

Brownlee Precision Model 410

Close-up view of one Brownlee Precision Model 410 channel. Notice the multi-use display and individual channel memory. The selector knob uses an optical encoder instead of potentiometer for extremely quiet operation.

Gain

Range: 1 to 10,000

Steps: 1, 1.5, 2, 2.5, 3, 4, 5, 6, 7, 8, 9, and factors of 10 thereof

Gain Accuracy: < 2% error

Lowpass Filter

Range: 1 kHz to 25 kHz, plus wideband

Steps: 1, 1.5, 2, 3, 5, 7, 10, 15, 20, 25 (all kHz), and wideband

Characteristic: 2-pole elliptic

Wideband Frequency Response: 200 kHz min., all gains

Input

Selection: A, -B, A-B, or Grounded

Coupling: AC (1 Hz cutoff) or DC

Impedance: 1 M Ω , 20 pF

Bias Current: 20 pA

Offset Voltage: 15 μ V max.

Voltage Range: \pm 10 V

CMRR: > 70 dB all gains

Noise: 1.5 μ V_{rms}
(10 μ V_{peak to peak}) @ 10 kHz

Four-channel instrumentation amplifier for clean recordings.

**Brownlee Precision Model 410 Amplifier**

The Brownlee Precision Model 410 is a four-channel general purpose laboratory amplifier. It can be used to amplify small signals from signal sources which may have a large common-mode level and high frequency noise. Each channel consists of a high gain/low noise amplifier, an input coupling selector, a 2-pole lowpass filter, and an output offset control. A control knob sets the amplifier parameters and the values are displayed on a bright LED alphanumeric readout.

- **Key Features**

- Clear front panel controls for all settings

- Calibrated gains from 1 to 10,000

- Single-ended or differential inputs

- 2-pole elliptic lowpass filter with range 1 kHz to 25 kHz

- AC or DC input coupling

- Low noise circuitry

- Self-trimming feature to remove internal offsets

- Memory on each channel

- Powerful output which can directly drive transducers

- Wide bandwidth: greater than 200 kHz on all gains

The Brownlee Precision Model 410 is a rugged, precise, and easy to use laboratory amplifier. It is well suited to a wide variety of research and test applications, particularly in the electrophysiology field.

Each of the four amplifiers has a non-inverting (A) and an inverting (B) input with front panel BNC connectors. The inputs can be switched to be DC-coupled, AC-coupled, or grounded. The differential or single ended signal is amplified by the selected gain, and high frequency noise is rejected by the adjustable lowpass filter.

The output level may be shifted by as much as ± 10 Volts with the output offset control.

The Model 410's input voltage noise is only $1.5 \mu\text{V}_{\text{rms}}$ or $10 \mu\text{V}_{\text{peak to peak}}$ (measurement bandwidth of 10 kHz).

Each channel functions independently and is internally shielded to prevent crosstalk. The output is capable of driving large currents and capacitive loads.

The front panel interface of this amplifier preserves the simplicity and "feel" of older analog instruments while taking advantage of the benefits of digital circuitry.

Changing an amplifier setting is as easy as pushing a parameter button ("Gain" for example) and turning the control knob up or down until the desired setting is reached. Unlike a potentiometer however, the settings increment or decrement through discrete, calibrated steps. The bright LED alphanumeric readout displays the exact value ("Gain=250" for example).

A complete setup may be stored for each channel in memory.

This product is manufactured in U.S.A.

If additional features are desired (such as 8-pole Bessel lowpass filter, Auto-Zero, line notch filter, highpass filter, multiple memories per channel, and DVM), then please consider the Brownlee Precision Model 440.

Brownlee Precision Model 410 Amplifier Ordering Information

Part No.	Product Description	Price
04-10	Brownlee Precision 410 - 4-channel instrumentation amplifier	\$ 1,850
04-220	Brownlee Precision Amplifier - International 220V power option	\$ 325

U.S./Canada prices shown. International prices add 15%. Email or visit web store for latest prices.

