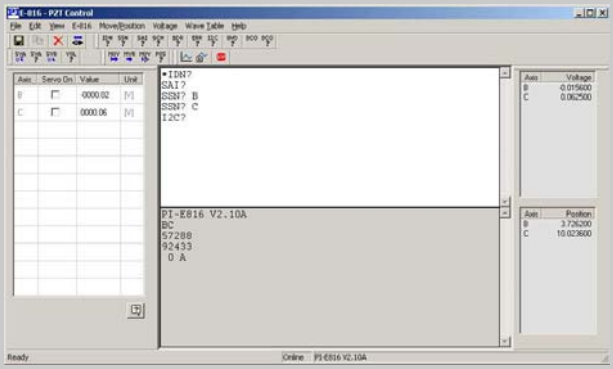
Piezo · Nano · Positioning

PZ146E Software Manual

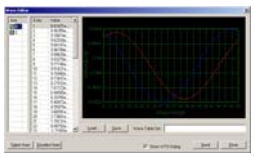
PZTControl for E-816

Release: 3.2.1 Date: 2007-06-21



This document describes software for the following product(s):

- E-816 Computer Interface and Command Interpreter, networkable



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0.3 Availability of Program and Documentation

PZTControl and this document as well as the other software tools and manuals accompanying the piezo controller system can be found on the product CD. Updated releases are available via FTP or email: contact your PI sales engineer or write info@pi.ws.

1 Introduction

This *PZTControl* manual assumes that you are already familiar with the motion system (stage, controller, host PC). All information on how to put the motion system into operation can be found in the User Manual for the *E-816* Computer Interface and Command Interpreter submodules.

1.1 Purpose of PZTControl

PZTControl is a 32-bit Windows application which was developed to control one or more networked *E-816* Computer Interface and Command Interpreter submodules.

The following basic functions are currently implemented:

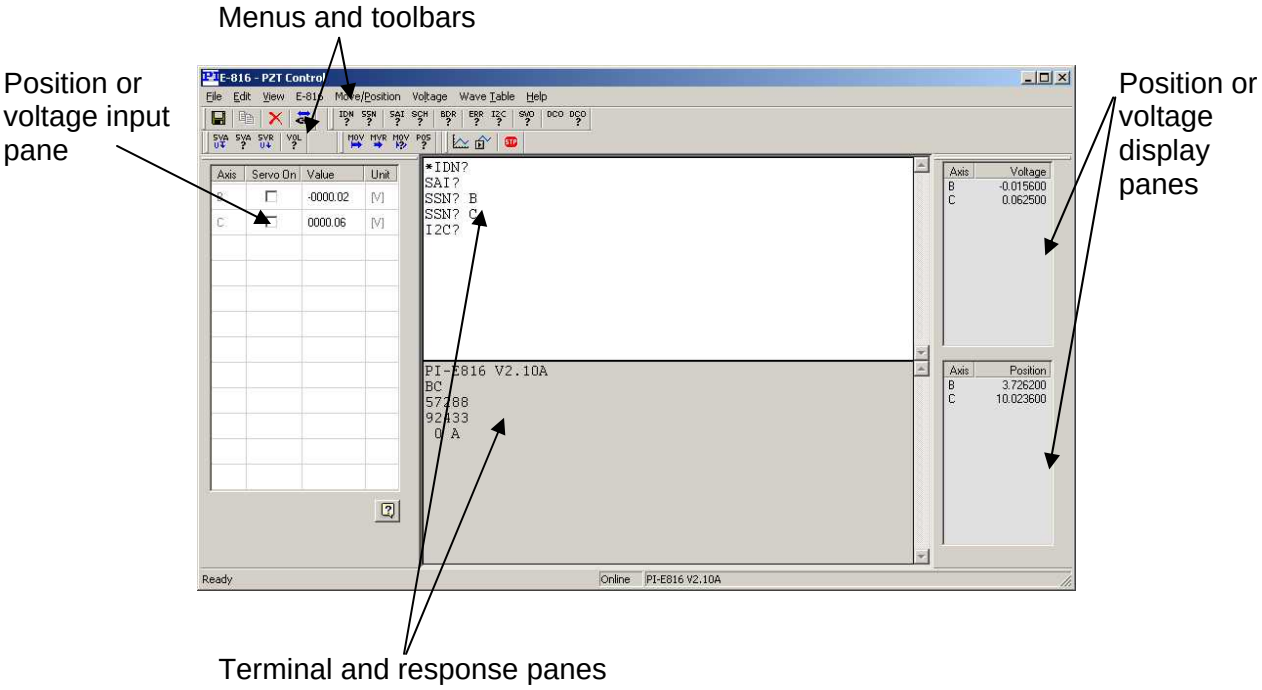
- Input of positions and voltages in "manual mode" (command input through a terminal and response window, toolbar buttons, panes for position or voltage input). *PZTControl* provides access to all the commands in the PI General Command Set (GCS; for detailed command descriptions see the User Manual or the GCS DLL Manual). The toolbar buttons are especially useful for initial testing and simple applications.
- Convenient user interface to the wave table for "automatic mode" control. In this mode the wave table content is used to command the axes, and no other control is possible.

