Berkeley Nucleonics Corporation

Model 725 Multi-Trigger Digital Delay Generator

User Guide

Documentation for the Model 725

and **timer*PRO*** Software

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INTRODUCTION

The Model 725 is a fully programmable logic and timing controller for coordinating and synchronizing lab equipment and physical experiments. Model 725 provides clocks, counters, triggers, and many other useful functions, with 10 ns resolution and 100 ps accuracy.

The Model 725 consists of two components: **timer*PRO*** software and the Model 725 multi-trigger digital delay generator. **timer*PRO*** lets you design and run experiments from a simple graphical interface. The Model 725 provides the connections and control for your experimental devices.

Parts List

Your Model 725 package should include the following items:

1. The Model 725 multi-trigger digital delay generator
2. AC power cable
3. **timer*PRO*** software installation CD
4. 9-pin RS-232 cable
5. User's manual.

If any parts are missing or damaged please contact technical support.

Specifications

timer*PRO* software will run on any computer running Microsoft® Windows® XP or later. Drivers for National Instruments'® LabView™ software are also available for download. See *www.berkeleynucleonics.com* for more information.

The Model 725 includes eight TTL-compatible inputs and eight TTL-compatible outputs. Voltages in the range 2.5–5 V are TTL "highs" and voltages in the range 0.0–0.2 V are TTL "lows." Intermediate voltages should not be present on inputs and outputs except during transitions. The inputs and outputs are protected against connection to 115 VAC. When disconnected the inputs are read as TTL "highs."

The Model 725 can be connected to/ disconnected from the PC at any time without damage to either unit. This ability allows you to program the Model 725 at your computer, then to take the unit to the experiment area for stand-alone use.

Basic Functions

The Model 725 provides eight functional **channels**, or internal signal paths.

At any time, each channel can be assigned one of eight **timing modes**. Timing modes include clocks, counters, delayed pulses after triggers, etc. You can set various **properties** for each timing mode—for example, the delay length on a Delayed Pulse After Trigger. All modes are aligned to a precise, 100 MHz internal **clock or an external clock**, allowing resolution down to 10 ns.

Each channel also includes **logic** settings which specify the conditions that will trigger the channel. A channel can be triggered by any logical combination of signals from the eight inputs and/or the outputs of other channels.

The timing properties and logic that you set up in **timer*PRO*** can be transferred and stored in the memory of the Model 725. You can store up to 64 variations of these properties in **settings profiles** in the Model 725. You can then switch between settings profiles to switch experiments, compare different timing scenarios, or simulate different real world conditions.

All settings and setting profiles for a particular experiment can be stored as an **experiment file** on your computer. Experiment files bear a .trg extension.

How You Will Use the Model 725

In most cases, you'll use the Model 725 as follows:

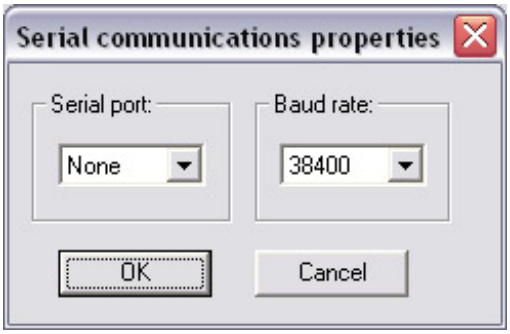
1. Using the **timer*PRO*** software, open an existing experiment file, or create a new file.
2. In **timer*PRO*** (or LabView), program the properties and logic for each channel and for the experiment as a whole.
3. Send the properties and logic to the Model 725's memory.
4. Test your program by simulating triggers and examining the outputs using the Model 725's channel LEDs and/or an oscilloscope or other diagnostic tool.
5. Store variations of channel properties in one of the Model 725's 64 settings profiles.
6. Plug your experimental equipment to the Model 725.
7. Run the experiment, using the Model 725 by itself or leaving it tethered to the PC. Switch between settings profiles to explore various timing conditions.

Installing **timer*PRO*** Software

Insert the **timer*PRO*** software disk in your computer drive and execute the setup.exe file.

Setting Up the Model 725

1. Plug the power cable from the back of the Model 725 into a 100–250 VAC power outlet.
2. Connect the 9-pin cable to the back of the Model 725 and to a free serial port on the PC.
3. Press the Power button on the front of the Model 725.
4. From your computer, run timerpro.exe to launch **timer*PRO***.
5. From within **timer*PRO***, select **View > Options>Com Port**. The Serial Communications Properties screen will open.



6. Select the port to which the Model 725 is connected. The Model 725 will automatically detect the baud rate, which is typically set to 38400. If the RS-232 cable running to your Model 725 is greater than 30 m long, you may need to lower the baud rate to achieve reliable communication.

Field Upgradeable Software

The firmware in the Model 725 is field upgradeable, allowing access to new timing modes and capabilities as they become available.

To upgrade the firmware, download the latest version from *www.berkeleynucleonics.com*. Then choose **Program > Update Firmware** to load data from that file.

Getting Help

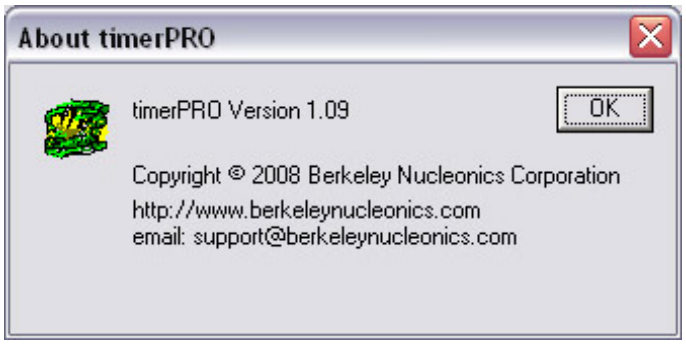
This guide is your main source for information on operating the Model 725 and **timer*PRO*** software. The guide is also available in an Abobe® Acrobat® (pdf) file for electronic viewing.