Output

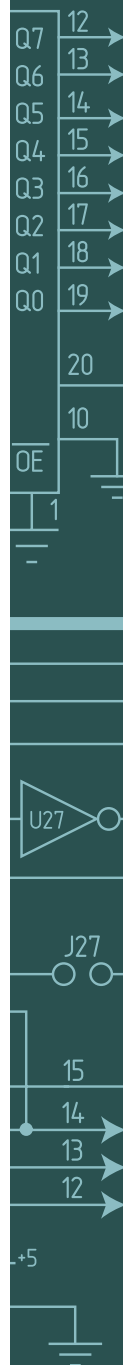
Voltage Range: ± 10 V

Current Capability: ± 100 mA

Slew Rate: 10 V/ μs

Output Offset Control Range:
 ± 10 V in .5 V steps

Noise: $500 \mu\text{V}_{\text{rms}}$
($3 \text{ mV}_{\text{peak to peak}}$) @ 10 kHz



Brownlee Precision Model 410

The Model 440 adds controls for a highpass filter, notch filter, digital volt meter, auto zero, and input impedance on each channel.

Gain, Lowpass Filter, and Highpass Filter generally step through the following values

1.0, 1.1, 1.2, 1.3, ... 1.9,
2.0, 2.2, 2.4, 2.6, ... 4.8,
5.0, 5.5, 6.0, 6.5, ... 9.5,
and multiples of 10 thereof.

Gain

Range: 0.1 to 10,000

Steps: 0.1, 0.15, 0.2, 0.25, 0.3,
0.4, 0.5, 0.6, 0.7, 0.8, 0.9, then as
above for gains 1.0 to 10,000

Gain Accuracy: < 2% error.

Lowpass Filter

Range: 20 Hz to 50 kHz (8 pole),
plus 80 kHz (2 pole) and wideband.

Steps: as above for frequencies
20 Hz to 15 kHz, then 18,
20, 22, 25, 33, 40, 50, 80
(all kHz), and wideband.

Characteristic: 8 pole Bessel
(8 pole Butterworth may be
substituted on any or all channels;
contact AutoMate Scientific).

Wideband Frequency Response:
500 kHz min. all gains.

High performance four-channel amplifier and signal conditioner in one quiet package.

**Brownlee Precision Model 440 Amplifier**

The Brownlee Precision Model 440 incorporates four channels of sophisticated amplifier and filter circuitry in a friendly, easy to use instrument. Each channel consists of a high gain/low noise amplifier, an 8-pole Bessel lowpass filter, a highpass filter, a line notch filter, and output offset controls. A control knob sets the amplifier parameters, and the values are displayed on a bright LED alphanumeric readout.

- **Key Features**

- Clear front panel controls for all settings
- Gains from 0.1 to 10,000 in fine, calibrated steps
- Single-ended or differential inputs
- 8 pole Bessel lowpass filter with range 20 Hz to 50 kHz
- Highpass filter with frequency range .01 Hz to 100 Hz
- Output offset control to shift output up to ± 10 Volts
- Auto-Zero feature to reset the output to the baseline level
- Notch filter to suppress line noise
- Digital Voltmeter on channels 1 and 2
- Powerful output which can directly drive transducers
- Wide bandwidth: greater than 500 kHz on all gains

Precise

The Brownlee Precision Model 440 is a rugged, flexible, and precise laboratory amplifier. It was designed with particular attention to the needs of electrophysiology research. These requirements include: high gain, low noise, clean pulse response, adjustable filtering, removal of offset levels, high input impedance, and ease of use.

The 8 pole Bessel lowpass filter is ideal for removing high frequency noise while accurately amplifying the shape of input pulses. Overshoot and ringing are negligible, even with fast rise and fall times and at high gains. There are 108 different cutoff frequencies available over a range from 20 Hz to 50 kHz.

The input bias current is also very low at 20 pA. The input resistance may be set for 1 M or $10^{12}\Omega$. These characteristics make the amplifier almost "invisible" to the source, allowing the direct connection of many types of electrodes.

Easy To Use

The Model 440's front panel interface preserves the simplicity and "feel" of older analog instruments while taking advantage of the benefits of digital circuitry.

Changing an amplifier setting is as easy as pushing a parameter button ("Gain" for example) and turning the control knob up or down until reaching the desired setting. Unlike a potentiometer however, the settings increment or decrement through discrete, calibrated steps. The bright LED alphanumeric readout displays the exact value ("Gain=850" for example).

Multiple setups may be stored for each channel in memory. All the input and output BNC connectors are conveniently located on the front panel. Each channel functions independently and is internally shielded to prevent crosstalk.