Since *PZTControl* is based on the *E-816* General Command Set (GCS) DLL, it thereby offers an easy way to observe and test the functionality of this DLL.

Other Features of *PZTControl* are:

- Control for multiple axes (networked *E-816s*)
- Enable/disable servo-control (servo on = position control; servo off = voltage control)
- *E-816* parameter configuration dialog
- Communication over RS-232
- Real-time voltage and position display
- System status display

1.2 Overview



The toolbars provide shortcuts for certain commands. Each toolbar function can also be reached by a menu entry.

Most toolbar icons or menu choices simply enter the corresponding command into the terminal pane and send it to *E-816*. All responses are shown in the response pane.

With the entries from the *View* menu you can show or hide the various toolbars and the dockable position or voltage input and display panes. All visible items are listed with a check mark. So if you have accidentally hidden an item, you can get it back with the *View* menu.

2 Software Installation

2.1 Installation

The software package installs with the familiar installation procedure: a setup program guides you through all installation steps using interactive dialogs. After running the program, *PZTControl* is fully installed.

2.2 Deinstallation

During installation, *PZTControl* registers itself in the Windows system. This enables automatic de-installation using the mechanism supported by the Windows operating system. When starting the item *Add/Remove Programs* or *Software* in the *Control Panel*, the pop-up dialog shows a software list which contains the entry “PI E-816 Host-Software”. By selecting this item and choosing "Modify" for the task to perform, *PZTControl* can be completely removed.

