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ST-300
SmartTable® Controller



User's Manual

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EU Declaration of Conformity

Application of Council Directive(s): ☒ 2014/30/EU Electromagnetic Compatibility Directive (EMCD)
☒ 2014/35/EU Low Voltage Directive (LVD)
☒ 2011/65/EU Restriction of Hazardous Substances Directive (RoHS)

Standard(s) to which conformity is declared: ☒EN 61326-1:2013 (EMC);
☒EN 61010-1:2010 (Safety);

Emissions:
☒CISPR 11:2015 Industrial, Scientific and Medical Equipment Radio-Frequency Disturbance Characteristics - Limits and Methods of Measurement {Class A Group 1}
☒IEC 61000-3-2:2014 EMC/Limits for Harmonic Current Emission
☒IEC 61000-3-3:2013 EMC/Limitations of Voltage Fluctuations and Flicker in Low-Voltage Supply Systems

Immunity:
☒IEC 61000-4-2:2008 EMC/Electrostatic Discharge Immunity Test
☒IEC 61000-4-3:2006 2006+AMD1:2007+AMD2:2010 EMC/Radiated Radio - Frequency Electromagnetic Field Immunity Test
☒IEC 61000-4-4:2012 EMC/Electrical Fast Transient/Burst Immunity Test
☒IEC 61000-4-5:2014 EMC/Surge Immunity Test
☒IEC 61000-4-6:2013 EMC/Conducted Disturbances induced by Radio Frequency Fields Immunity Test
☒IEC 61000-4-8:2009 EMC/Power Frequency Magnetic Field Immunity Test
☒IEC 61000-4-11:2004 EMC/Voltage Dips, Short Interruptions and Variations Immunity Test

Manufacturers Name: MKS Instruments, Inc. Andover, MA, USA

Importer's Name & Location: Micro Controle Spectra-Physics, 9, rue du Bois Sauvage, F-91055 Evry, France

Equipment Type/Description: Vibration Isolation System

Model Number(s): ST-300-series, IQD-series, IQ-series, (M-)SST-series, (M-)ST-series, (M-)OTS-SST-series, (M-)OTS-ST-series, J-OTS-ST-series

MKS confirms that, with respect to the products listed above, it believes it is in conformity with the selected European Union harmonization legislation. MKS product conforms to the above Directive(s) and Standard(s) only when installed in accordance with manufacturer's specifications. This declaration has been issued under the sole responsibility of the manufacturer.

Date: August 28, 2017

(Signature)

James Fisher
(Full Name)

VP & General Manager
(Title)

Warranty

Newport Corporation warrants that this product will be free from defects in material and workmanship and will comply with Newport's published specifications at the time of sale for a period of one year from date of shipment. If found to be defective during the warranty period, the product will either be repaired or replaced at Newport's option.

To exercise this warranty, write or call your local Newport office or representative, or contact Newport headquarters in Irvine, California. You will be given prompt assistance and return instructions. Send the product, freight prepaid, to the indicated service facility. Repairs will be made and the instrument returned freight prepaid. Repaired products are warranted for the remainder of the original warranty period or 90 days, whichever first occurs.

Limitation of Warranty

The above warranties do not apply to products which have been repaired or modified without Newport's written approval, or products subjected to unusual physical, thermal or electrical stress, improper installation, misuse, abuse, accident or negligence in use, storage, transportation or handling. This warranty also does not apply to fuses, batteries, or damage from battery leakage.

This warranty is in lieu of all other warranties, expressed or implied, including any implied warranty of merchantability or fitness for a particular use. Newport Corporation shall not be liable for any indirect, special, or consequential damages resulting from the purchase or use of its products.

First printing 2017

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Newport Corporation
1791 Deere Avenue
Irvine, CA, 92606
USA

Part No. 90066706, Rev. E

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Service Information

This section contains information regarding factory service for the source. The user should not attempt any maintenance or service of the system or optional equipment beyond the procedures outlined in this manual. Any problem that cannot be resolved should be referred to Newport Corporation.

Technical Support Contacts

North America & Asia
Newport Corporation Service Dept.
1791 Deere Ave. Irvine, CA 92606
Telephone: (949) 253-1694
Telephone: (800) 222-6440 x31694

Europe
Newport/MICRO-CONTROLE S.A.
Zone Industrielle
45340 Beaune la Rolande, FRANCE
Telephone: (33) 02 38 40 51 56

Newport Corporation Calling Procedure

If there are any defects in material or workmanship or a failure to meet specifications, promptly notify Newport's Returns Department by calling 1-800-222-6440 or by visiting our website at www.newport.com/returns within the warranty period to obtain a **Return Material Authorization Number (RMA#)**. Return the product to Newport Corporation, freight prepaid, clearly marked with the RMA# and we will either repair or replace it at our discretion. Newport is not responsible for damage occurring in transit and is not obligated to accept products returned without an RMA#.

E-mail: rma.service@newport.com

When calling Newport Corporation, please provide the customer care representative with the following information:

- Your Contact Information
- Serial number or original order number
- Description of problem (i.e., hardware or software)

To help our Technical Support Representatives diagnose your problem, please note the following conditions:

- Is the system used for manufacturing or research and development?
- What was the state of the system right before the problem?
- Have you seen this problem before? If so, how often?
- Can the system continue to operate with this problem? Or is the system non-operational?
- Can you identify anything that was different before this problem occurred?

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1 Safety Precautions

1.1 Definitions and Symbols

The following terms and symbols are used in this documentation and also appear on the SmartTable Controller where safety-related issues occur.

1.1.1 General Warning or Caution



Figure 1 General Warning or Caution Symbol

The Exclamation Symbol in the figure above appears in Warning and Caution tables throughout this document. This symbol designates an area where personal injury or damage to the equipment is possible.

1.1.2 Electric Shock



Figure 2 Electrical Shock Symbol

The Electrical Shock Symbol in the figure above appears throughout this manual. This symbol indicates a hazard arising from dangerous voltage. Any mishandling could result in irreparable damage to the equipment, and personal injury or death.

1.1.3 European Union CE Mark



Figure 3 CE Mark

The presence of the CE Mark on Newport Corporation equipment means that it has been designed, tested and certified as complying with all applicable European Union (CE) regulations and recommendations.

1.1.4 Frame or Chassis

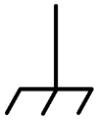


Figure 4 Frame or Chassis Terminal Symbol

The symbol in the figure above appears on the SmartTable Controller. This symbol identifies the frame or chassis terminal

1.1.5 On

Figure 5 On Symbol

The On Symbol in the figure above represents a power switch position on the Model ST-300 SmartTable controller. This symbol represents a Power On condition.

1.1.6 Off

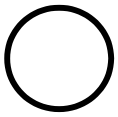


Figure 6 Off Symbol

The Off Symbol in the figure above represents a power switch position on the Model ST-300 SmartTable controller. This symbol represents a Power Off condition.

1.1.7 Protective Conductor Terminal



Figure 7 Protective Conductor Terminal Symbol

The protective conductor terminal symbol in the above figure identifies the location of the bonding terminal, which is bonded to conductive accessible parts of the enclosure for safety purposes. The intent is to connect it to an external protective earthing system through the power cord.

1.1.8 USB Connector Symbol



Figure 8 USB connector Symbol

The USB connector symbol in the above figure identifies the location of the USB communications connector.

1.1.9 Waste Electrical and Electronic Equipment (WEEE)



Figure 9 WEEE Directive Symbol

This symbol on the product or on its packaging indicates that this product must not be disposed with regular waste. Instead, it is the user responsibility to dispose of waste equipment according to the local laws. The separate collection and recycling of the waste equipment at the time of disposal will help to conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For information about where the user can drop off the waste equipment for recycling, please contact your local Newport representative.

1.2 Warnings and Cautions

The following are definitions of the Warnings, Cautions and Notes that are used throughout this manual to call your attention to important information regarding your safety, the safety and preservation of your equipment or an important tip.



WARNING

Situation has the potential to cause bodily harm or death.



CAUTION

Situation has the potential to cause damage to property or equipment.

NOTE

Additional information the user or operator should consider.

1.2.1 General Warnings

Observe these general warnings when operating or servicing this equipment:

- Heed all warnings on the unit and in the operating instructions.
- Do not use this equipment in or near water.
- Route power cords and other cables so they are not likely to be damaged.
- Disconnect power before cleaning the equipment. Do not use liquid or aerosol cleaners; use only a damp lint-free cloth.
- Lockout all electrical power sources before servicing the equipment.
- To avoid explosion, do not operate this equipment in an explosive atmosphere.
- Qualified service personnel should perform safety checks after any service.
- The SmartTable Controller is only approved for use in an industrial environment. Use of the product in a residential environment may result in electromagnetic compatibility difficulties due to conducted as well as radiated disturbances.

1.2.2 General Cautions

Observe these cautions when operating or servicing this equipment:

- If this equipment is used in a manner not specified in this manual, the protection provided by this equipment may be impaired.
- Do not block ventilation openings.
- Use only the specified replacement parts.
- Follow precautions for static sensitive devices when handling this equipment.
- This product should only be powered as described in the manual.
- There are no user-serviceable parts inside the ST-300 SmartTable Controller
- To prevent damage to the equipment, read the instructions in the equipment manual for proper input voltage.

1.2.3 Mounting precaution

The dampers are usually installed at two adjacent table corners along a longer side. The exact position of each damper is indicated by three visible flat-head screws flush with the table top. Please note that four sealed mounting holes in each damper area are only 0.457 in. (11.6 mm) deep. When using any of these holes, choose the screw length accordingly. Using screws that are too long may cause damage to the dampers and delamination of the table face sheet.

1.2.4 Summary of Warnings and Cautions

The following general warning and cautions are applicable to this instrument:



WARNING

Before operating the SmartTable Controller, please read and understand all of Section 1.



WARNING

Do not attempt to operate this equipment if there is evidence of shipping damage or you suspect the unit is damaged. Damaged equipment may present additional hazards to you. Contact Newport technical support for advice before attempting to plug in and operate damaged equipment.



WARNING

Before cleaning the enclosure of the SmartTable Controller, or the enclosure of any attached Damper Assemblies, the power supply's AC power cord must be disconnected from the wall socket.



CAUTION

There are no user serviceable parts inside the SmartTable Controller and the associated Damper Assemblies. Work performed by persons not authorized by Newport will void the warranty. For instructions on obtaining warranty repair or service, please refer to Section 6.



WARNING

If this equipment is used in a manner not specified in this manual, the protection provided by this equipment may be impaired.



WARNING

While the SmartTable Controller's rear panel power switch turns power OFF to the internal electronics, it should not be depended upon to fully disconnect the unit from MAINS power. Disconnect the power supply unit's power cord to fully isolate this equipment from MAINS power. Do not position this equipment so that it is difficult to disconnect the power cord.



The SmartTable Controller is intended for use in an industrial laboratory environment. Use of this product in other environments, such as residential, may result in electromagnetic compatibility difficulties due to conducted as well as radiated disturbances.



WARNING

The SmartTable Controller is intended for use ONLY with Newport Damper Assemblies. DO NOT ATTEMPT TO USE THE SMARTTABLE CONTROLLER WITH UNAPPROVED DEVICES.

1.3 Location of Warnings

1.3.1 Rear Panel

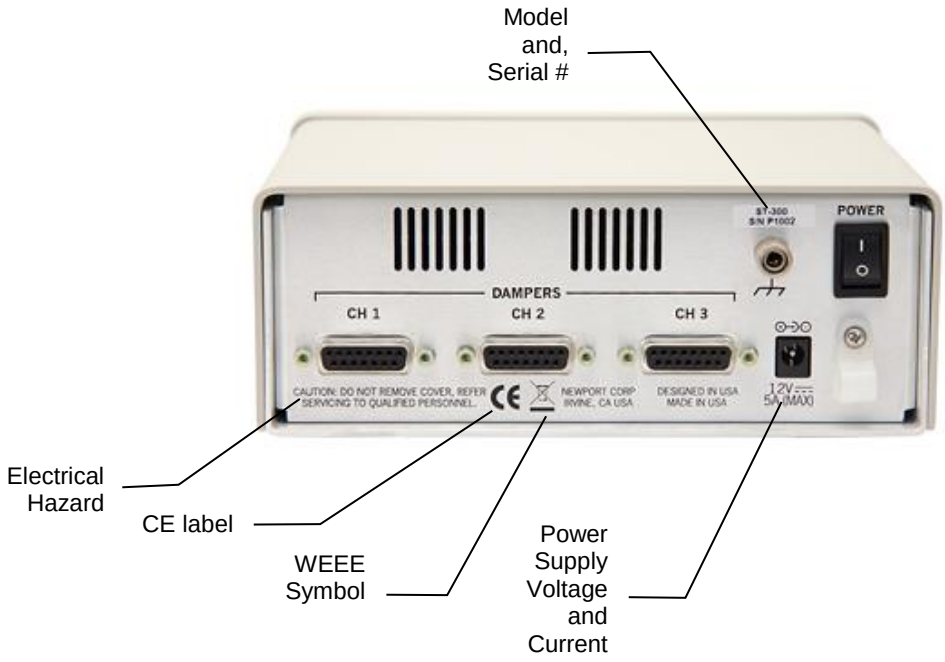


Figure 10 Rear Panel Labels and Warnings (ST-300)

2 General Information

2.1 Introduction

The SmartTable is a combination of the structurally damped vibration isolation table, electronics that monitor vibrations in real time, and active elements that use the real-time data to suppress the vibration.