If the input signal has a drifting DC offset voltage, it can be removed using the Highpass Filter. The Output Offset control can shift the output baseline level from -10 V to +10 V in 100 mV steps. This is helpful if the output level must match the input range of a computer's A/D board, for example.

The Model 440's powerful output stage can drive ± 100 mA, and is stable even driving capacitive loads. A notch filter is available to remove line noise.

Brownlee Precision Model 410 Amplifier Ordering Information

Part No.	Product Description	Price
04-40	BP 440 - High performance 4-channel amplifier and signal conditioner	\$ 3,250
04-220	Brownlee Precision Amplifier - International 220V power option	\$ 325

U.S./Canada prices shown. International prices add 15%. Email or visit web store for latest prices.

Highpass Filter (AC Coupling)

Range: .01 Hz to 100 Hz

Steps: DC, AutoZero DC, then as above

Input

Selection: A, -B, A-B, or Grounded

Impedance: 1 M Ω or $10^{12}\Omega$, 20 pF

Bias Current: 20 pA

Offset Voltage: 15 μ V max.

Voltage Range: ± 10 V

CMRR: > 70 dB all gains

Noise: 1.5 μ V_{rms}
(10 μ V_{peak to peak}) @ 10 kHz

Output

Voltage Range: ± 10 V

Current Capability: ± 100 mA

Slew Rate: 10 V/ μ S

Output Offset Control Range: ± 10 V
in 100 mV steps

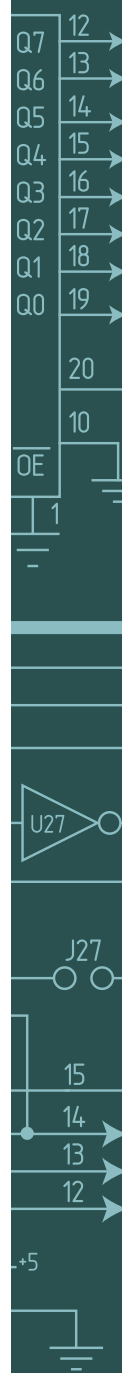
Noise: 500 μ V_{rms}
(3 mV_{peak to peak}) @ 10 kHz

Auto-Zero

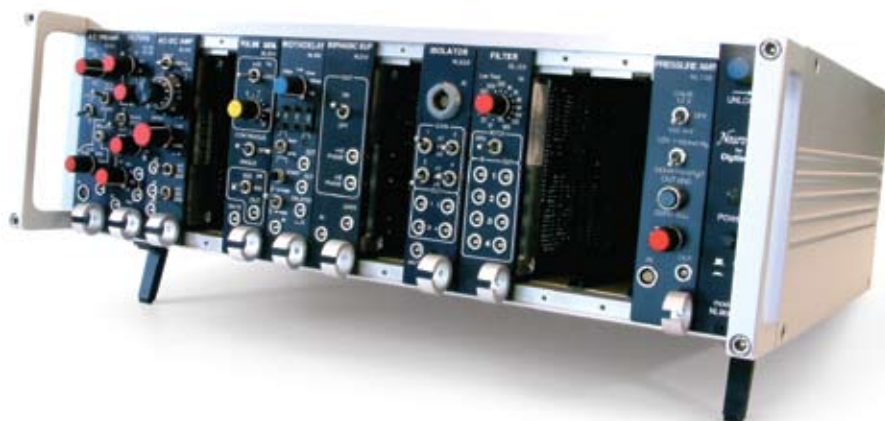
Pressing "Auto-Zero" will reset the output to the baseline level (when the Highpass Filter is on) and self-calibrate the amplifier's internal offset voltages.

DVM

Channels 1 and 2 include a handy Digital Voltmeter to quickly and easily measure the input level.



A complete solution to your electrophysiology needs.



NL905 Small Case System and Power Unit



This smaller case holds four NeuroLog modules instead of thirteen.