3 Getting Connected

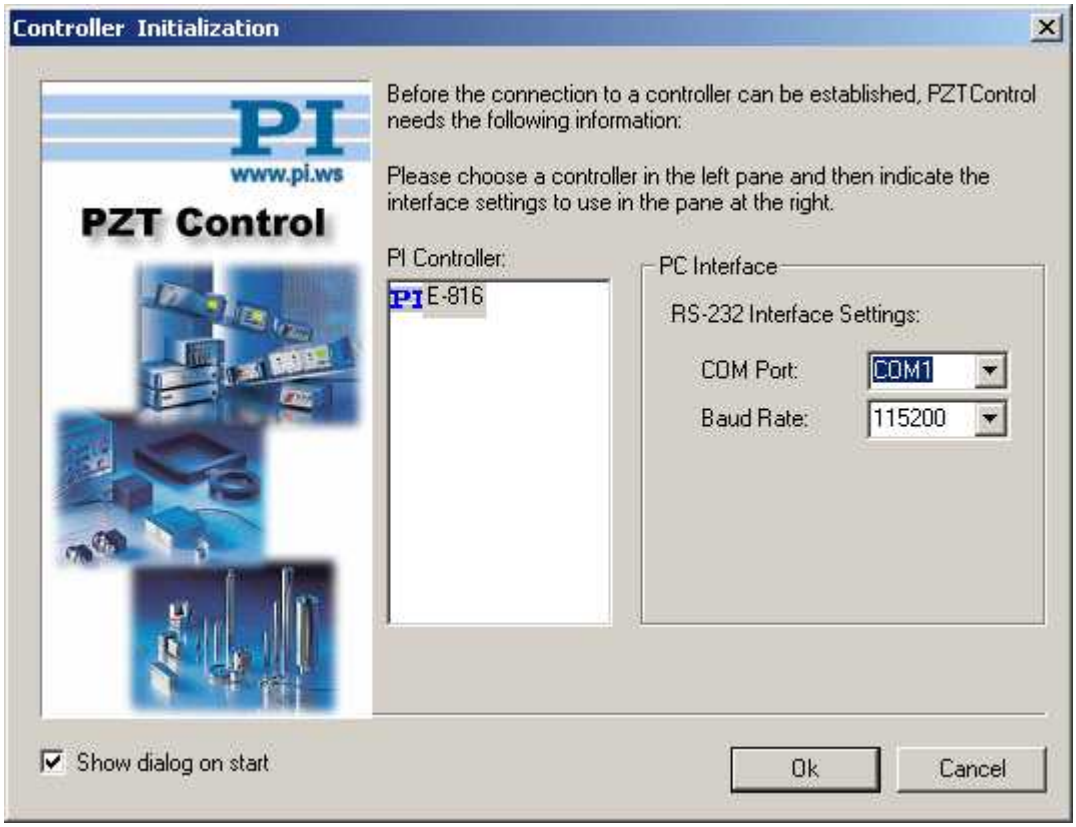
If you are using the *E-816* for the first time, you may need to select and configure the interface at the hardware first. Follow the instructions in the hardware device User Manual to determine (and/or set) the baud rate. The settings at the hardware must match those in the *PZTControl* host software.

Make sure that the DIP switches and jumpers on all modules and submodules are set so as to enable full computer control. Incorrect settings may not be immediately apparent. See the manuals for the various components for details.

To control more than one *E-816* from the same host PC, you can use the E-*816*'s automatic networking feature. Only one "master" E-816 will then be connected to the host PC while all further *E-816*s are interconnected via an I2C bus (note that changing which is the master unit is simply a matter of re-plugging the RS-232 cable and power-cycling the *E-816*s). *PZTControl* will handle an E-816 network as one multi-axis controller, with some restrictions on the "slave" axes. It is recommended to set up the network before you start working with *PZTControl*. See the *E-816* User Manual for details and instructions. If your hardware consists of plug-in modules (with integrated E-816s) in a common chassis, the network should be pre-installed and ready for use.

To control more than one *E-816* network from the same host PC, you must connect each network to a separate serial port and run separate copies of *PZTControl* in separate windows.

When you start *PZTControl* for the first time, the *Controller Initialization* dialog will be displayed:



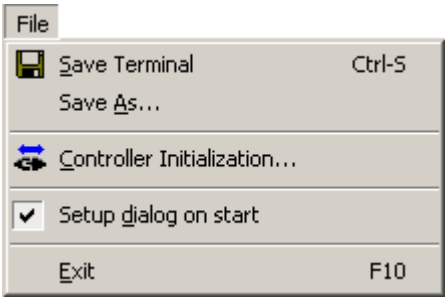
Select the installed interface type (*E-816* supports RS-232 only) and click *OK*. The program will try to connect to the device using the current interface settings. If it

fails, recall the *Controller Initialization* dialog using the *File* menu and reconfigure the interface.