The vibration state of an optical table is a critical characteristic, in many cases defining its suitability for a task at hand. Reducing vibration, especially the dynamic deviation of the table from a rigid-body type behavior, is one of the most important criterions of the table design. Vibration reductions is achieved mainly by vibration isolation using passive isolating legs, such as Newport S-2000A or I-2000. These isolating legs reduce the vibration transmitted from the floor to the optical table. Although excellent isolation from floor vibration can be achieved in these systems, the table will deviate from the ideal rigid-body behavior at natural frequencies of its flexural vibrations. External sources acting on the tabletop (i.e. air turbulence and acoustical waves) or the dynamic events generated in the payload excite resonance vibration in the table's own free-state modes such as bending and torsion. This can lead to deterioration of the payload performance, in particular, misalignment of the optical equipment.

The SmartTable includes active vibration dampers that add energy dissipation to all natural vibration modes of the table in a wide frequency range without creating any additional resonances at lower frequencies. If the load on the table changes, the dampers maintain their efficiency and stability after simple auto-tuning of control gains.

2.1.1 Newport Active Vibration Dampers

	Part or model numbers	Application
IQ Dampers	41483-01	Integrated, 8 in. thick Newport optical tables
	41483-02	Integrated, 12 in. thick Newport optical tables
	41483-03	Integrated, 18 in. thick Newport optical tables
	90057882 or IQ-V	Add-on, for damping vertical vibration
	90057883 or IQ-H	Add-on, for damping horizontal vibration
IQD Dampers	41483-04	Integrated, 12 in. thick Newport optical tables
	41483-05	Integrated, 18 in. thick Newport optical tables
	90066660 or IQD-V	Add-on, for damping vertical vibration
	90066661 or IQD-H	Add-on, for damping horizontal vibration

Table 1 Newport Active Vibration Dampers

IQ dampers are normally used with typical laboratory size optical tables (up to 12 ft. or 3.5 m long) and other relatively small vibration-isolated structures with the lowest natural frequency of flexural vibration above 100 Hz. IQD dampers are optimized for use with larger structures, in particular with the doubled optical tables having the lowest natural frequency of flexural vibration in the 40 – 100 Hz range.

2.2 Specifications

Working Surface	400 Series ferromagnetic stainless steel 3/16 in. (4.8 mm) thick with integrated damping layer
Surface Flatness [in. (mm)]	±0.004 (±0.1), over 2 ft. (600 mm) square
Core Design	Trussed honeycomb, vertically bonded closed cell construction, 0.010 in. (0.25 mm) Steel sheet materials, 0.030 in. (0.76 mm) Triple core interface
Active Damping	IQ electronic damping technology
Structural Damping	Constrained layer core, damped working surface and composite edge finish
Mounting Holes	1/4-20 holes on 1 in. grid (M6-1.0 holes on 25 mm grid), 0.5 in. borders (12.5 mm borders)
Hole/Core Sealing	Easy clean conical cup 0.75 in. (19 mm) deep, Non-corrosive high impact polymer material

Table 2 Specifications

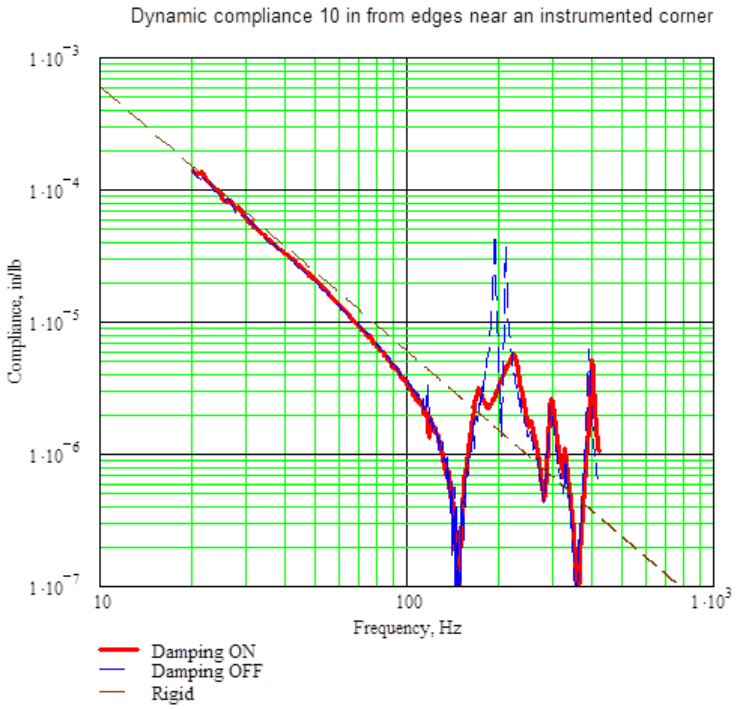


Figure 11 Dynamic Compliance Curve.
(This data was taken on a ST-48-8 table supported by I-2000 isolators.)

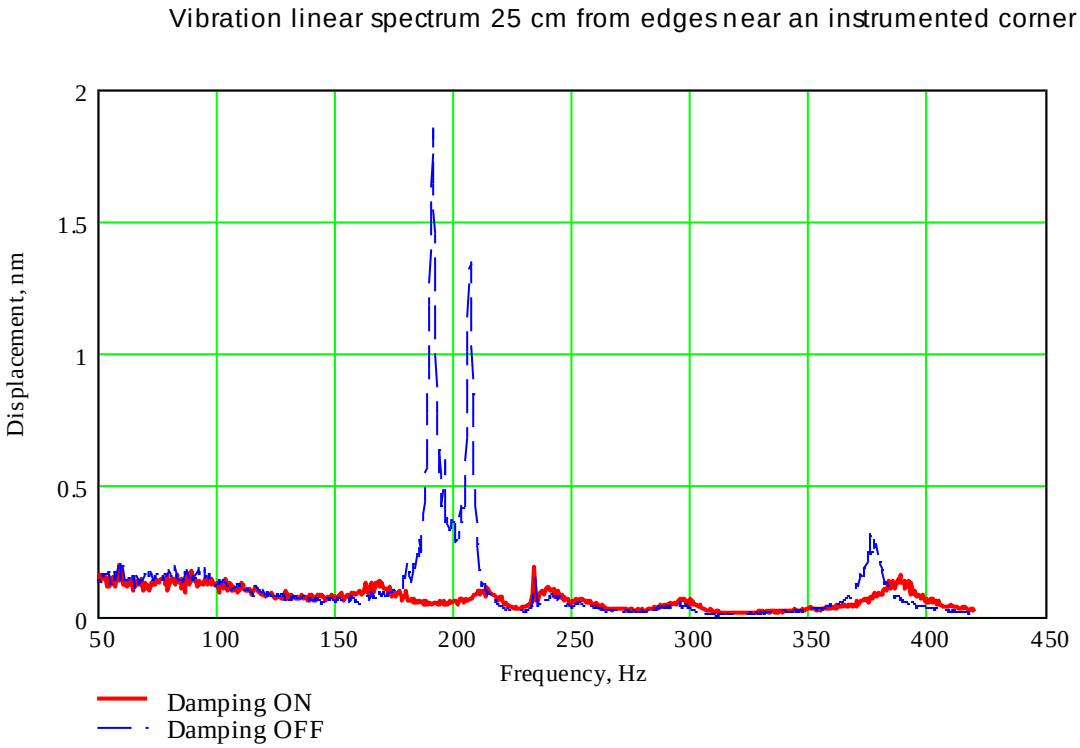


Figure 12 Effect of damping on table vibration levels

The SmartTable uses the same materials and has the same main mechanical characteristics as passively damped Newport RS series table. The dampers are installed at the table corners. The exact position of each damper is indicated by three flat-head screws that are flush with the table top corners.

⚠	**CAUTION** **Please note that the four sealed threaded holes in each damper area are only 0.457 in (11.6 mm) deep. If you need to use some of these holes, choose the length of the screws accordingly. Using screws that are too long may cause damage to the dampers and de-lamination of the table facesheet.**

SmartTable Controller Specifications

Output Power	
Continuous current	3A @ 12VDC
Input Power	
Voltage	12V ±5%
Average Current @ continuous output rating	3A
Peak Current @ continuous output rating	5A

Table 3 SmartTable Controller Specifications

System Environmental Specifications

AC Input	100-240VAC, 1.5A 50/60Hz ±10%
Chassis Ground	4 mm banana jack
Size (H x W x D) [in. (mm)]	7.5W x 6.67L x 3.19H (190.5W x 169.3L x 80.9H)
Weight [lb (kg)]	2.4 (1.1)
Operating Temperature	5 °C to 40 °C
Operating Humidity	< 85% relative humidity non-condensing
Storage Temperature	0 - 60 °C < 85% non-condensing
Altitude	< 3000 m
Electrical Class	1
Installation Category	2
Pollution Degree	2
Use Location	Indoor use only

Table 4 Environmental Specifications

3 Getting Started

3.1 Unpacking and Handling

It is recommended that the SmartTable Controller is unpacked in a lab environment or work site. Unpack the system carefully; a USB flash drive and a power supply are included with the instrument. Inspect the box carefully for loose parts before disposing of the packaging. You are urged to save the packaging material in case you need to ship your equipment in the future.

3.2 Inspection for Damage

The SmartTable Controller is carefully packaged at the factory to minimize the possibility of damage during shipping. Inspect the box for external signs of damage or mishandling. Inspect the contents for damage. If there is visible damage to the instrument upon receipt, inform the shipping company and Newport Corporation immediately.



WARNING

Do not attempt to operate this equipment if there is evidence of shipping damage or you suspect the unit is damaged. Damaged equipment may present additional hazards to you. Contact Newport technical support for advice before attempting to plug in and operate damaged equipment.

3.3 Parts List

Parts included with the SmartTable System:

- Model ST-300 Series SmartTable Controller
- Power Supply with power cord (US), 12V/5A, Newport P/N 90066688
- USB Flash Drive (contains Device User's Manual and Software)

If you are missing any hardware or have questions about the hardware you have received, please contact Newport.

3.4 Choosing and Preparing a Suitable Work Surface

The SmartTable Controller may be placed on any reasonably firm table or bench during operation. Note that manual operation of ST-300 front panel controls will mechanically disturb the normal operation of the system if the controller is placed on or attached to the optical table itself.

3.5 Electrical Requirements

Before powering the unit for the first time, the following precautions must be followed:

- Provide adequate distance between the SmartTable Controller air vents and adjacent walls for ventilation purposes. A spacing of approximately 2 inches from all surfaces is adequate.

3.6 Power Supply

Power to the Model ST-300 SmartTable Controller must only be supplied using an appropriate 12 Volt DC Newport-approved power supply such as the one supplied with the controller. The supplied power supply is auto-ranging and is approved for operation between 100 to 240VAC.



WARNING

Do not attempt to power the SmartTable Controller unit with an unapproved power supply. Failure to do so can cause damage to the SmartTable Controller unit, Fire, or Death.

Optional: To prevent the power supply from being accidentally disconnected during operation, a strain relief is provided to secure the power cord. Figure 13 shows suggested methods for securing the power cord.



Figure 13 Optional strain relief to secure the power cord

3.7 Operating Temperature

The SmartTable Controller is designed for operation in a laboratory environment. Recommended ambient operating temperatures are 20 – 25 °C. Operation at higher or lower ambient temperatures for limited periods (e.g., several hours) will not cause any harm but may slightly reduce the performance.