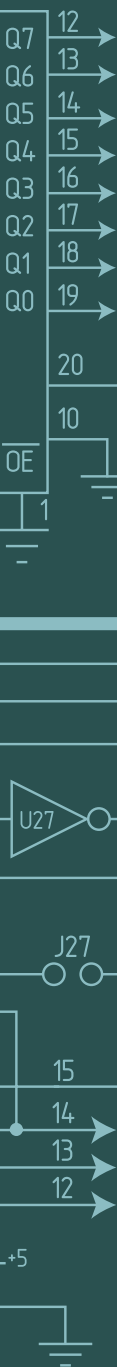
NeuroLog Modular System

The NeuroLog System provides a modular and highly versatile means of carrying out intracellular, extracellular or transducer-based recordings, signal conditioning, pulse generation or electrical stimulation within one compact device.

The NL900D Case & Power Supply unit allows up to thirteen modules to be installed. This means a single NeuroLog System can be used to amplify several different parameters, such as extracellular spikes, intracellular potentials or even blood pressure, as well as produce outgoing trigger pulses to other pieces of equipment or electrically stimulate a preparation.

Amplification & Signal Conditioning

The NeuroLog System provides AC or DC coupled amplification of biological signals from transducers, single electrode or multi electrode configurations. DC coupled amplifiers output absolute voltage levels and are most commonly employed for intracellular or transducer recording where baseline membrane potentials or slow voltage shifts are of interest.



With AC coupled amplifiers, the “DC baseline” is removed by high-pass filtering. Such amplifiers are used for extracellular recording of action potentials in neuronal preparations, ECG, EMG or EEG waveforms. The variety of NeuroLog pre-amplification and amplification modules means that users can develop systems specifically suited to their particular application. The NeuroLog range also contains a number of filter and signal conditioning modules which can be used prior to final data acquisition.

Extracellular AC Recording

The NL100AK head-stage and NL104A AC PRE-AMPLIFIER provide an excellent combination suitable for extracellular recordings from neuronal preparations with sharp electrodes. They can be used in single-sided or differential recording modes, provide impedance matching for micro-electrode recording and feature low noise amplification. Continuously adjustable bandpass filtering from 0.1 Hz to >50 kHz is available through the NL125/6 FILTERS. In addition, the NL201 SPIKE TRIGGER can be used to convert spikes into uniform TTL pulses which can then be counted, converted to frequency or further analyzed using other modules. Use of the NL120S AUDIO AMPLIFIER and NL985S LOUDSPEAKER would allow the spikes to be monitored audibly.



Intracellular DC Recording

The NL102G DC PREAMPLIFIER is a suitable amplifier for intracellular recording (it can also be used for extracellular micro-electrode recordings). Used with the NL106 AC/DC AMPLIFIER it provides a total gain up to x1,000, while the NL125/6 FILTERS give continuously adjustable bandpass (and notch) filtering from DC to >50 kHz. The NL102G features capacitance neutralization, current injection (up to 100 nA) and impedance checking. Internally generated current injection and impedance checking can both be controlled by other devices or NeuroLog modules. The NL102G now includes the NL412 PULSE box, allowing remote and full activation of the capacitance compensation circuitry. This “buzz” process can aid penetration during electrode impalement.



Four Channel Isolated Amplification for EEG, EMG or ECG Recording

An ideal system for multi-channel AC recording of physiological signals such as EEG, EMG or ECG in the research environment. The system provides a wide range of amplification and filter settings. The NL844 4-CHANNEL PREAMPLIFIER can be positioned near the recording site, reducing the length of the electrode cables and minimizing interference. The outputs are connected to the NL820A ISOLATOR (housed in the NeuroLog case), where further amplification of the signals can be selected on a channel by channel basis. Further filtering can be carried out by the various NL134/5/6 or NL144 FILTERS, while the signal can be conditioned for ADC input using the NL530 CONDITIONER.





Transducer Measurements

The NL108A PRESSURE AMPLIFIER provides an easy method of monitoring physiological pressure changes and can be used in combination with your own or our disposable (NL108T2) / reusable (NL108T4, shown opposite) pressure transducers. A pressure transducer and appropriate lead connects to the NL108A module, allowing continuous monitoring of parameters such as blood or intra-tracheal pressures. The output of the NL108A can be fed directly to a chart recorder or ADC interface for PC-based acquisition.