RS-232 Settings:

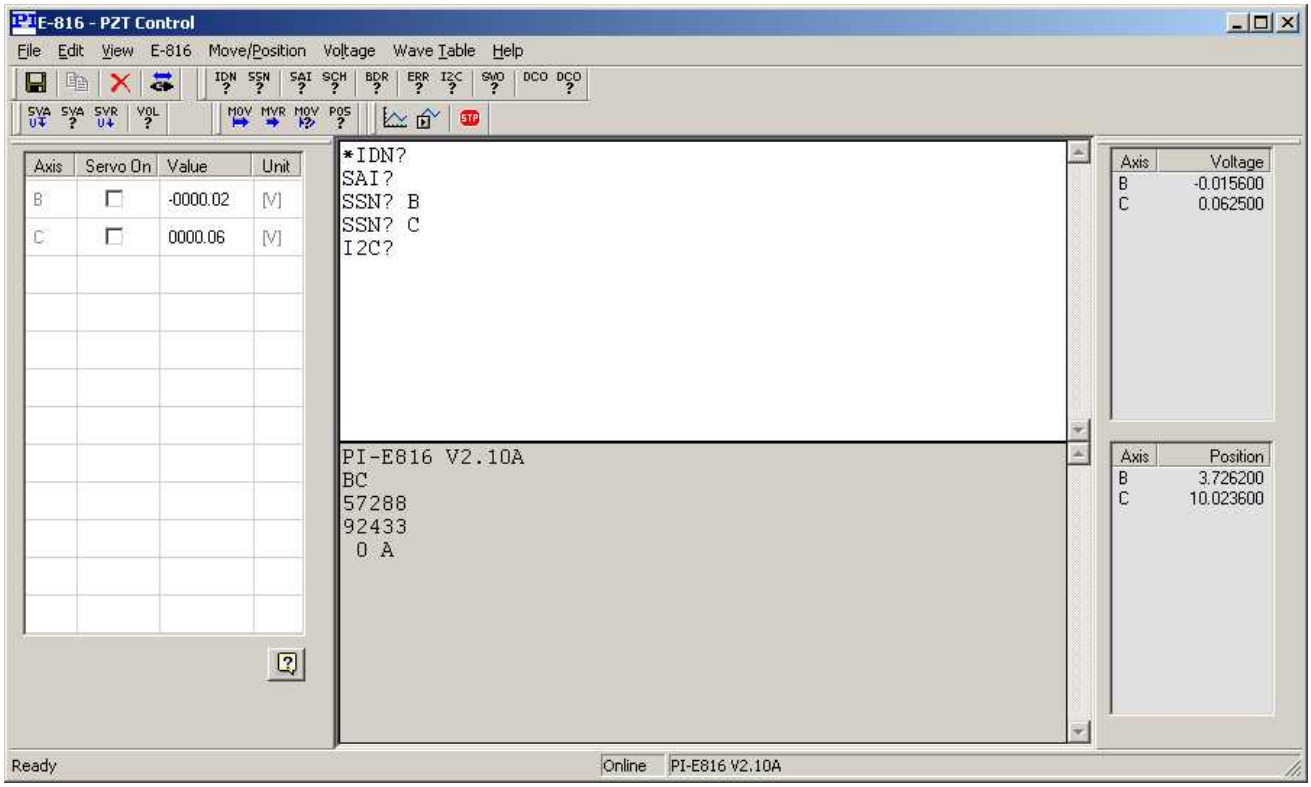
- **COM Port**: Select the desired COM port of the PC, something like “COM1” or ”COM2”. Only the ports available on the system that are not in use by other applications will appear in the list.
- **Baud Rate**: The baud rate of the interface. Please read the documentation of the connected *E-816* to determine the values it supports and how to set them. The settings in *PZTControl* must match those on the hardware!

You can inhibit display of the *Controller Initialization* dialog on program start with the menu sequence: *File* → *Setup dialog on start*.



On the next start the *Controller Initialization* dialog will not be displayed.

4 Terminal and Response Panes



In the center of the *PZTControl* main window you will find the two text panes of the *terminal emulator* (in the focus of the figure above). The top window is a terminal where you can enter commands for the *E-816* using the command syntax of the *PI General Command Set.* The available commands are listed in the *E-816* User Manual.

A command is typed in the terminal pane and sent when **ENTER** ("↵") is pressed. The terminal will send everything you type to the controller. The bottom pane shows the responses sent by the device, if any.