3.8 System Diagrams

Recommended connections of the SmartTable Controller to the various Newport Dampers and Optical Table Systems

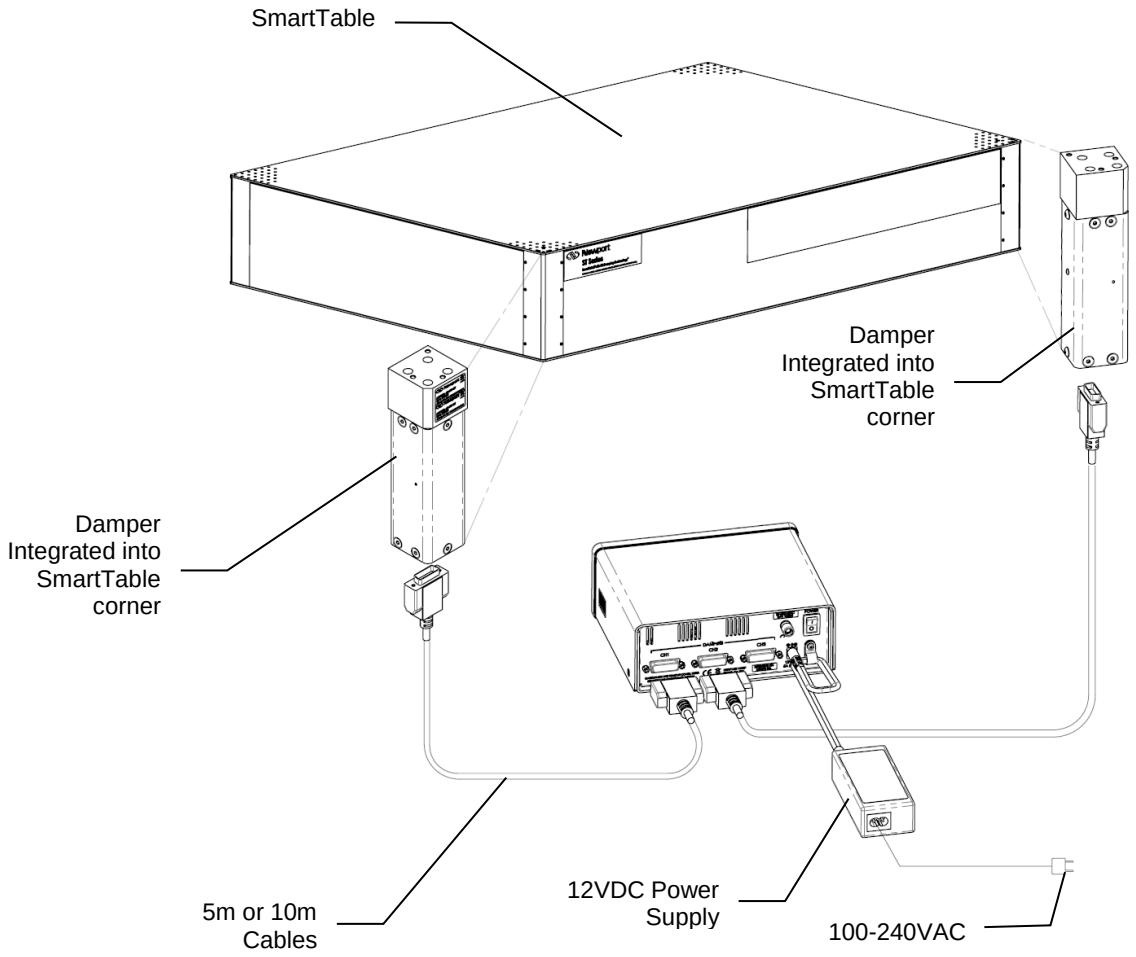


Figure 14 SmartTable Two Channel System

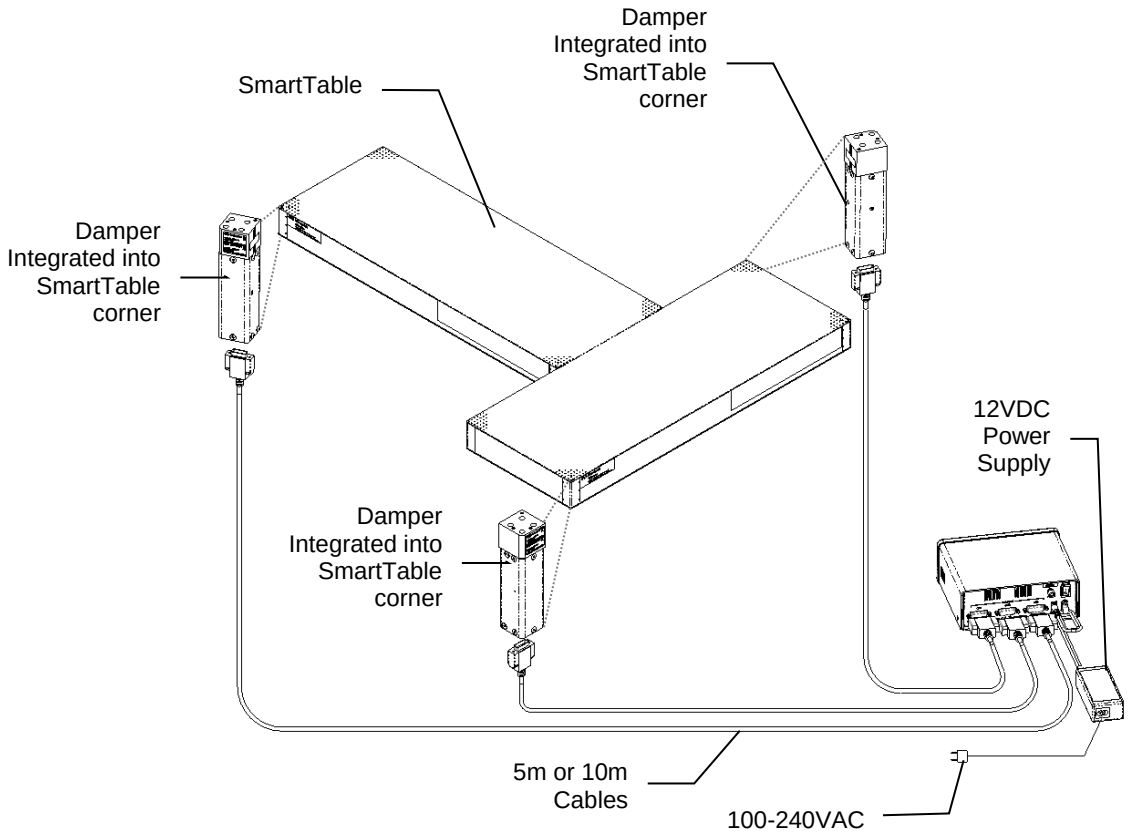


Figure 15 SmartTable Three Channel System

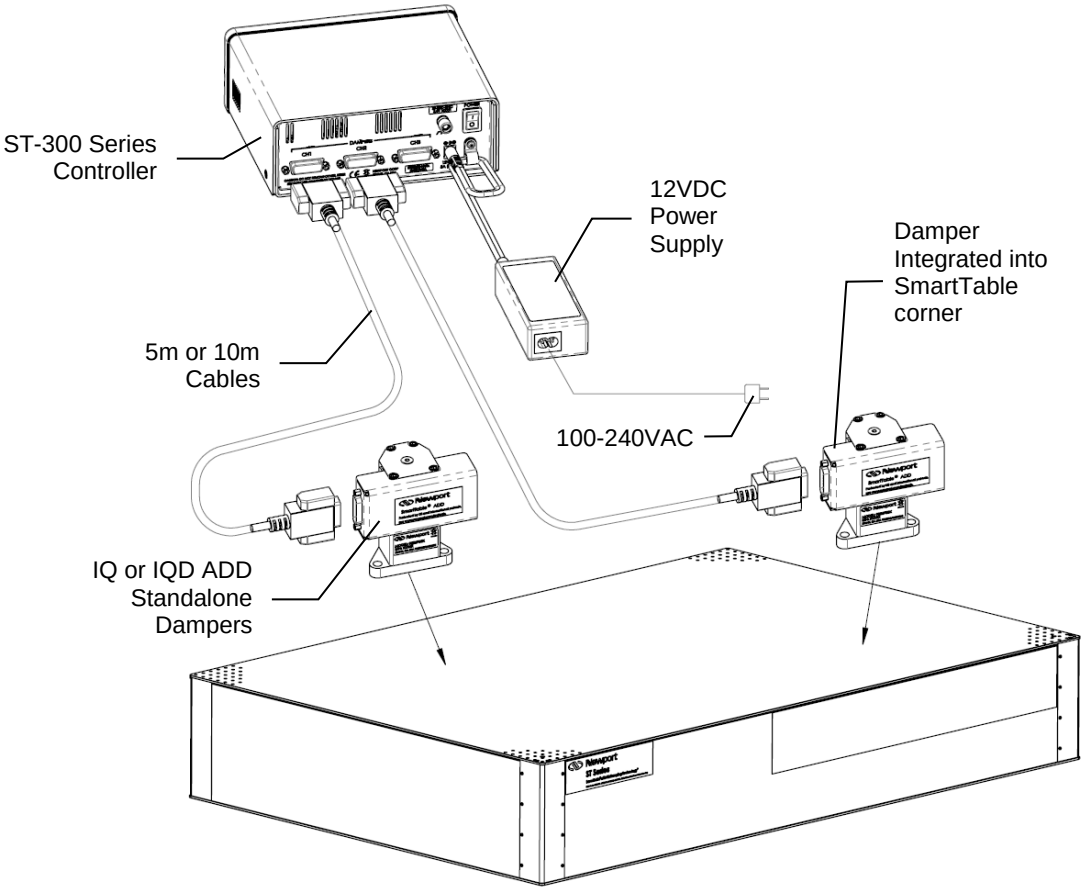


Figure 16 Two Channel IQ Standalone System with Table

4 System Operation

⚠	**WARNING** **Before operating the Model SmartTable Series, please read and understand all of Section 1.**

4.1 Front Panel

The SmartTable Controller front panel is arranged for easy operation. Seven distinct indicators and controls are located on the front panel that allows the user to operate the system as well as provide system status. The front panel is shown in Figure 17 below.

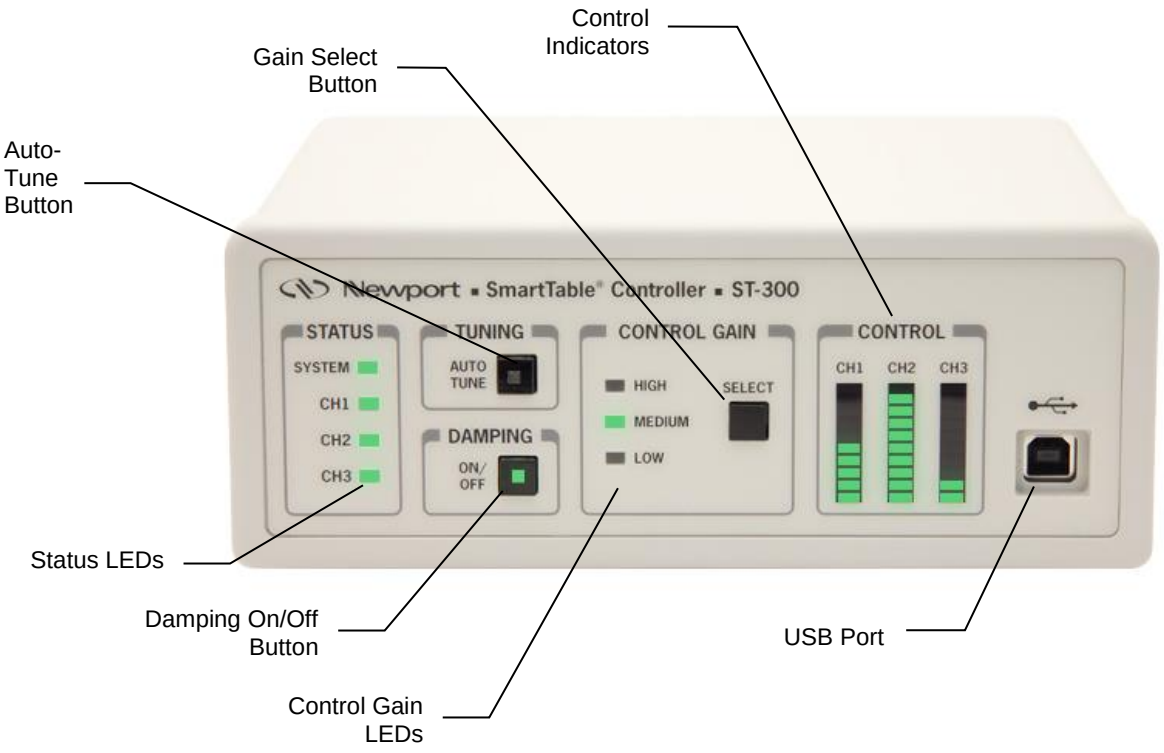


Figure 17 Front Panel Layout.

4.1.1 Status LEDs

The table below shows the meaning of the various colors of SYSTEM, CH1, CH2 and CH3 status LED's.