Pulse Generation & Electrical Stimulation

The NeuroLog range includes several modules capable of pulse generation. Pulse patterns can be pre-defined in a variety of ways, allowing you to control other modules within the NeuroLog rack or send TTL compatible trigger pulses to external devices, such as stimulators or acquisition systems. The NeuroLog range includes the small constant current NL800A STIMULUS ISOLATOR which can be controlled by other NeuroLog modules. Our new NL512 BIPHASIC BUFFER allows one or two NL800A's to be controlled by an analog waveform, such as that produced by a computer controlled DAC.

NeuroLog Modular System

Part No.	Product Description	Price
NL-900D	NeuroLog [®] case and power supply	\$ 1,855
NL-905	NeuroLog [®] small case and power supply	\$ 1,172
NL100AK	NeuroLog Pre Amp Head Stage (for NL104A) Headstage, including NL973A Accessory Kit	\$ 570
NL100RK	NeuroLog Pre-Amp with Stimulus Relay, NL100AKS Headstage & NL100C Stimulus Controller	\$ 1,807
NL101	NeuroLog Electrode Chamber (specify pin # and o.d.)	\$ 67
NL102G	NeuroLog DC Pre-Amplifier with Pulse Buzz (NL 412)	\$ 2,816
NL104A	NeuroLog AC Pre-Amplifier	\$ 1,225
NL106	NeuroLog AC/DC Pre-Amplifier	\$ 1,225
NL120S	NeuroLog Audio Amplifier	\$ 603
NL125/6	NeuroLog Filter (Lo-cut, Hi-cut, 50/60Hz notch)	\$ 1,090
NL136	4-channel Low-Pass Filter + 60Hz Notch	\$ 2,297
NL144	4-channel High-Pass Filter	\$ 1,862
NL201	NeuroLog Spike Trigger	\$ 1,057
NL301	Pulse Generator (replaces NL300)	\$ 553
NL703	NeuroLog EMG Integrator	\$ 766
NL820A	NeuroLog 4 Channel Isolation Amplifier	\$ 2,083
NL822	2-channel remote AC pre-amplifier	\$ 1,823
NL822/P	2mm plugs, with BLACK insulator, for NL822/824 etc. (pack of 10)	\$ 24.80
NL844	NeuroLog 4 channel AC Preamplifier	\$ 3,170
NL985S	Loudspeaker for NL120S (with safety plugs)	\$ 180

AutoMate Scientific offers a complete line of Digitimer NeuroLog modules.

U.S./Canada prices shown. International prices add 20%. Email or visit web store for latest prices.

Eliminate 50/60 Hz noise and harmonics without filtering.



Hum Bug Noise Eliminator

- Eliminates electrical interference**
 - Simple 50/60 Hz sine waves
 - Mixtures of 50/60 Hz harmonics
 - Noise spikes from dimmers
 - Complex noise from fluorescent lamps
- No waveform distortion**
 - No frequency loss or DC voltage shift
 - No signal attenuation or phase error

The Hum Bug is a powerful device for canceling electrical interference in real-time, avoiding all of the traditional problems associated with notch filters. The Hum Bug constructs a replica of noise present on the input signal and continuously subtracts this replica from the signal as it passes through the instrument. It performs this function in the presence of biological activity even when noise characteristics evolve over time.

Specifications:

Physical

Standard steel instrument box with cast aluminum base

- W-6.5" D-7.5" H-1.3" (32.2 x 18.1 x 3.1 cm)
- Weight - 2.8 lbs. (1.3 kg)