You can make the content of the terminal pane available outside of *PZTControl* with the *Save* (save as a text file) or *Copy* (copy the selected text to the clipboard) toolbar buttons or the corresponding items of the *File* menu. *Clear* will clear the active pane.

5 Edit Toolbar

This toolbar has the standard functions familiar from many other Windows applications. With “Clear” you can clear the contents of the active terminal windows. ”New device connection” (re)connects an *E-816* (network) when communications have been interrupted.

6 General Toolbar

This toolbar has shortcuts for some simple commands. If you click on one of these buttons, the command will be entered in the terminal window and sent to the device. The response window will show the answer from the device, if any.

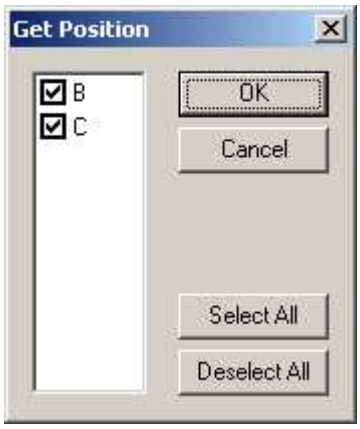
When “ERR?” is called from the menu or the toolbar, *PZTControl* also translates the response into the more meaningful text version so you do not have to learn all the error codes.

The commands on the *General* toolbar are all also available on the pull-down menu titled *E-816*.

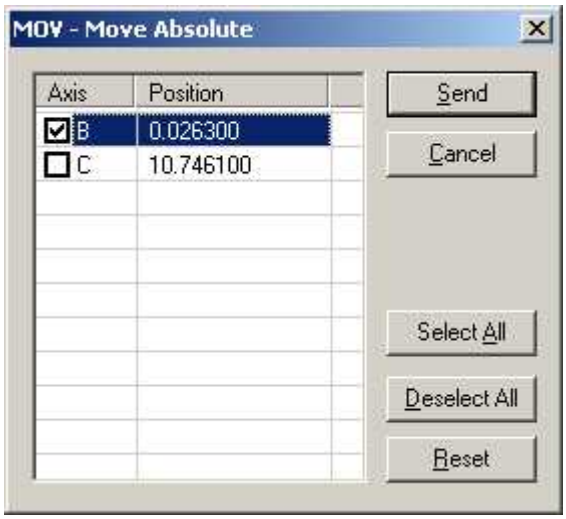
7 Position and Voltage Toolbars

The position and voltage toolbars handle most commands for moving the connected axes or setting voltages for them.

When a command needing axis identifiers is selected, *PZTControl* will prompt you to select the axes you want to access.



With commands that need additional parameters for each axis *PZTControl* will show the dialog displayed on the right to obtain the parameters for the axes.