Item	Level	Category	Comment	Ch1 LED	Ch2 LED	Ch3 LED	System LED
1	System	Unpowered	Power supply not connected or power switch off	OFF	OFF	OFF	OFF
2	System	Unpowered	Defective power supply	OFF	OFF	OFF	OFF
3	System	Unpowered	Blown internal fuse	OFF	OFF	OFF	OFF
4	System	Powered	No system problem	–	–	–	Green
5	System	Fault	Critical component failure or main firmware is corrupted	–	–	–	Red
6	Channel 1	Fault	Damper disconnected during operation	Red	–	–	Green
7	Channel 1	Fault	Damper disabled due to component failure	B-Red	–	–	Green
8	Channel 1	Warning	Damper enabled and operating in overload condition	Amber	–	–	Green
9	Channel 1	Fault	Damper disabled due to saturation	B-Amber	–	–	Green
10	Channel 1	Tuning	Auto-tuning in progress	B-Green	–	–	Green
11	Channel 1	Damping	Damper enabled (normal operation)	Green	–	–	Green
12	Channel 1	Disabled	Damper disabled via software or damper not present when controller was turned ON	OFF	–	–	Green
13	Channel 2	Fault	Damper disconnected during operation	–	Red	–	Green
14	Channel 2	Fault	Damper disabled due to component failure	–	B-Red	–	Green
15	Channel 2	Warning	Damper enabled and operating in overload condition	–	Amber	–	Green
16	Channel 2	Fault	Damper disabled due to saturation	–	B-Amber	–	Green
17	Channel 2	Tuning	Auto-tuning in progress	–	B-Green	–	Green
18	Channel 2	Damping	Damper enabled (normal operation)	–	Green	–	Green
19	Channel 2	Disabled	Damper disabled via software or damper not present when controller was turned ON	–	OFF	–	Green
20	Channel 3	Fault	Damper disconnected during operation	–	–	Red	Green
21	Channel 3	Fault	Damper disabled due to component failure	–	–	B-Red	Green
22	Channel 3	Warning	Damper enabled and operating in overload condition	–	–	Amber	Green
23	Channel 3	Fault	Damper disabled due to saturation	–	–	B-Amber	Green
24	Channel 3	Tuning	Auto-tuning in progress	–	–	B-Green	Green
25	Channel 3	Damping	Damper enabled (normal operation)	–	–	Green	Green
26	Channel 3	Disabled	Damper disabled via software or damper not present when controller was turned ON	–	–	OFF	Green

Where B-Red = Blinking Red, B-Amber = Blinking Amber, B-Green = Blinking Green

Table 5 Definition of SYSTEM, CH1, CH2 and CH3 status LED's.

4.1.2 Auto-Tune

The auto-tune button allows the user to retune the system. The auto-tuning process, when two dampers are connected, can typically take 90 seconds for IQ dampers and up to 4 minutes for IQD dampers; the duration will be slightly longer when three dampers are connected. Care must be taken not to disturb the table during this time. If there is equipment on the table that can be a source of non-stationary vibration or noise, it should be shut down. If the table was inadvertently disturbed by mechanical shock or loud noise during the auto-tuning, it is recommended to repeat the process.

Beeping or tonal sounds can be heard from the dampers during the auto-tuning process. Please note that during the auto-tuning process the table may experience higher vibrations than during normal operation.

Note: The Auto-Tune Button LED will stay solid green during auto-tuning. The auto-tuning process can be stopped by depressing the Auto-Tune button for the second time.

Note: If the controller detects a change in the table load or dynamic status, it will recommend auto-tuning to be performed by slowly blinking the Auto-Tune Button LED.

The controller comes pre-set for the optimal performance of the lightly loaded table. If additional load is added to the table or, subsequently, removed from the table, it is recommended to perform auto-tuning. Auto-tuning must also be performed in the following cases:

- Amber blinking for any or all of CH1, CH2 and CH3 status LEDs.
- Green blinking Auto-Tune LED.
- Audible sound from any of the dampers.

4.1.3 Damping

The damping button toggles the damping feature ON and OFF. Use it to manually turn off the table damping or to manually turn it on. The same action can be performed from the SmartTable application (see Section 5 Software).

4.1.4 Control Gain

Select the desired gain by pushing the Control Gain button. The gain settings are High, Medium, and Low. The higher the gain, the better the system performance. However, keep in mind that higher gain settings decrease the gain stability margin. So, if there are moving objects on the table, or if the table load changes often, you might want to set the gain to a more conservative value like Medium or even Low.

The “Low” setting is recommended for add-on dampers on small isolated platforms such as 2 in. and 4 in. thick breadboards.

The auto-tune process will respect the user gain setting. The controller will find the optimal gain values during auto-tuning process and then will readjust the gains based on the user setting.

4.1.5 Control LED Bar Graphs

The bar graphs are a quick visual dynamic indicator of the SmartTable controller output for each damper. When the system is configured for two dampers, the bar graph for the damper that is not configured is turned off. All the bar graphs are turned ON when all 3 dampers are configured. All the bar graphs are also turned OFF when dampers are disabled.

4.1.6 USB Interface

The instrument is designed to communicate with standard USB interfaces. The cable required is a USB A/ B connection cable.

4.2 Rear Panel

In the following figure shows the ST-300 rear panel.

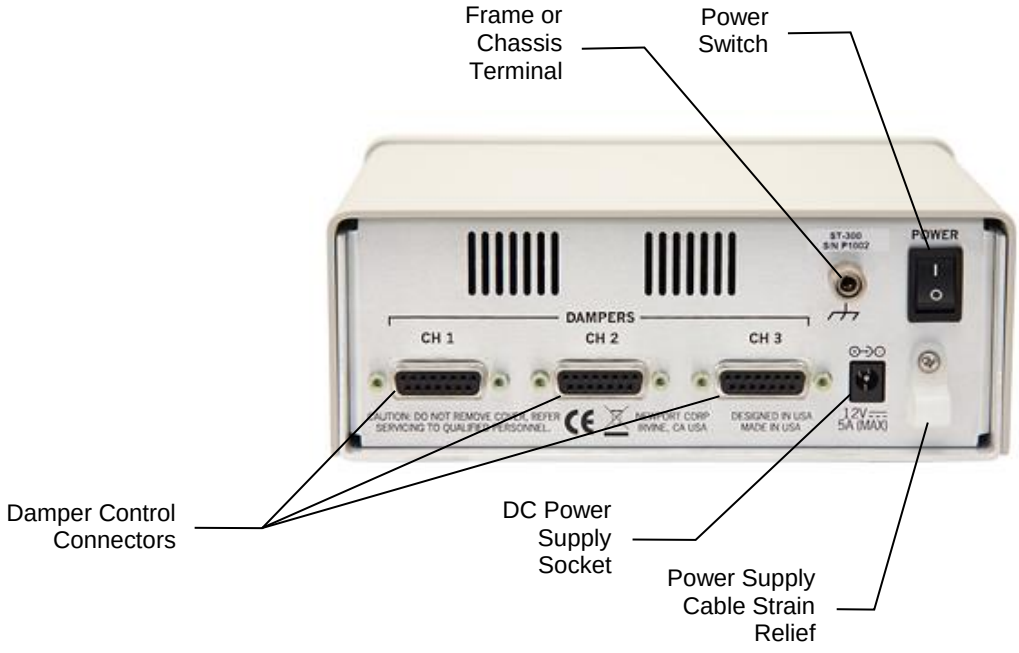


Figure 18 ST-300 Rear Panel

4.2.1 Power Switch

The rear panel-mounted power switch can be used to turn ON or OFF the SmartTable Controller. Note that this switch interrupts DC power entering the controller unit; it does NOT deactivate the external power supply unit.

4.2.2 Power Supply Socket

Plug the included the external power supply unit connector into the Power Supply Socket on the rear of the instrument, then the AC power cord into a wall socket.

The power supply is 12V/5A, Newport P/N 90066688.

4.2.3 Damper Output Connectors

Three 15 pin connectors labeled CH1, CH2 and CH3 are the connection points for the SmartTable active dampers.

4.2.4 Frame or Chassis Terminal

This terminal provides access to frame or chassis connection.

5 Software

5.1 Overview

The USB flash drive that comes with the ST-300 Controller provides an installation package for the controller software and USB driver. This application communicates with the ST-300 Controller through a USB communication interface. The application is designed to allow the user to remotely control all the features supported by the controller.

NOTE

Install the software and USB drivers before connecting the USB cable to the controller for the first time.

Minimum requirements for the computer:

- A personal computer with 400 MHz Pentium processor or equivalent (Minimum); 1GHz Pentium processor or equivalent or higher (Recommended)
- Microsoft Windows XP, Windows 7, Windows 8 operating systems
- 1 GB of memory for Windows (minimum, Windows XP)
- Hard disk up to 500 MB space may be required
- USB port (version 1.1 minimum)
- Display 1024 x 768 high color, 32-bit (minimum)
- Microsoft Mouse or compatible pointing device

1. Insert the USB flash drive that accompanies the controller in one of your computer's USB ports. To install the USB driver and software double-click on **SETUP.EXE** file. Follow the on-screen instructions to complete the installation process. For more information refer to the **ST-300 Readme** file on the USB flash drive.
2. Connect the USB cable to the Controller and power it on.

3. Start the application by clicking on Start => Programs => Newport => SmartTable Application.

5.2 Menu

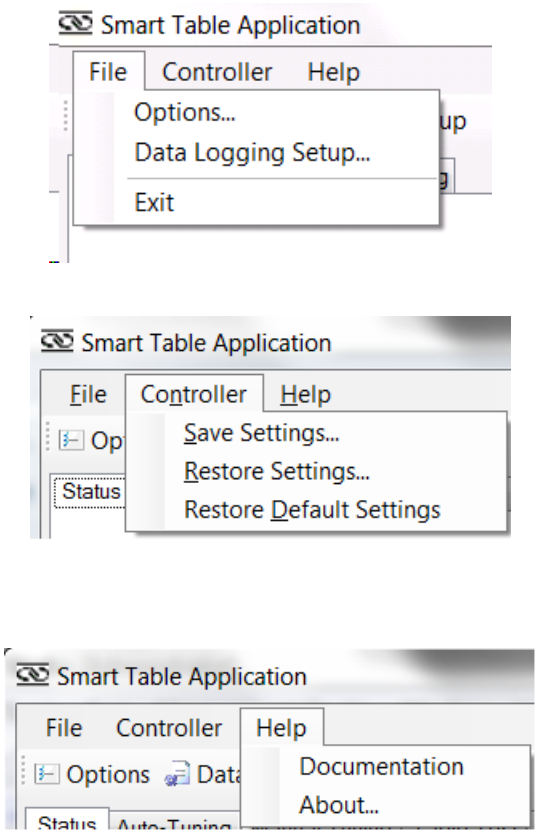


Figure 19 SmartTable application menus

5.2.1 File

The File menu contains the Options and the Data Logging Setup menu choices. The Options menu choice opens the Options dialog and the Data Logging Setup menu choice opens the Data Logging Setup dialog. Both of these menu choices have a corresponding button on the tool bar that will open the same dialog. The Options dialog is described in Section 5.3 and the Data Logging Setup dialog is described in Section 5.4.

5.2.2 Controller

This menu item contains Save Settings, Restore Settings and Restore Default Settings.

5.2.2.1 Save Settings

Save the controller settings to a file.

5.2.2.2 Restore Settings

Restore the controller settings from a file.

5.2.2.3 Restore Default Settings

Restore the controller settings to default values.

5.2.3 Help

With the Help Menu you can access the Documentation and the About Screen.

5.2.3.1 Documentation

Clicking on this menu item will open the Docs folder installed in the application folder.

5.2.3.2 About Screen

The application software version number is displayed on this screen. Also, the controller data (model name, serial number, firmware version and firmware date) are shown here.

The last line indicates the type of damper the controller is configured for. It can show either IQ Dampers or IQD Dampers. In the rare situation, when the user needs to change the damper type, the command is “DT 0” and “DT 1”. All channels will be set to the same damper type. “DT 0” sets the damper type to IQ dampers and “DT 1” sets the damper type to IQD dampers. To send the command, hit Ctrl-Alt-T to bring up the Terminal tab window. Then type the command in the Command window and press Enter on the keyboard to send.

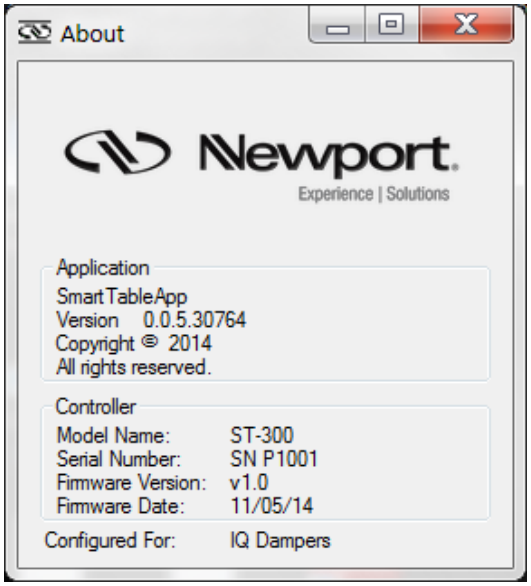


Figure 20 About Screen

5.3 Options

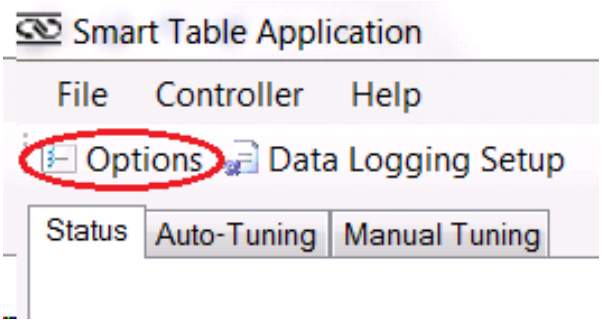


Figure 21 Options button location

The Options button opens the Options screen, as in Figure 22. The same window can be accessed from the main menu (see Section 5.2.1).