Power

- 115-120 VAC at 60 Hz
- 230-240 VAC at 50/60 Hz

Input Voltages

Input protection: 50 volts peak-to-peak

Maximum input signal recognized by the adaptor: 5 volts peak-to-peak

Maximum noise amplitude for complete cancellation: 1 volt peak-to-peak

Frequency Response

Input to output: DC to greater than 500 kHz

Hz and harmonics cancellation: 50/60 Hz to 4 kHz



Controls

Bypass: halts noise cancellation by routing input directly to output

Hold: suspends adaptation to evolving noise characteristics

Clear: clears the noise replica

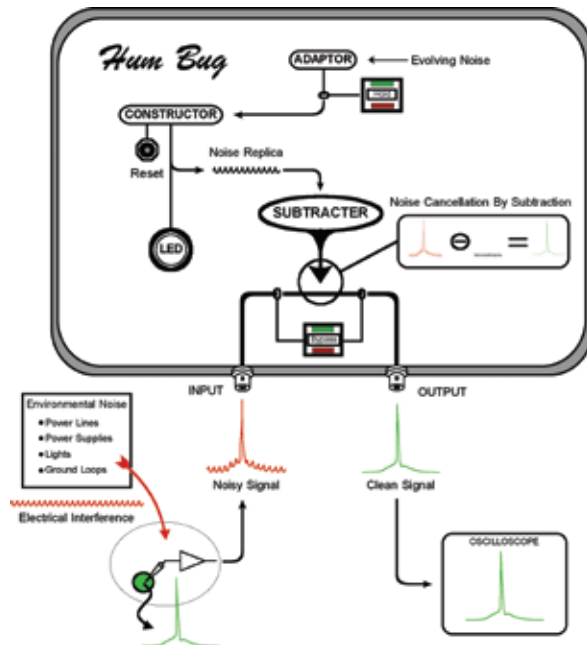
Display

LED indicates changing noise levels

- Green: decreasing amplitude of the noise replica
- Red: increasing amplitude of the noise replica

The Hum Bug is not a filter. It does not create phase delays, amplitude errors, DC shifts or waveform distortion. Simply connect it between your preamplifier and any analysis equipment and it will automatically eliminate 50/60 Hz noise and harmonics with frequencies up to several kHz. Noise is eliminated without altering the signal of interest even when frequencies within the signal overlap with noise components. No settings or adjustments are required.

The Hum Bug can eliminate 50/60 Hz noise from virtually any analog signal. It is equally effective at removing noise associated with inadequate grounding, ground loops, and electrical pickup. Common applications include noise elimination from signals recorded using microelectrodes, skin electrodes (EKG, EMG, EEG), high gain amplifiers, magnetic sensors, and audio equipment.



Hum Bug Noise Eliminator Ordering Information

Part No.	Product Description	Price
Q-HUMBUG	Hum Bug - 50/60Hz active noise eliminator	\$ 1,725

U.S./Canada prices shown. International prices add 15%. Email or visit web store for latest prices.

Deliver precise constant voltage or current stimuli.



DS2A Constant Voltage, DS3 Constant Current, DS4 Bi-phasic Stimulus Isolators

Brief pulses of electricity are used in various biomedical research applications as a stimulus to excite nerve or muscle fibers. Several factors need to be considered when choosing the right stimulator.

- In order to minimize artifacts introduced into electrophysiological data, it is desirable to electrically isolate the stimulator from both ground and the trigger device.
- The voltage required to send current through tissues can vary greatly, making it important to have control over the stimulus driving force.
- Large impedance variations during an experiment can result in loss of the stimulus. In this event, a constant current stimulator may be more suitable.

Our three isolated stimulators either provide constant voltage (DS2A), constant current (DS3), or bi-phasic output (DS4) giving you the ability to choose the stimulator which best suits your experimental needs.

DS2A Constant Voltage Stimulator

- External control of pulse duration.
- Overload protection circuit preventing current in excess of 50 mA being delivered.

DS3 Constant Current Stimulator

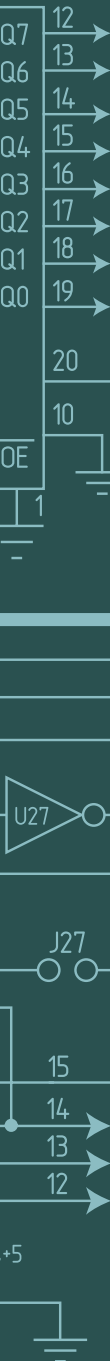
- Four current ranges allow precise control of output between 2 µA and 32 mA.
- Output discharge (Clamp) circuit prevents capacitance build-up during stimulus trains, which is important to prevent stimulus loss.
- 90 V compliance provided.

DS2A & DS3 Features:

- Accurate and reproducible stimulus characteristics.
- Switchable polarity, variable output and duration ranges (20 µs to 2 sec).
- External pulse duration control through the BNC trigger input.
- A single-shot button, which operates irrespective of trigger inputs.
- Cases manufactured from insulating material may be rack mounted using an optional mounting frame (Model D121-11) available from AutoMate Scientific.
- Power provided by standard batteries. Note that current is only drawn during pulse delivery.