While running **timer*PRO***, press **F1** to view this document online. Or, press **SHIFT-F1**, then select a button or menu option to view help topics for a particular feature.

www.berkeleynucleonics.com also includes helpful applications notes and other technical information to help you use the Model 725.

If you are unable to find the information you need, please contact our technical support team at +1 (800) 234-7858, or e-mail us at info@berkeleynucleonics.com.

If you need to contact support, please let us know your Model 725 serial number (located on the bottom of the unit) and the version of software you are using. To determine the software version, select **Help > About timer*PRO***.

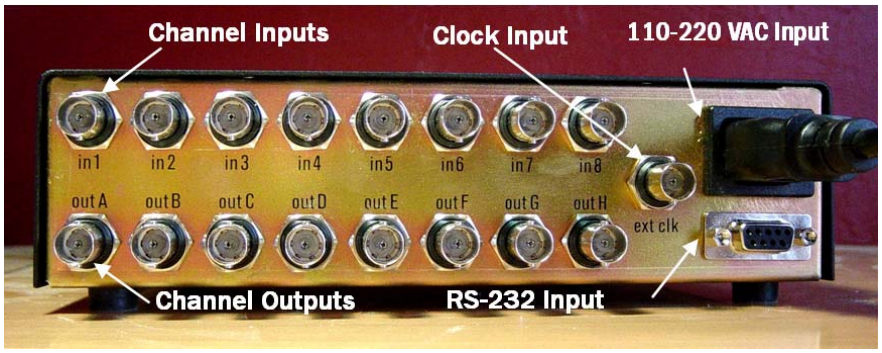


OVERVIEW OF MODEL 725 CONTROLS

The Model 725 is the control unit and interface for your experimental equipment. You will program it using the **timer*PRO*** software. Once you've designed, tested and downloaded your program, you can control the Model 725 from the computer, or you can run it in stand-alone mode.

Indicators and controls on the Model 725 front panel will help you run your experiments. You'll learn all about these functions in the *Experimenting* section later. For now, we'll give you a short tour of the inputs, outputs and controls so you can work with the unit while you learn to use the **timer*PRO*** software.

Back Panel Inputs and Outputs

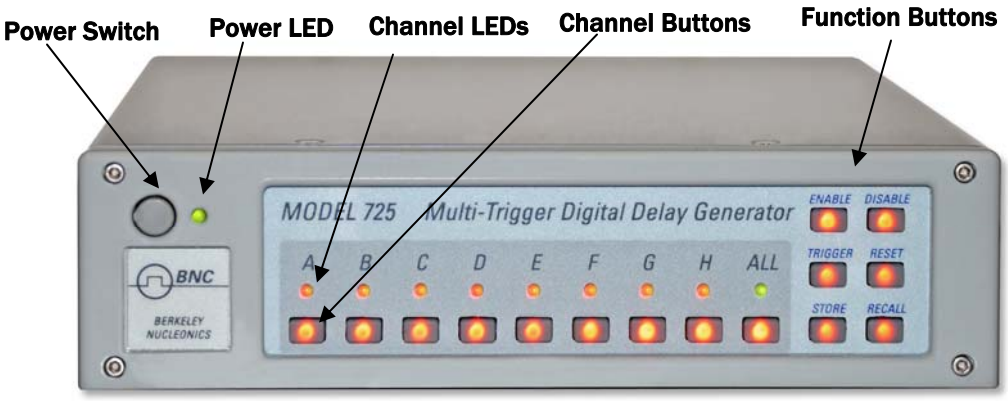


The back panel includes the following connectors:

- an internally-fused jack for a standard 100–250 VAC power cord
- a 9-pin RS-232 jack to connect to the Com port of your PC
- eight BNC channel input jacks (in1–in8), normally high (5 V)
- eight BNC channel output jacks (outA–outH), normally low (0 V)
- a BNC input jack for an external clock source.

The inputs and outputs will accept any device into that sends or receives TTL-compatible signals.

Front Panel Controls



The Model 725 front panel controls begin with the **Power button** and **Power LED** in the upper left corner. When you first press the Power button, the LED will flash green and red while the system runs its initial diagnostics. It will then glow steadily: if it glows a steady green, the front panel is unlocked and accepting button pushes; if it glows red, the front panel is locked (see ***timerPRO*** *Software Interface: General Settings* below). Even the power switch will be deactivated, safeguarding against mis-setting or tampering.

The **channel LEDs** offer useful information about the state of each channel. A green light typically indicates that the channel is ready to receive a trigger. A red light typically indicates that the channel is in the process of triggering. When a channel indicator is off, the channel is disabled (see *Running Experiments: Enable/Disable Channels*). More will be discussed in the *Timing modes* section.

The **All Channel LED** shows the status for all channels. A green LED indicates that the Model 725 will respond to external inputs and that the external outputs are active. A red LED indicates that the Model 725 will not respond to external inputs and that outputs are in a fixed and frozen logical state.

The **Channel and Function Buttons** work as pairs—you will select one of each to perform any function. In the base state, all buttons glow dimly, indicating that they're ready for your instruction. Once you press a channel or function button, only the available options will be illuminated.

Please contact Berkeley Nucleonics for the full User Manual

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