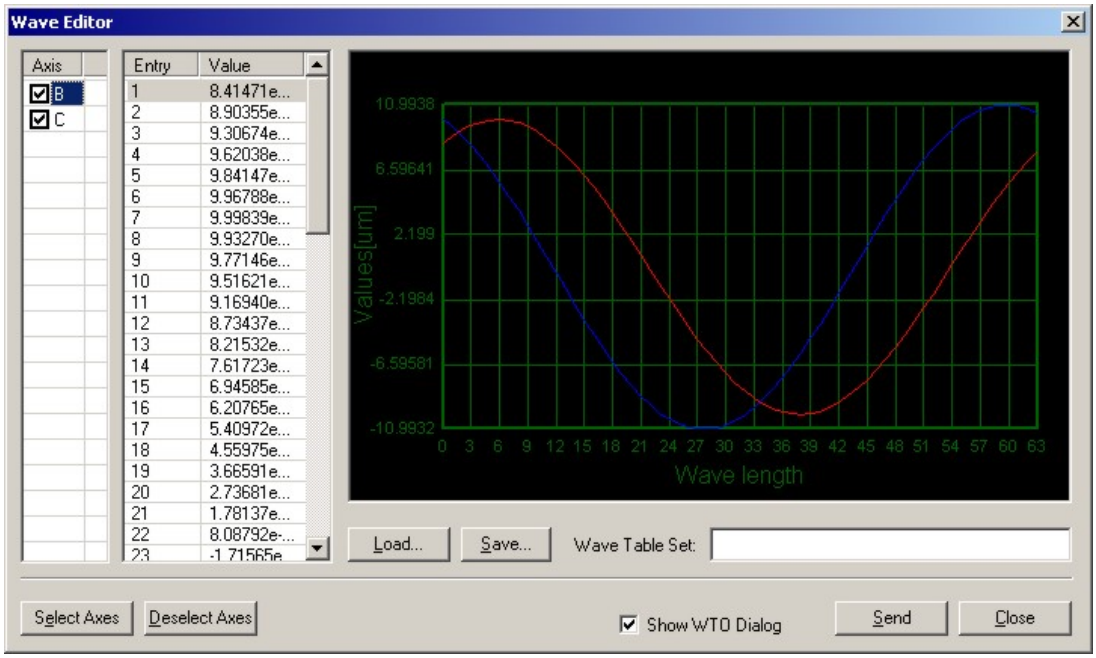
8 Wave Table Toolbar

This toolbar provides convenient access to the *E-816* internal wave table, with which the axes can be controlled in "automatic mode". As long as the wave table content is used to command the axes, no other control is possible.

8.1 Wave Editor

The *E-816* features internal wave tables each capable of storing up to 64 data points. The wave tables are, of course, fully controllable via the *E-816* ASCII command set, but with the *Wave Editor* the *PZTControl* offers a convenient graphical user interface to edit them.

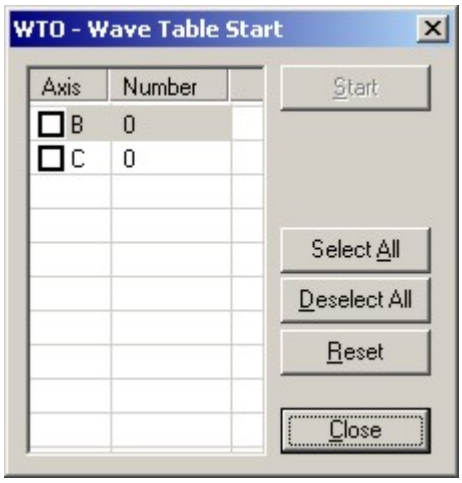
You can invoke the *E-816 Wave Editor* (see figure below) with the button in the *E-816 Wave Table* toolbar.



8.2 Wave Table Activation

To open the *Wave Table Start* dialog (see figure below), press the button (*WTO* is the appropriate GCS command). With this dialog you can set the wave table output mode for the given axis.

If the wave table output mode is activated for an axis (appropriate line in the dialog is checked), the number of wave-table data points given in the *Number* column will be output each time an external trigger signal is received. For details about the external trigger signal see the *E-816* User Manual.



8.3 Wave Table Stop

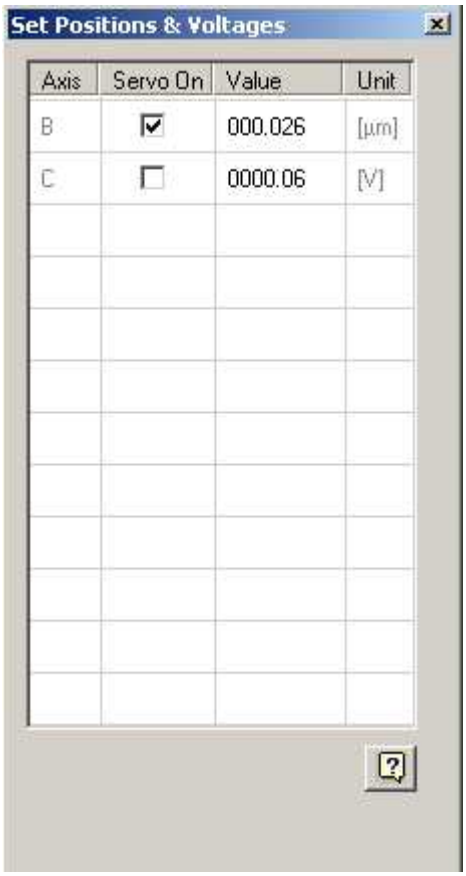
To stop the Wave Table output, press the button in the *Wave Table* toolbar.