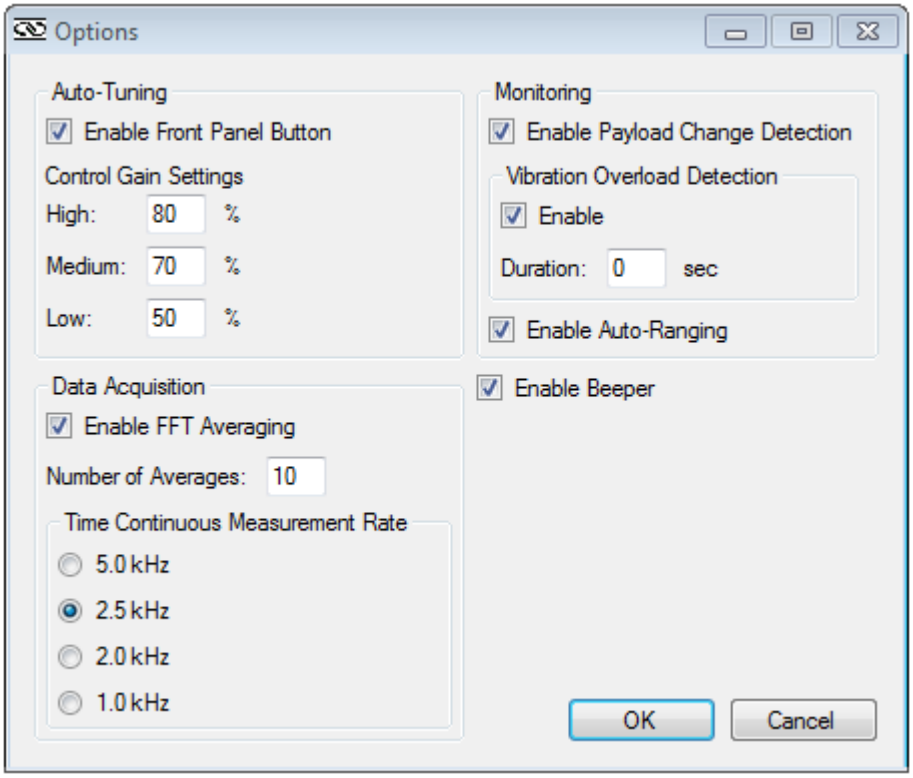


Figure 22 Options Screen

The Options Screen allows the user to customize the controller and the SmartTable Application functionality to their requirement. It provides access to the following functions:

5.3.1 Auto-tuning

- **Enable the front panel button**. Uncheck this box to disable initiation of auto-tuning process locally.
- **Low, Medium and High control loop gain margins**. Specify the desired percentage by which the control loop gain is scaled at the end of auto-tuning process. The gain stability margin and the control loop gain have inverse relation. While lower loop gain may be desired if the system is being used in an environment where the payload is continuously changing, such lower gain may also result in reduced damping performance. Note that lower gains setting are recommended for add-on dampers on small isolated platforms such as 2 in. and 4 in. thick breadboards.

5.3.2 Data Acquisition

- **Enable FFT averaging**. Uncheck this box to cancel averaging by the application. If this box is not checked, the application will collect either undamped or damped vibration levels only once.
- **Number of averages**. Specify the number of times undamped and damped vibration levels are collected, or the FFT has to be averaged.
- **Time Continuous Measurement Rate**. When selecting Time Continuous display in the Auto-Tuning screen the measurement rate can be selected to accommodate your computer speed and the number of tasks running in the background. The default of 2.5 kHz works for most computers, but if other tasks are running in the computer's background you might want to select 2.0 or 1.0 kHz (Section 5.6.1).

5.3.3 Monitoring

- **Enable Payload Change Detection**. Uncheck this box to prevent the controller from detecting changes in the SmartTable payload that might necessitate tuning of control loop gains.
- **Vibration Overload Detection**. Uncheck this box to prevent the controller from monitoring the ambient vibration levels.
- **Overload Duration**. If feedback overload detection is enabled, specify the amount of time (in seconds) for which the feedback signal overload is allowed before the controller generates a warning message.

5.3.4 Enable Auto-Ranging

If this box is checked it allows the control and monitoring systems to adjust to the ambient vibration level. Uncheck this box if the vibration level is subject to frequent changes (e.g., caused by pulse loads due to moving on-board equipment or loud transient sounds).

5.3.5 Enable Beeper

If this box is checked the unit will beep to give the user audible cues regarding the operation (e.g., button press, system fault).

5.4 Data Logging Setup

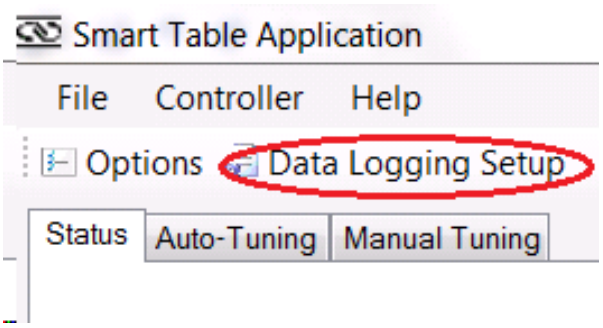


Figure 23 Data Logging button location

The Data Logging Setup button (Figure 23) opens the Data Logging dialog window, as in Figure 24. The same window can be accessed from the main menu (see Section 5.2.1).

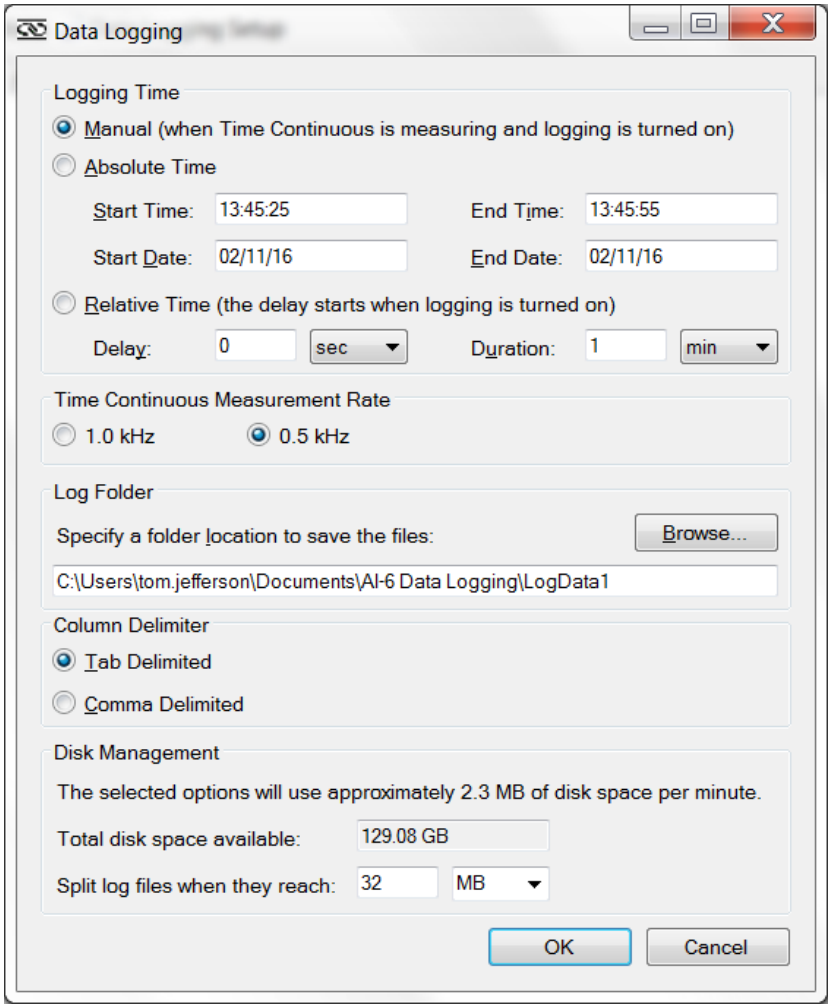


Figure 24 Data Logging Dialog Window

5.4.1 Logging Time

The Logging Time group box allows one of three choices to be made: Manual, Absolute Time or Relative Time.

If Manual is selected then data logging will begin when data logging is turned on (via the "Turn Logging On" button) and Time Continuous measuring is in progress. Data logging will end when measuring is stopped or data logging is turned off (via the "Turn Logging Off" button). The Rec. LED will turn red when data is being written to the log file.

If Absolute Time is selected then data logging will begin at the specified Start Date / Time and finish at the specified End Date / Time as long as Time Continuous measuring is in progress and data logging is turned on (via the "Turn Logging On" button). The Rec. LED will turn red when data is being written to the log file.

If Relative Time is selected then data logging will begin after the specified delay and last for the specified duration as long as Time Continuous measuring is in progress and data logging is turned on (via the “Turn Logging On” button). The Rec. LED will turn red when data is being written to the log file. Note that the delay begins when the “Turn Logging On” button is pressed (even if measuring has not started yet).

5.4.2 Log Folder

The Log Folder group box allows the user to specify a folder location to write the data logging files. A folder path may by typed into the text box or the Browse button may be used to graphically navigate to a folder using a Browse For Folder dialog window. The Browse For Folder dialog window will fill the text box with the proper folder path.

5.5 Tabs

The SmartTable Application has three main tabs: Status, Auto-Tuning and Manual Tuning. The features available in these tabs are explained in the following sections.

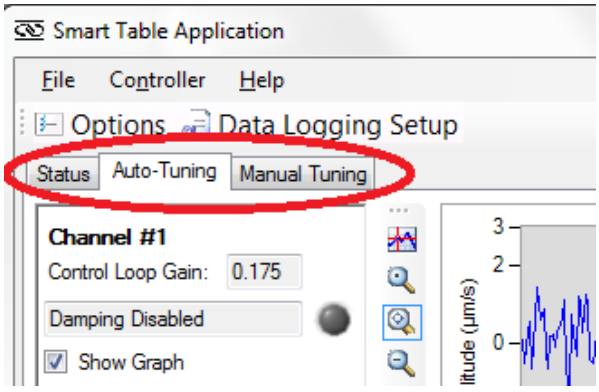


Figure 25 The application tabs

5.6 Status Tab

A few seconds after the “About” screen appears, the application will switch to the “Status” Tab.

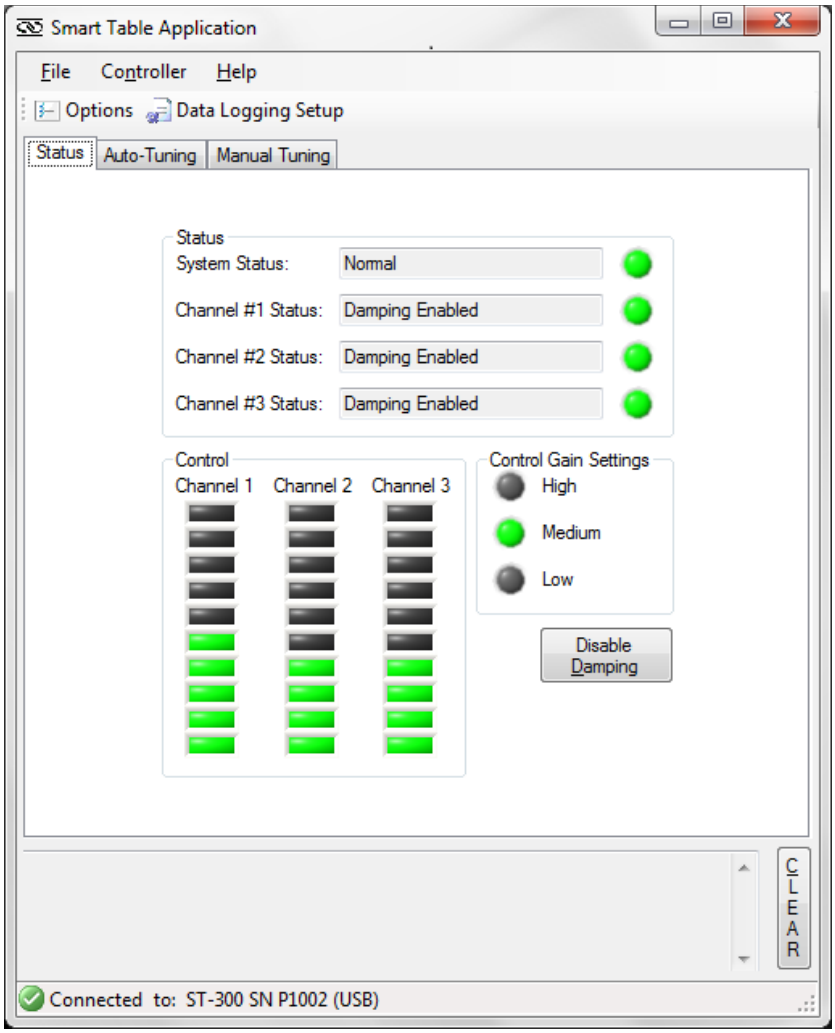


Figure 26 Status Screen

This tab provides the basic current status of the controller.

