



Tech Note

CK-100 Eight Channel High Voltage Stimulator

Overview

The CK-100 is a constant voltage stimulator that is capable of developing up to 100 Volts DC (direct current) on each of its eight channels. Even though it may have other applications, the CK-100 has been designed to deliver electrical stimuli to tissues or organs kept in the appropriate type of bath during pharmacological and cardiovascular research.

Front Panel



Figure 1: The command mode control knob for selecting the type of triggering used on the CK-100, and input connector for the common mode with a BNC cable attached, are seen on the left side. The output connectors and controls, the amplitude knob and the On-Off switch, are seen on the right side.

Output Controls

The output voltage of each channel is set independently using the its own calibrated ten-turn dial (Figure 1). Each 360o turn of the dial increases the output voltage of that channel by 10 Volts. The number of full turns made on the dial is displayed in the window above the knob. The dial has 10 major gradations, with 10 minor gradations between each major gradation. Each major gradation is equal to 10% of a turn, or 10% of 10 Volts. For example, if the number in the window on the dial is 2 and the number on the dial is 7, the output voltage of that channel is 27 volts.

The nominal polarity of the signal is positive. A negative voltage can be delivered to the tissue by reversing the lead wires of the electrodes at the outputs of the channel.

The current that is delivered by a channel is dependent on the load (resistance) across the two stimulating electrodes. If the voltage of the stimulus and the resistance of the tissue are known, the current can be calculated using **Ohm's Law**. If there is no resistance between the stimulating electrodes, a short circuit exists and the current output of the channel is limited to 10mA. (40 mA for Ch1 & ch2).

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Command Mode Controls

The CK-100 can be operated in one of three different modes selected by a rotary switch on the left side of the unit (Figure 1):

- DC mode. Each channel can be operated manually and independently of each other. Set the voltage output of each channel with the amplitude knob; turn on the channel by flipping the ON/OFF toggle switch on the front of the channel. Do this for each channel needed. Turn off the channel when not needed by flipping the toggle switch in the other direction.
- Common mode. Enable all the channels needed by flipping their toggle switches to the ON position. The channels are now ready to be activated by a signal from another device. The command signal used to activate the enabled channels comes from another device like the stimulator of an iWorx data acquisition unit. The command signal must be a TTL or logical signal. The TTL signal needed by the CK-100 must be 3 to 5 volts in amplitude and at least 2 milliseconds in duration. The duration and frequency of the TTL signal controls the duration and frequency of all the enabled channels on the CK-100. The amplitude knob of each enabled channel controls the voltage output of that channel. When the TTL signals end, the outputs of the channels on the CK-100 end.
- Remote mode. Each enabled channel can be turned on or off independently by its own TTL signal from a digital output dedicated to that channel.

Common Mode

1. Rotate the command mode control knob to Common.
2. Connect the stimulator output of a data acquisition unit, like the IX-118 (Figure 2) or IX-214 (Figure 3), to the Common Command Input on the CK-100 with the appropriate cable (Figure 2). If the stimulator has a differential output, connect the positive (+) and the ground (GND) connectors of the stimulator to the Common Command Input of the CK-100 with the appropriate cable.



Figure 2: The analog output of an IX-118 data acquisition unit connected to the Common Command Input of the CK-100.



Figure 3: The analog output of an IX-214 data acquisition unit as it is configured to connect to the Common Command Input of the CK-100. The BNC cable to the CK-100 needs to be connected to the IX-214 with a Male Double Banana-Female BNC adapter.

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3. Turn on the CK-100 and the data acquisition unit.
4. Open the data acquisition software.
5. Program the stimulator output of the data acquisition unit to the time parameters required in the experiment (Figure 4). Remember that these signals must meet the minimum TTL parameters of a trigger.
6. Enable the channels needed on the CK-100 by flipping their toggle switches to the ON position.
7. Set the voltage output of each enabled channel.
8. Begin recording and activate the stimulator of the data acquisition unit.

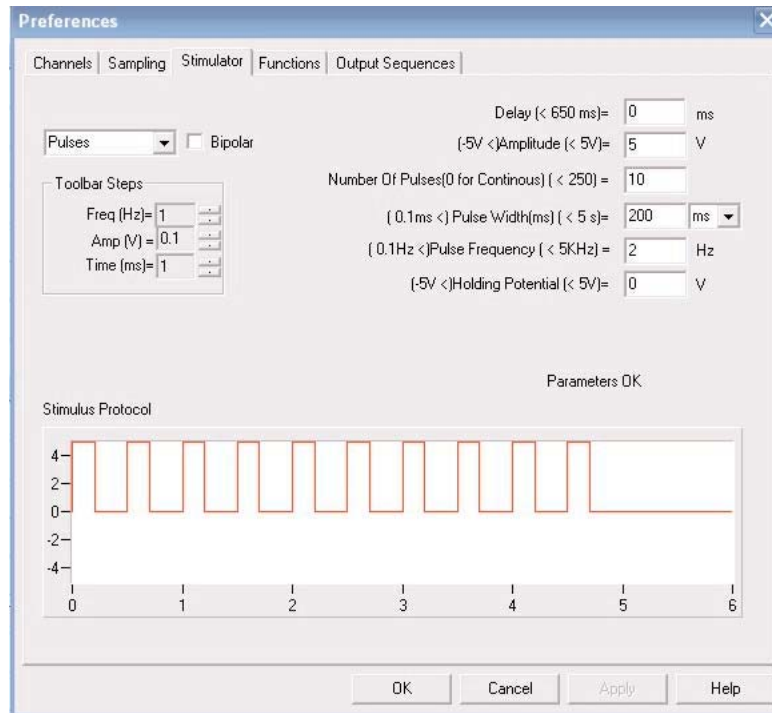


Figure 4: The Stimulator Preferences window of the LabScribe2 recording software used with iWorx data acquisition units. The stimulus parameters are programmed for 10 pulses on 200ms duration at 2Hz. The amplitudes of the pulses from the data acquisition unit are set to 5 Volts for use as a TTL signal.

Remote Mode Using a Data Acquisition Unit with Digital Outputs

1. Rotate the command mode control knob to Remote.
2. Connect the digital outputs of a data acquisition unit, like the IWx/118, to the Remote Input on the rear panel of the CK-100 with the appropriate cable. If you are using Remote Mode on the CK-100 with digital outputs of an IWx/118, contact iWorx/CB Sciences to purchase a cable.
3. Turn on the CK-100 and the data acquisition unit.
4. Open the data acquisition software.
5. Program the digital outputs of the data acquisition unit to the time parameters required in the experiment.
6. Enable the channels needed on the CK-100 by flipping their toggle switches to the ON position.
7. Set the voltage output of each enabled channel.
8. Begin recording and activate the digital output sequence on the recording software.

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Caution

EXTREME CARE SHOULD BE TAKEN NOT TO TOUCH THE STIMULATING ELECTRODES OR ANY EXPOSED WIRES WHILE THE STIMULATOR IS RUNNING. Each channel of the CK-100 can deliver as high as 100V at 10mA (ch1 & ch2 at 40mA).

Specifications

Channels:	8
Maximum Voltage Output:	100V on each channel
Maximum Current:	40mA on ch1 and ch 2 (Determined by the load) 10mA on ch3-ch8 (Determined by the load)
Output Control:	Remote via logic (TTL) signal, or Manual
Maximum Duty Cycle:	100%
Logic Requirements:	3-5V @ 2mA

Experiments

Experiments using the CK-100 stimulator can be found on the iWorx newsletter website at:
<http://www.iworx.com/newsletter/Feb08newsletter.htm>.

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