9 Set or Display Positions or Voltages

The entries of the *View* menu affect the display on the host PC screen: you can not only hide or show toolbars, but also several panes for setting or displaying positions and voltages for single or multiple axes.

9.1 *Set Positions and Voltages* Pane

The *Set Positions & Voltages* dockable pane provides convenient access to the various axes connected to your *E-816* network. For each axis there are controls to change the servo mode and input a position or voltage value.



9.1.1 Servo Mode

Servo On

With servo mode on (checked), the controller will activate position servo-control functions for the currently selected axis. When servo-mode is on, only position targets may be entered. Make sure that all switches or jumpers on associated modules/submodules are set to allow servo control via the host software.

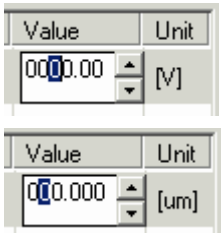
Servo On

With servo mode off (not checked), the device will not activate any servo-control. When servo mode is off, only voltage targets may be entered.

Note: The *E-816* uses the servo-control services of another submodule, so when using it, that submodule must be in computer-controllable mode. See the associated User Manuals.

9.1.2 Voltage and Position Input

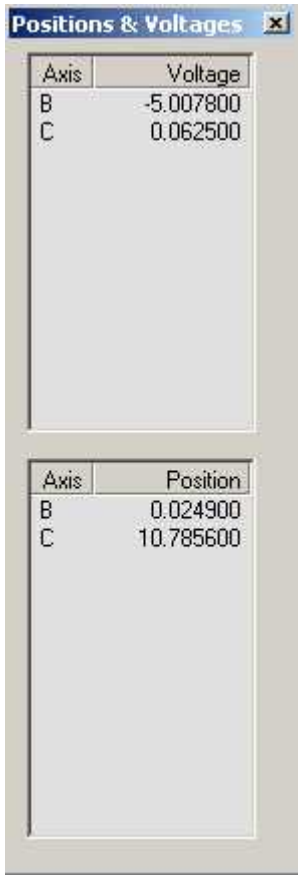
There are several ways to input or change a voltage or position value:



- A spin control to change the selected digit
- Up/down cursor keys (↑ or ↓). The selected digit will be incremented or decremented by 1.
- Left/right cursor keys (← / →) are used to select a digit.
- Keyboard or numeric keypad to input a value for the selected digit.

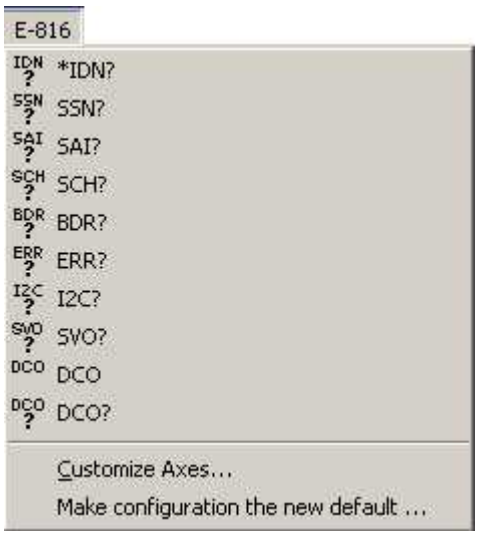
9.2 *Positions and Voltages* Pane

The *Positions & Voltages* dockable pane (at right) displays the current voltage and position of the various axes connected to your *E-816* network.



10 Customize and Check Axes

You can configure several hardware parameters of the master *E-816* and query the status of the individual axes. To do this, open the *Customize Axes* window with the *E-816* → *Customize Axes …* menu sequence.



The *Customize Axes* window consists of two cards, which are described in the following subsections.