The System, Channel 1, Channel 2 and Channel 3 status LEDs, Control Gain settings and Control bar graphs shown here match the corresponding values on the controller’s front-panel within 0.5 second latency (typical). A text message with a brief description of the status is provided alongside the LEDs.

If the controller generates any errors, they are displayed in the message text box at the bottom of the screen. Note that the software appends a timestamp

to the message at the time it is received from the controller. Click on the "Clear" button to delete all messages.

At the bottom of the screen, the Connection status shows that the application is connected to the ST-300 model with the corresponding serial number.

If the user has just two channels connected, the unconnected third channel will be disabled and the corresponding bar graph will be simply turned off. The channel status will read "Damper Not Configured".

5.6.1 Auto-Tuning Tab

This tab provides access to initiating the auto-tuning process remotely, as well as to observe the controller performance.

Control Gain Setting and Auto-Tune Button. Adjust the control gain setting to a desired level (low, medium or high) if necessary and click the "Auto-Tune" button. Clicking the "Auto-Tune" button here is similar to pushing "Auto-Tune" button on the controller's front-panel.

Enable Damping Button. Clicking the "Enable Damping" or "Disable Damping" button will enable or disable damping. If the damping is enabled, the "Disable Damping" button is visible, and vice-versa.

Measure Undamped Button. Click the "Measure Undamped" button to record vibration level with damping disabled. The software will disable damping on all channels and measure vibration levels. The data will be averaged over several time frames.

When measuring undamped data, the graphs are displayed with blue color. Since the data are taken in undamped mode, the Damping Enabled LEDs are turned off if they were on. The user can enable the damping again, at the end of the measurement by clicking the Enable Damping button.

Measure Damped Button. Click the "Measure Damped" button to record vibration level with damping enabled (see Figure 28). The software will enable damping on all channels and measure vibration levels.

Save Graphs Button. Click on "Save Graphs…" button to save the measured data in both HTML and text formats. When the "Save Graphs…" button is clicked the user is presented with a dialog to specify or browse to a folder path. This folder path is used to store three files which are generated at this time (a HTML file, a Time Response text file, and a FFT text file). The HTML file name is the same as the folder name, but with the ".html" extension. The HTML file contains some textual headings and two images (a Time Response graph and FFT graph) on each channel that is configured. The Time Response text file name is the folder name followed by " – Time" and the FFT text file is the folder name followed by " – Freq". Both of these text files use the ".txt" extension. The format of these two files is tab delimited text, with seven columns, where the first row is the heading of

each column. The first column contains the value of the X axis (time in seconds or frequency in Hz), and the next six columns are the undamped and damped Y axis data values for channels 1 – 3.

FFT or Time Response. Both un-damped and damped vibration level data can be displayed in either frequency domain or time domain. Select either FFT or Time Response from the pull-down menu for the desired view (Figure 27). The FFT resolution is 0.19 Hz.

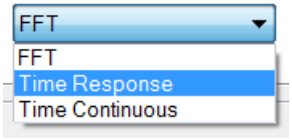


Figure 27 Plot type combo box

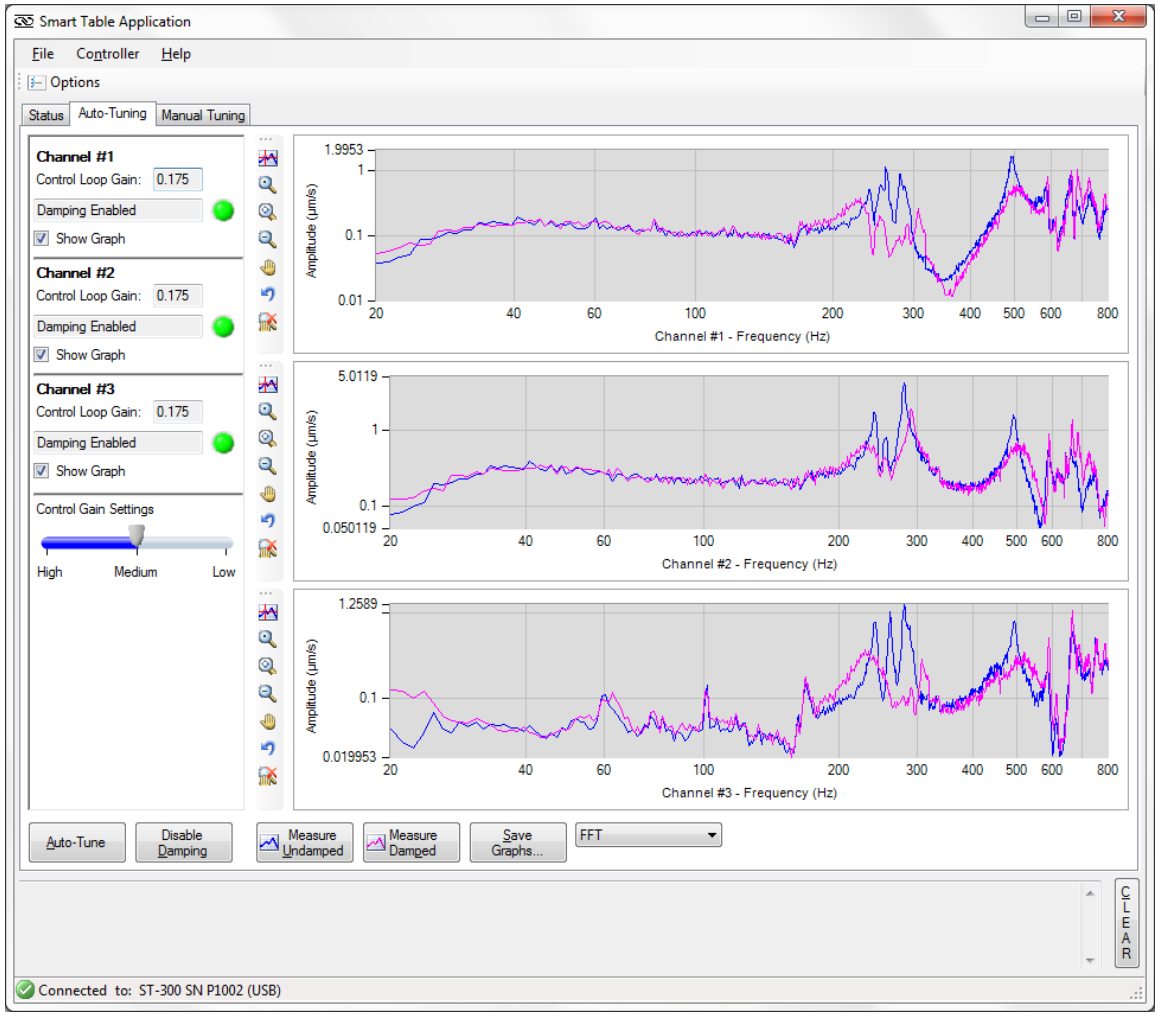


Figure 28 FFT Mode

In FFT mode the application can average the measurements. The number of averages is set in the "Options" screen (Section 5.3.2).

In either mode, the user can check the "Show Graph" box to display 3, 2 or 1 channels (see Figure 29 and Figure 30).

In FFT or Time Response mode, when clicking the "Measure Undamped" button, the graphs show a blue waveform corresponding to the undamped data sampled by the ST-300. When clicking the "Measure Damped" button, the graphs show a magenta waveform superimposed over the undamped waveform. This is useful for checking the performance of the system.