DS4 Bi-phasic Stimulator

- Voltage input ranges of ±1V, ±2.5V, ±5V and ±10V.
- Output in 4 overlapping ranges of ±10µA, ±100µA, ±1mA & ±10mA)
- ±48 V compliance provided.
- GATE input allows multiple DS4's connected to one DAC out.



Additional Specifications

DS2A & DS3 Trigger

A positive pulse between 3 V and 20 V is required to trigger these stimulators. The trigger input current varies from 6 mA to 62 mA over the above voltage range. Trigger pulse duration should not normally be less than 4 μ s.

DS2A & DS3 Pulse Duration

Range: 20 μ s to 2 sec. One dial allows continuous adjustment from 2 to 20, while another is used to select the range (from 10 μ s, 100 μ s, 1 ms, 10 ms, 100 ms or external source) with \pm 10% accuracy.

Trigger Isolation

Optical coupling is employed between the trigger source and the stimulator circuitry. The capacity coupling is less than 3 pF.

Batteries (DS2a & DS3)

11 x PP3 9V, IEC-6R61 style batteries. Current is only drawn when delivering a pulse. Note that battery test sockets are built-in.

Batteries (DS4)

The DS4 includes a \pm 15V external power supply or accepts 10x 12V GP23A batteries.

Mounting

One or two stimulators may be mounted in a 19" rack using a specially fabricated frame (model D121-11) available from AutoMate Scientific.

Dimensions

Panel size: 190 mm x 110 mm.

Weight

800 g complete with batteries

Output terminals

A pair of 2 mm touch-proof sockets on the front panel spaced at 0.75".

Indicator

An LED operates for the duration of each output pulse.

Technical Specifications

- Output:**

DS2A-Mk.II (Constant voltage): Two ranges provide 99 V (high) and 9 V (low) maximum output. A multi-turn dial allows output to be selected as a percentage of maximum. Square wave pulse profile with typical rise time <1 μ s and fall time <3 μ s into resistive load.

DS3 (Constant current): Output between 2 μ A and 32 mA. Control is achieved by a variable range switch with four selections (10 μ A, 100 μ A, 1mA, 10 mA) and a three-turn dial. Pulses from high impedance stimulators (constant current units) can result in cells "charging-up" between stimuli, leading to stimulus loss. This problem has been overcome in the DS3, which has an Output Discharge (Clamp) Circuit that operates for 20 μ s after each stimulus pulse. This will discharge cells with capacitances as high as 1000 pF.

DS4 (Bi-phasic): Bi-phasic constant current proportional to the input voltage up to 5 kHz signals. \pm 10 μ A; \pm 100 μ A; \pm 1mA; \pm 10mA for a full scale input. >2 μ s duration. An "inactivity sensor" reduces battery usage and damaging "leak currents" during infrequent stimulation, while maintaining low levels of zero crossing distortion for repetitive waveforms.



Isolated Stimulators Ordering Information

Part No.	Product Description	Price
DS2A	Constant voltage stimulator	\$ 1,124
DS3	Constant current stimulator	\$ 1,291
DS4	Bi-phasic stimulator	\$ 2,268
D121-11	19" rack frame for two stimulators or DG2A	\$ 101

U.S./Canada prices shown. International prices add 20%. Email or visit web store for latest prices.

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tel 510.845.6283 | fax 510.665.3975 | e-mail info@autom8.com

Compact, free-standing, battery powered pulse generator.



DG2A Train/Delay Generator

The DG2A is a compact, free-standing, battery powered instrument which can be used to generate trigger pulses required for repetitive stimulation. Also featuring DELAY controls, it is useful for determining nerve or axonal Effective Refractory Period (ERP) through the production of a delayed second pulse.

Various modes allow output pulses to be produced singularly (SINGLE), continuously (FREE-RUN & GATED) or in a burst (TRAIN), with the burst/train duration and pulse frequency determined by the front panel controls. In each of the modes (except FREE-RUN), outputs can be initiated either by the front panel push button, a TTL compatible trigger/gating pulse or a suitable foot switch.

The unit has control of train duration over three full decades, pulse repetition rate (or frequency) within that train over five decades and control of the delayed pulse over three decades. It has two BNC output sockets (i) the SYNC output produces a pulse to trigger recording devices or synchronize other equipment and (ii) the OUT output produces either a delayed version of the same or pairs of delayed and non-delayed pulses.

