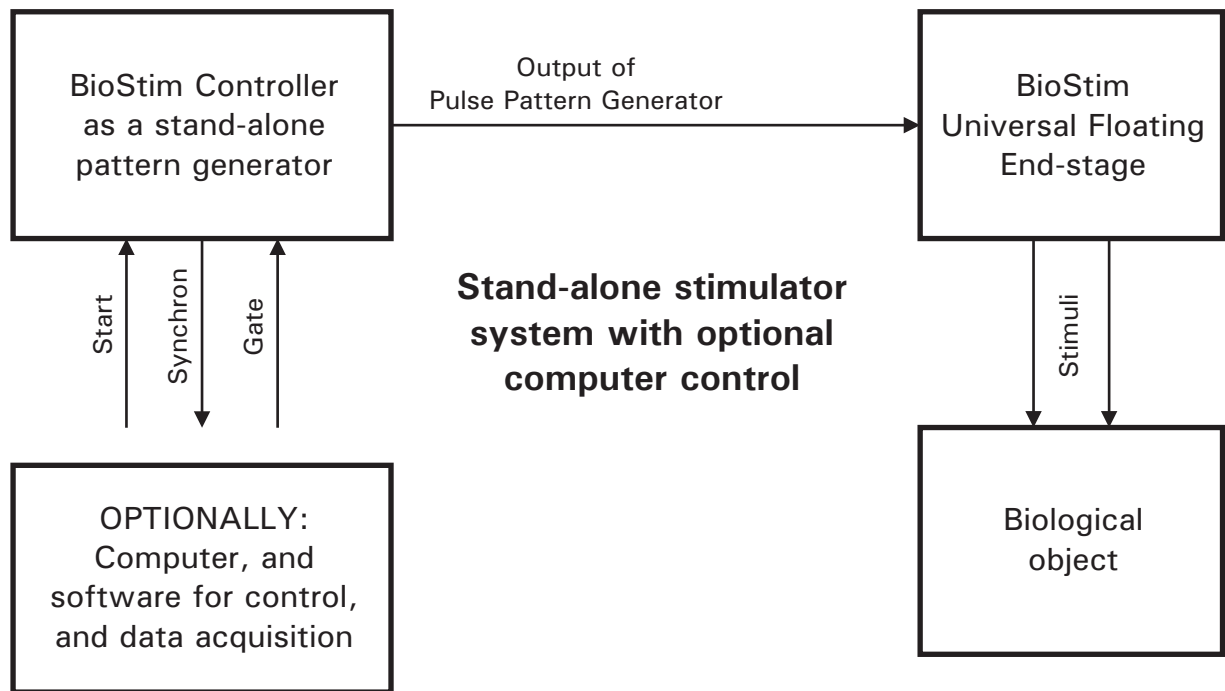
Further development

Until now we have developed many different features for the **BioStim** system, as it is listed above. In spite of this, if you can not find the appropriate function for your special task in our actual choice, and this function seems to be interesting for other our customers, we will develop a special function especially for you. It is our method, how we improve the features of our equipment. We collect all the notices and feedbacks of our customers, and we implement their (may be your) knowledge into the features of **BioStim**.

Warranty

We give you full warranty service, including rest parts for the period of 3 years by default. Longer warranty periods can also be defined and agreed (the actual conditions should be discussed before placing the order).

International technical hotline by phone: (36) (20) 9234-386

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Stand-alone stimulator system with optional computer control

BioStim Controller as a stand-alone pattern generator

→ Output of Pulse Pattern Generator →

BioStim Universal Floating End-stage

Start | Synchron | Gate

OPTIONALLY: Computer, and software for control, and data acquisition

Stimuli ↓

Biological object

Computer-controlled (software based) stimulator system

Optional external control signal ↓

BioStim Computer Interface

→ Output of BioStim Computer Interface →

BioStim Universal Floating End-stage

TTL Input ↑

Computer, and software for control, and data acquisition

Stimuli ↓

Biological object

Components of the BioStim universal biological stimulator system: two possible arrangements