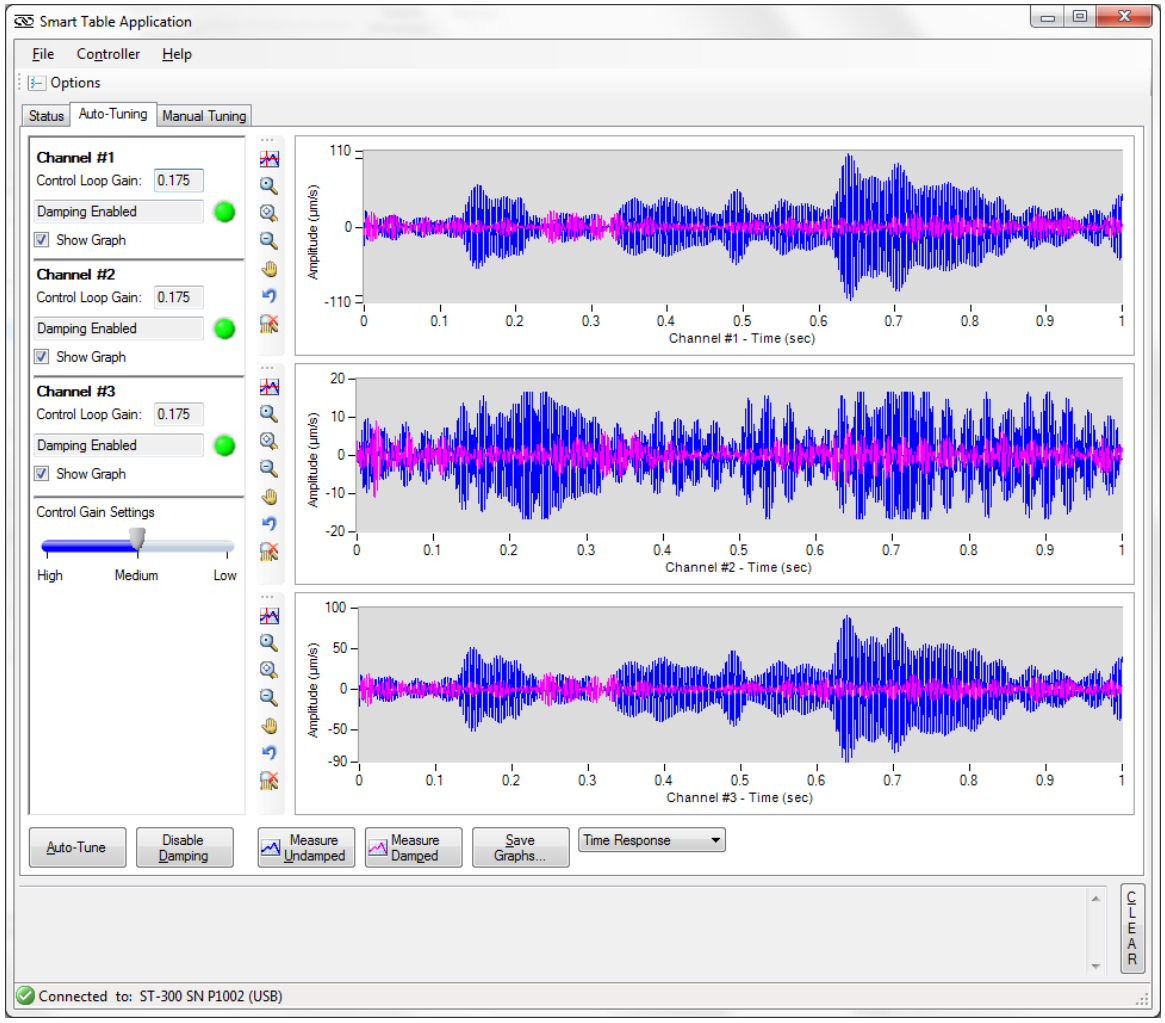


Figure 29 Auto-Tuning Screen with Time Response and 3 Channels selected

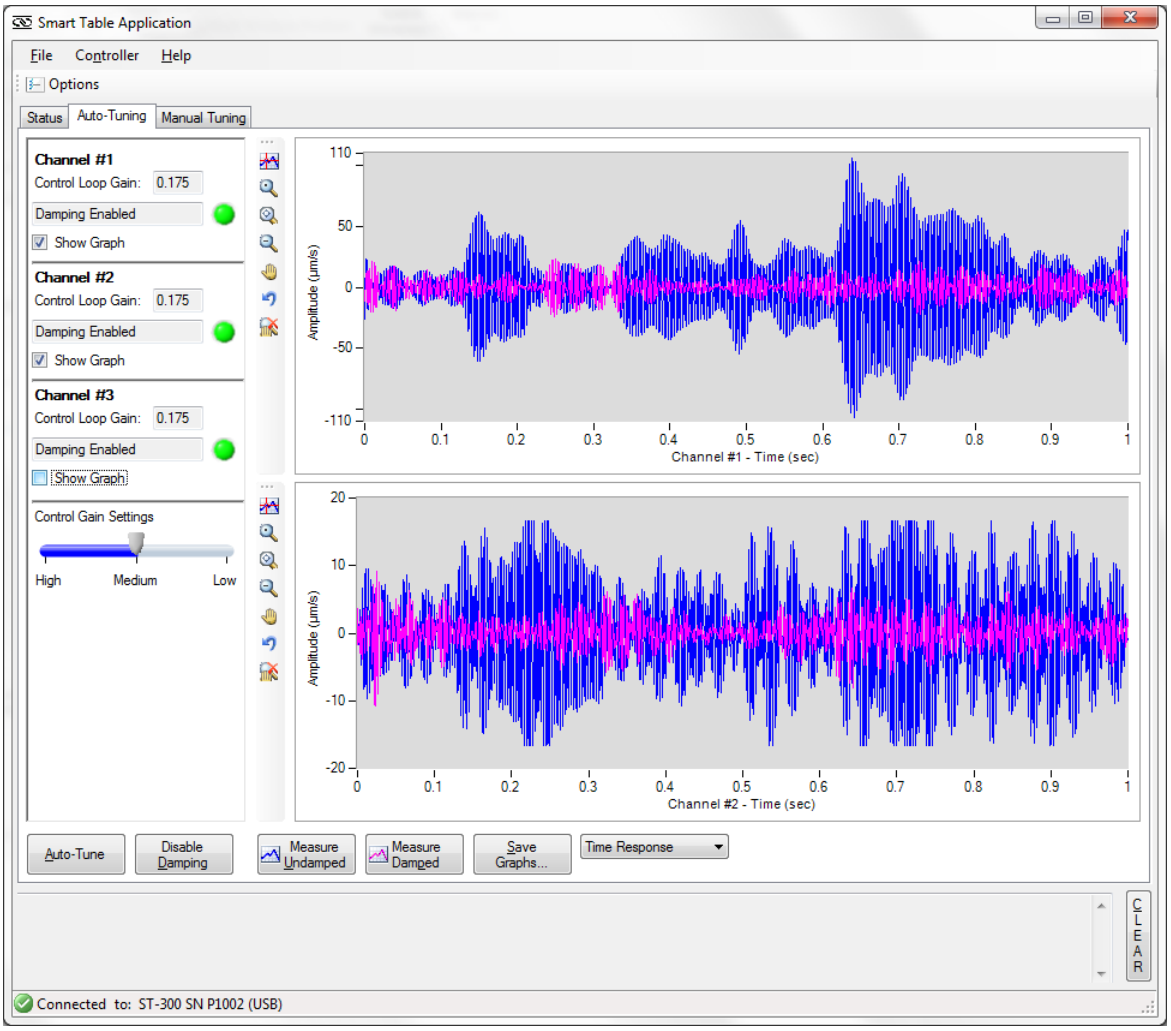


Figure 30 Auto Tuning Screen with Time Response and 2 Channels selected

Time Continuous. Both un-damped and damped vibration level data can be displayed in Time Continuous mode, similar to an oscilloscope. Enable the "Show Graph" box for showing either channel graph. Depending on your computer speed and number of tasks running in the background, choose Time Continuous Measurement Rate in the Options window (Section 5.3.2). The highest rate is 5.0 kHz and the lowest is 1.0 kHz.

In Time Continuous mode, the ST-300 takes 5,000 samples per channel and displays them on the corresponding graph. Each measurement acquisition time depends on the measurement rate set in Options. For example, if the measurement rate is set on 5 kHz, ST-300 will collect 5,000 samples (per

channel) in one second. Every second, a new set of 5,000 points is displayed until the user clicks the Stop button.

The table below shows the acquisition time for each measurement rate.

Time Continuous Measurement Rate	Acquisition time
5 kHz	1 sec
2.5 kHz	2 sec
2 kHz	2.5 sec
1 kHz	5 sec

Table 6 Acquisition time for each measurement rate

Use the “Stop” button to end the continuous measurement.

During continuous measurement, the application continuously adjusts the Y-axis for each graph. If this adjustment is not desired, click the “Fixed Range” button. The Fixed Range button will change to “Auto Range” and the graphs will show a default Y-axis scale. The user can return to auto range by clicking the Auto Range button.

In Time Continuous mode the graphs show either damped or undamped data. To measure damped data, click on “Measure Damped” button. The graph will display continuous magenta waveforms as in Figure 31.

NOTE

USB communication errors may occur due to (a) slow computer or (b) USB traffic from other devices on the same port (e.g., USB hub with ST-300 and other peripherals). In this scenario, lowering the Time Continuous Measurement Rate to 1 or 2 kHz (see Options window) may alleviate the problem. Otherwise try a faster computer with a dedicated USB port.

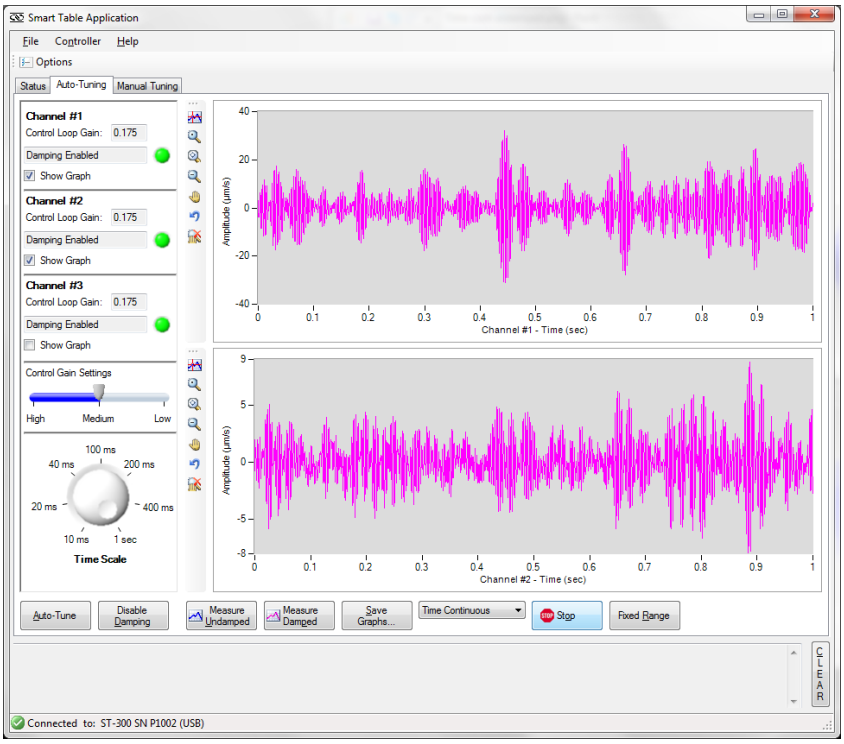


Figure 31 Time Continuous Damped measurement

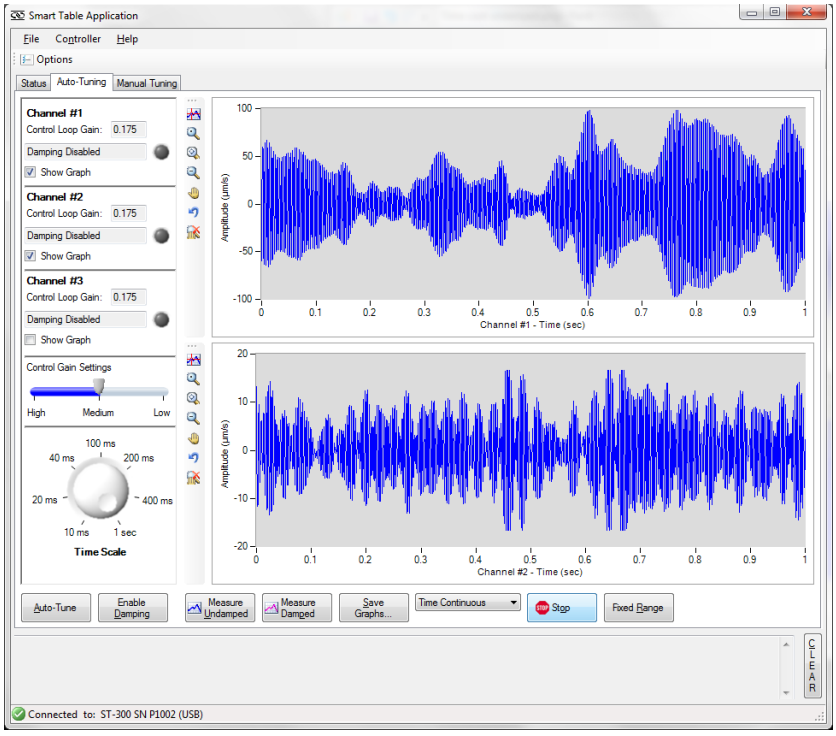


Figure 32 Time Continuous Undamped measurement

Graph Buttons. Use the buttons on the left side of each graph (Figure 33) to study the displayed data.

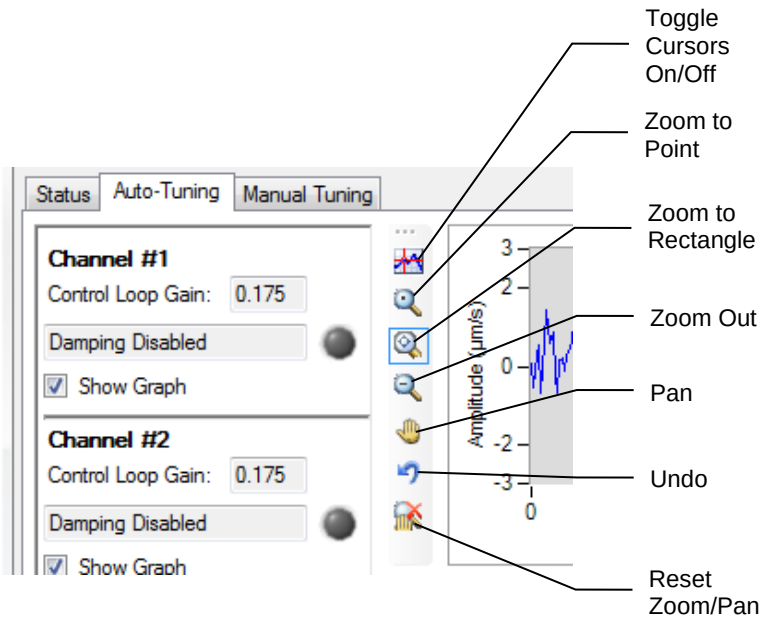


Figure 33 ST-300 Graph Buttons

- Enable Cursors. Use this feature to bring up two cursors on either graph. The cursors can be "grabbed" with the mouse and moved on the X or Y-axis. The cursor position is displayed on the graph in an x,y format (Figure 34).
- Zoom to Point. Click anywhere on the graph to zoom around that position.
- Zoom to Rectangle. Draw a rectangle on the graph. The graph will be expanded at the rectangle size (Figure 34).
- Zoom Out. Zoom out by clicking on the graph.
- Pan. The mouse pointer changes to a palm. Use it to "grab" the graph and move it.
- Undo. This button undoes the last operation.
- Reset Zoom/Pan. This button resets the graph back to its original form.

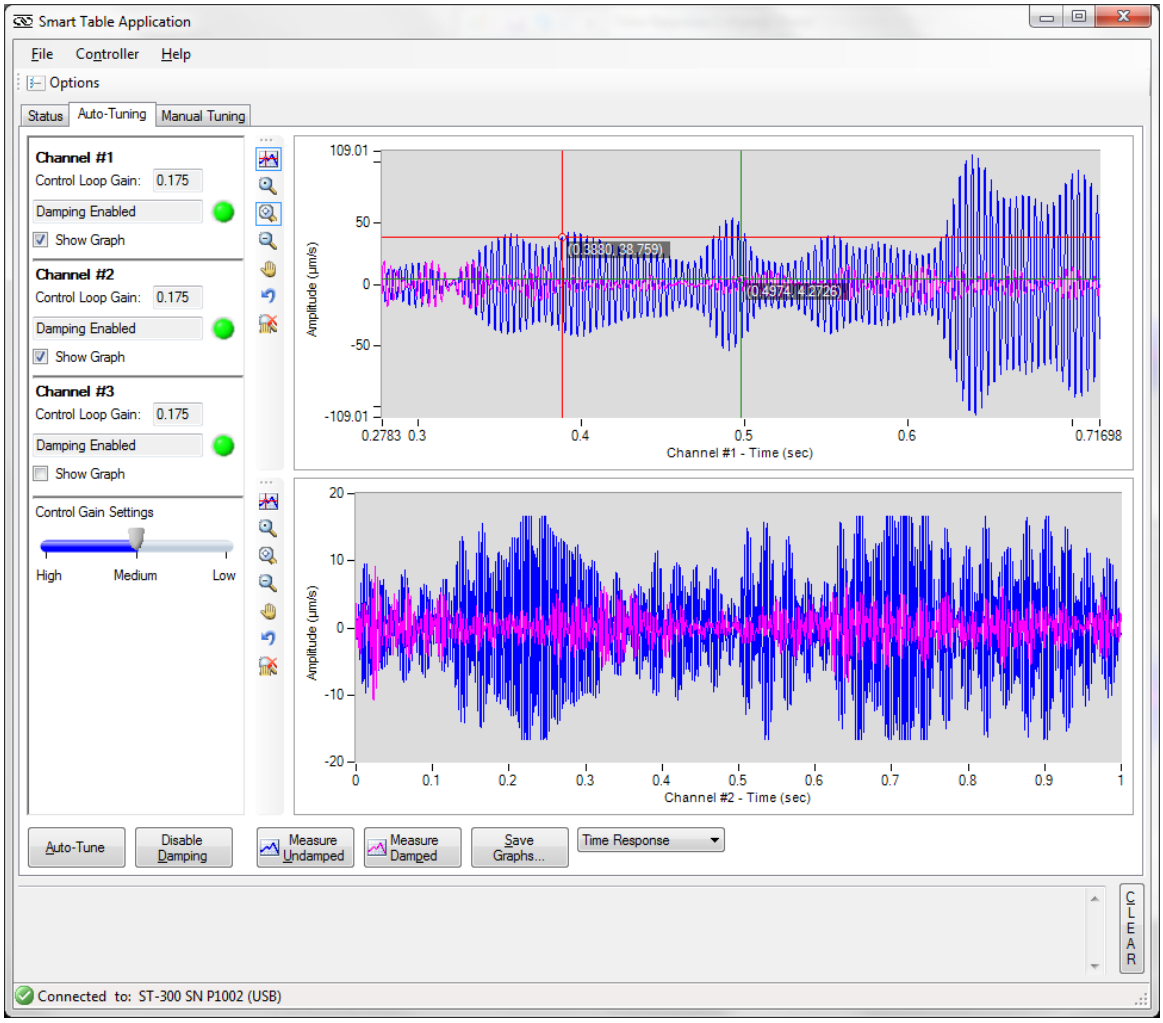


Figure 34 Time Response with Channel 1 zoomed and cursors selected

Time Scale Knob. The time scale knob (Figure 35) allows you to change the X-axis of all the graphs the same as you would with an oscilloscope. The unit takes 5000 samples from all three channels and sends them to the PC. If the Time Continuous Measurement Rate is 5 kHz set in Options (see Section 5.3.2), the total acquisition time is 1 second. If the knob is set to maximum (fully clockwise as shown in Figure 35), the graphs will display all 5000 samples. Rotating the knob counter-clockwise will set the graphs' maximum time to the knob setting.