Additional Specifications

Delay

Total range: 1 ms - 1200 ms in three overlapping ranges

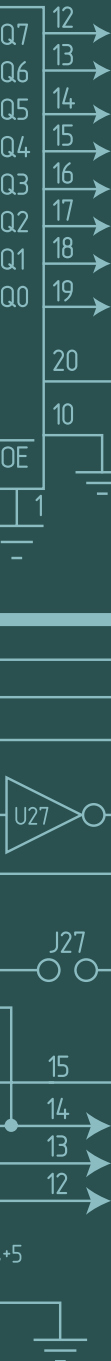
Control: Single turn control marked 1 - 12 ms with intermediate integer panel marks

Accuracy: $\pm 1\%$ at '1' and '12' marks, $\pm 5\%$ at intermediate marks

Multiplier: x1 ; x10 ; x100

Internal Jumper: Enable "x10" - giving a 10 ms - 12 sec total range. The front panel provides a check-box for marking with a waterproof pen when enabled.

Indicator: "TOO LONG" Red LED that flashes if DELAY is longer than can be produced for each pulse.



Outputs - SYNC

Connector: BNC socket

Signal: Positive going, 200µs pulse, TTL compatible pulse (5V amplitude).

Outputs - OUT

Connector: BNC socket

Signal: Positive going, 200 µs pulse, TTL compatible pulse (5 V amplitude).

Control: Selection of only the Delayed pulse (upwards) or both the Sync and Delayed pulses.

Indicator: Amber LED flashes for each OUT output pulse.

Internal Jumper: Enable "Active Low" - giving an Output that is Low during its active phase. The front panel provides a check-box to mark with a waterproof pen when enabled.

Power

Consumption: <2 mA

Internal: 9V PP3 - (IEC-6LR61) style. Alkaline preferred

Battery Life: Approximately 250 Hours with Ever Ready 6LF22 or Duracell MN1604

Dimensions

Size: 188 x 110 x 60 mm (w h d)

Weight: 490 grams (1 lb.) with battery fitted.

Please note that no accessories, other than a battery, are supplied.

Specifications of the DG2A

The unit always produces a pulse to synchronize other equipment at SYNC and a pulse delayed from SYNC by DELAY controls.

- **Modes:**

Control: Four position rotary switch. Movement of this control will immediately terminate any cycle and keep it in a Reset state for about 1 second. This is a useful feature should an exceedingly long cycle be selected by accident. Functions: SINGLE - Input signal triggers a single Output pulse. FREE-RUN - Continuous Output pulses as set by REPETITION controls. GATED - Input signal enables unit to produce pulses as set by REPETITION controls. TRAIN - Input signal Triggers unit to produce pulses as set by REPETITION controls for the time as set by the DURATION controls.

- **Input:**

Connector: BNC socket. Levels: TTL high (>1.5 V), TTL low (<0.8 V). Polarity: Active High (GATE/TRAIN) and Positive edge (SINGLE) or Active Low and Negative edge by Internal Jumper. Internal Jumper: Enable "Active Low" - allows a Low Input during its active phase. The front panel provides a check-box to mark with a waterproof pen when enabled. In Active Low an external contact closure can be used. Push-button: Has same function as a valid input signal. Indicator: "TOO FAST" Red LED flashes if a Trigger is received while the unit is busy.

- **Duration:**

Total range: 10 ms - 12 seconds in three overlapping ranges. Control: Single turn control marked 1 - 12 sec with intermediate integer panel marks. Accuracy: ±1% at '1' and '12' marks, ±5% at intermediate marks. Multiplier: x0.01 ; x0.1 ; x1. Internal Jumper: Enable "x10" - giving a 100 ms - 120 sec total range. The front panel provides a check-box to mark with a waterproof pen when enabled.

- **Repetition (Frequency):**

Total range: 0.01 - 1200 Hz in five overlapping ranges. Control: Single turn control marked 1 - 12 Hz with intermediate integer panel marks. Accuracy: ±1% at '1' and '12' marks, ±5% at intermediate marks. Multiplier: x0.01 ; x0.1 ; x1 ; x10 ; x100.

Isolated Stimulators Ordering Information

Part No.	Product Description	Price
DG2A	Train/Delay generator	\$ 856

U.S./Canada prices shown. International prices add 20%. Email or visit web store for latest prices.