10.1 Adapt E-816 Parameters

If you change the system configuration, i.e. use a new amplifier and/or a new stage, you can adapt some parameters of the master *E-816* (without validation) to assure the operability of the new system. These parameters are accessible on the *Parameters* card. Furthermore you have several saving and loading options.

On window opening the parameter values are those from the flash ROM of the master *E-816*. Note that it is also not possible to read the parameters from slave *E-816s*. Changing which is the master unit, however, is simply a matter of re-plugging the RS-232 cable and power-cycling the *E-816*s.

The parameter values Ksen, Osen, Kpzt, Opzt depend on the PZT stage and PZT amplifier used. They are also accessible by the corresponding ASCII command SPA (with parameter ID 7 to 10; see the *E-816* User Manual for the appropriate command descriptions). Note that the *Limits* fields are dimmed because the *E-816* does not support software limits.

NOTE

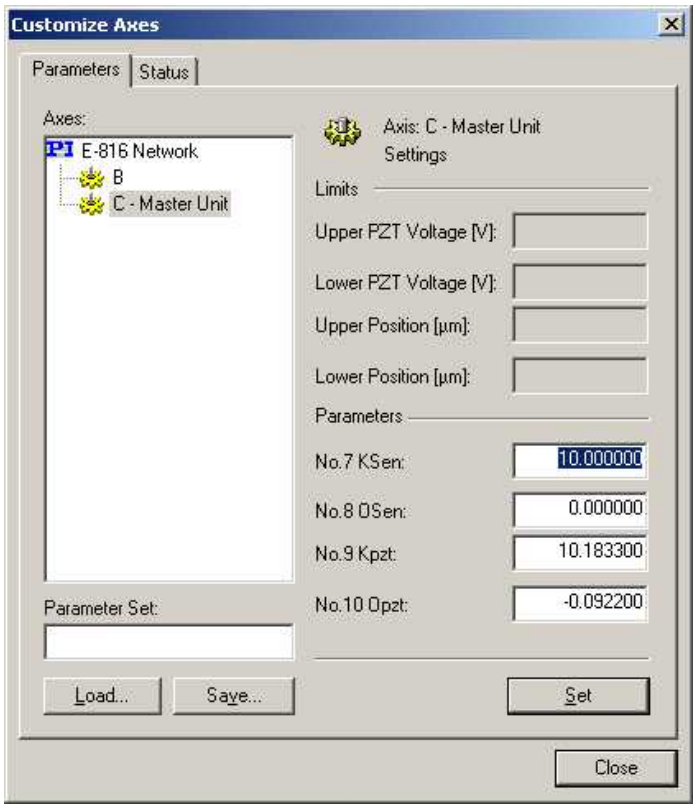
The offset and gain adjustments made with Ksen, Osen, Kpzt, Opzt have counterparts in the connected sensor and amplifier hardware (see associated User Manuals for calibration procedures). Hardware adjustments make the parameter values stored on the *E-816* invalid, and they have to be re-adjusted and saved.

You have the following options to save parameter changes:

Set retains changes until next power-down.

With *Save* you can store the current parameter values to a data file on the host PC. It is possible to store several parameter sets in the same file (when you select the same file for different parameter sets, they will be added to this file).

With *Load* you can select a parameter set which was saved to a parameter file on the host PC before.



CAUTION

Parameter changes will only be saved to *E-816* FLASH ROM when you send the WPA 100 command or use the *E-816* → *Make configuration the new default …* menu item. Otherwise all changes will be lost when powering down the device.

Note that saving to flash as described above comprises the following settings:

axis name (SCH),

baud rate (BDR),

averaging (AVG),

Ksen, Osen, Kpzt, Opzt values (SPA)

The saved settings are the new power-on defaults.

10.2 Read Out the Axis Status

You can check the status of all connected *E-816(s)* on the *Status* card in the *Customize Axes* window. This card pools several status request, which are also available by the appropriate ASCII commands in the terminal (OVF?, ONT?, SVO?); see *E-816* User Manual for detailed command descriptions).