If the Time Continuous Measurement Rate is set to 2.5kHz, the ST-300 will read 5000 samples every 2 seconds. The maximum setting of the Time Scale Knob is 2 seconds. If the knob is set to 200 ms the graphs' X-axis span will be between 0 and 200 ms and the graphs will show a waveform containing 500 samples (Figure 36).

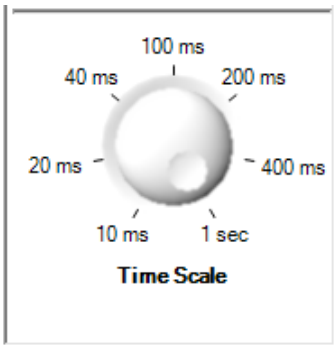


Figure 35 Time Scale Knob

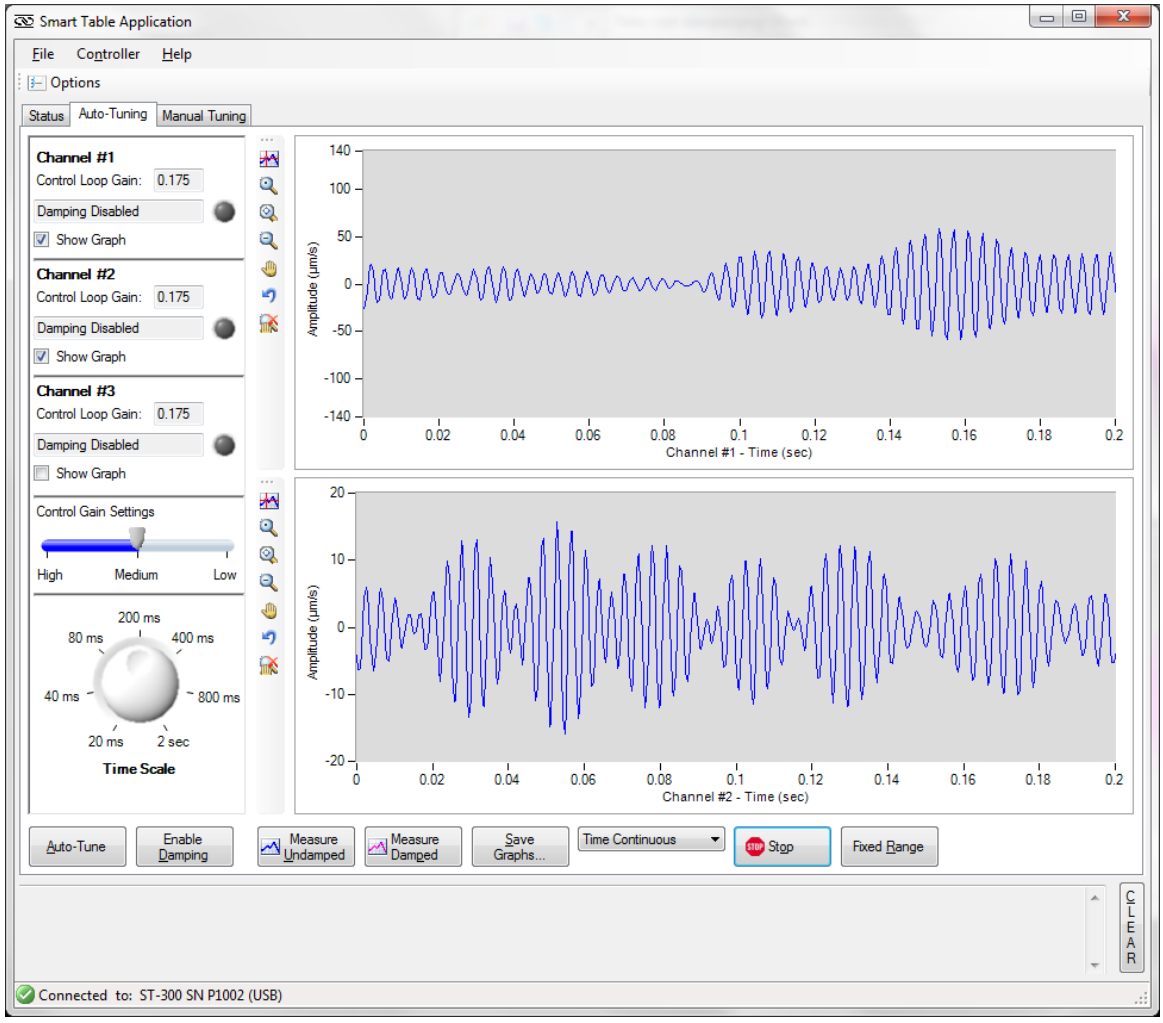


Figure 36 Time Continuous Graph (2.5kHz Time Continuous Measurement Rate and 200 ms Time Scale Knob setting)

5.6.2 Manual Tuning Tab

This tab provides direct control over the control loop gain used by the controller. It is recommended that users Auto-Tune their system first, and use the loop gains determined by the controller as a basis for fine-tuning the loop gains. In this screen the "Auto-Tune" button is replaced by the "Apply" button (Figure 37). Type the desired Control Loop Gain in the text boxes for each channel. Click the "Apply" button to send the desired loop gains to the controller, and save them in the controller's non-volatile flash memory. In case your changes produce an undesirable effect manifested by tonal noise from the dampers, blinking amber lights of the Status LEDs on the front panel, or blinking amber lights on the "Status" tab, click the "Disable damping" button and reverse the changes.

The "Enable Damping", "Measure Undamped", "Measure Damped", "Save Graphs", "Stop" and "Fixed Range" buttons behave the same way as described in the Auto-Tune Tab section.

NOTE

The "Apply" button needs to be pushed every time the settings are changed, so that the changes can be sent to the controller

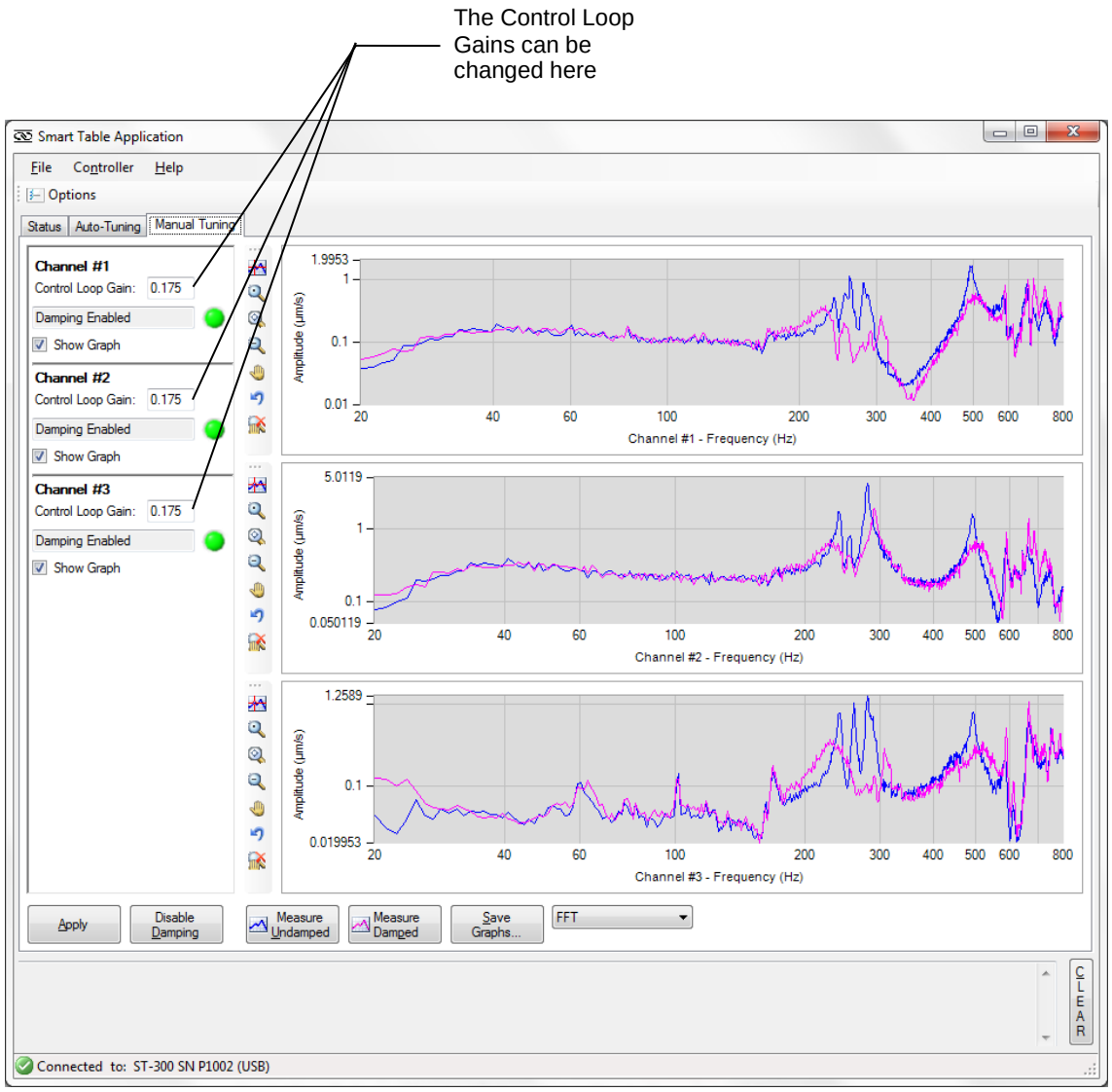


Figure 37 Manual Tuning Tab Screen. Time continuous mode.

6 Maintenance and Service

CAUTION

There are no user serviceable parts inside the SmartTable Controller. Work performed by persons not authorized by Newport Corporation will void the warranty.

6.1 Enclosure Cleaning

WARNING

Before cleaning the enclosure of the SmartTable Controller, the Power Supply's AC power cord must be disconnected from the wall socket.

The source enclosure should only be cleaned with a mild soapy water solution applied to a damp lint-free cloth. Do not use an acetone or alcohol solution; this will damage the finish of the enclosure.

6.2 Obtaining Service

The SmartTable Controller contains no user serviceable parts. To obtain information regarding factory service, contact Newport Corporation or your Newport representative. Please have the following information available:

1. Instrument model number (on the rear panel)
2. Instrument serial number (on rear panel)
3. Description of the problem.

If the instrument is to be returned to Newport Corporation, you will be given a Return Number, which you should reference in your shipping documents. Please fill out a copy of the service form, located on the following page, and have the information ready when contacting Newport Corporation. Return the completed service form with the instrument.

6.3 Service Form



Newport Corporation
U.S.A. Office: 800-222-6440
FAX: 949/253-1479

Name _____ **Return Authorization #**_____
(Please obtain RA# prior to return of item)

Company _____
(Please obtain RA # prior to return of item)

Address _____ _____Date _____

Country _____ Phone Number _____

P.O. Number _____ FAX Number _____

Item(s) Being Returned:

Model # _____ Serial # _____

Description _____

Reason for return of goods (please list any specific problems):

Newport Corporation
Worldwide Headquarters

1791 Deere Avenue
Irvine, CA 92606

(In U.S.): 800-222-6440
Tel: 949-863-3144
Fax: 949-253-1680

Internet: sales@newport.com



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