Digidata 1550B

Low-Noise Data Acquisition System Plus HumSilencer Adaptive Noise Cancellation System

User Guide

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MOLECULAR DEVICES

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Product manufactured by Molecular Devices, LLC.
3860 N. First Street, San Jose, California, 95134, United States of America.
Molecular Devices, LLC is ISO 9001 registered.

Contents

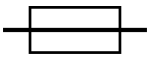
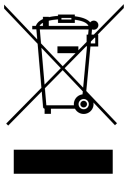
Safety Information

The safety information section provides information on the safe use of the instrument. It includes the use of user-attention statements in this guide, a key to understanding the safety labels on the instrument, precautions to follow before operating the instrument, and precautions to follow while operating the instrument.

Read and observe all warnings, cautions, and instructions. Remember, the most important key to safety is to operate the instrument with care.

WARNING! If the instrument is used in a manner not specified by Molecular Devices, the protection provided by the equipment might be impaired.

Symbols on the Instrument

Symbol	Indication
	The product documentation must be consulted.
	Power on.
	Location of a fuse.
	CSA certification.
	European technology conformity.
	Compliance with the Waste Electrical and Electronic Equipment (WEEE) Directive of the European Union. You must not discard this electrical or electronic product or its components in domestic household waste or in the municipal waste collection system. For products under the requirement of the WEEE directive, contact your dealer or local Molecular Devices office for the procedures to facilitate the proper collection, treatment, recovery, recycling, and safe disposal of the device.
	Compliance with California Proposition 65, which requires businesses to warn Californians about significant exposures to chemicals that cause cancer, birth defects or other reproductive harm.

Chapter 1: Introduction

The Digidata® 1550B digitizer is a high-resolution, low-noise digitizer plus HumSilencer™ Adaptive Noise Cancellation System for electrophysiology experiments. It is designed to send and receive signals from microelectrode amplifiers and to interact with peripheral instruments such as solution changers and stimulators.

The Digidata 1550B digitizer has eight independent analog input channels at up to 500 kHz each, and has eight independent 16-bit analog outputs for arbitrary waveform generation. There are eight digital output lines, as well as a dedicated SCOPE digital output and TAG and START digital inputs. There are three models of the Digidata 1550B digitizer, one of which excludes the HumSilencer Adaptive Noise Cancellation System. The other two models of the Digidata 1550B digitizer with adaptive noise cancellation (ANC) provide configuration through Analog Input Channels #0, or Analog Input Channels #0, #2, #4 and #6 to eliminate 50 Hz or 60 Hz line-frequency noise and associated high-frequency harmonics. The Digidata 1550B digitizer communicates with the host computer using USB 2.0.

The Digidata 1550B digitizer is a plug-and-play device, so it is automatically recognized by Windows. The Digidata 1550B digitizer is supported on Windows systems by AxoScope software Version 11 or newer and by pCLAMP Clampex software Version 11. AxoScope software is an easy-to-use, full-featured data acquisition program for Windows that is included with the Digidata 1550B digitizer.

The Digidata 1550B digitizer is contained within a rack-mount case, and has non-marking-elastomeric feet for use on a desktop.

Included Components

- Digidata 1550B digitizer
- Power cord
- USB 2.0 cable
- Software download instructions
- Printed Quick Start Guide

Recommended Computer System

- PC with a 2 GHz CPU (or faster)
- Windows 10, 11 (64-bit)
  (Windows 7 (32-bit and 64-bit) is supported)
- 4 GB RAM (or more)
- 2 GB hard disk (or more)
- 1920 x 1080 (or higher) display system
- 3 USB 2 ports

Programming

The Digidata 1550B digitizer is supplied with the AxoScope software Version 11 turnkey software for continuous data acquisition. No programming is required for use with this program, or with the pCLAMP software Version 11 data acquisition software.

For third-party programming of the digitizer, see the Test Bed and File Support Pack files included in the pCLAMP software, or go to the Molecular Devices website Knowledge Base for downloads.

HumSilencer Adaptive Noise Cancellation Theory of Operation

The HumSilencer Adaptive Noise Cancellation System (ANC) uses a combination of analog signal-processing circuitry and high-speed computing hardware to learn and subtract out unwanted electronic noise caused by the power line. Software controls in Clampex software and AxoScope software provide both the ability to turn on or turn off the electronic noise-learning, and the ability to report the whole signal or the signal-minus-noise. The ability to turn on or off the noise learning is provided so the scientist can control when noise is learned by the system to avoid learning a signal as noise.

Learning the pattern of line-caused noise starts with the understanding that the unwanted electronic noise is caused by the power line. The power line-frequency occurs with a period set by the local electrical grid. The grid produces alternating current (AC), with periods very close to the inverse of 50 Hz or 60 Hz. This AC line-voltage is sampled by circuitry inside the Digidata 1550B digitizer. The start of every line power-cycle is reported to the high-speed logic section of the processor. Using this timing signal as an input to mark the beginning and end of the power line-cycle, the digitization circuitry inside the Digidata 1550B digitizer averages the non-DC signal input to the ANC-enabled channels over 50 cycles. Due to the timing input, this is very selective for line-synchronous noise. Conversely, any input that is asynchronous with the power grid is excluded. A rolling average sets the time scale with which ANC adapts to noise changes, which means that the input of the newest power-cycle data causes the oldest data input to age out of the rolling average. To produce the noise-canceled signal, the average of the power-line noise in the signal is subtracted from the analog signal.

HumSilencer System Software Controls

Noise cancellation, like any electronic computing system, depends on the correct inputs for the correct function. The noise cancellation system assumes that the electronic signal input to the adapting canceling channel is noise, and removes it from the signal when the **Subtract** control is turned on. Manual control of the settings is provided to allow the adapting period to be correctly defined for specific experiments.

In the software, select the **Acquire** > **Edit Protocol** > **Inputs** > **HumSilencer** dialog tab checkbox to activate the ANC circuitry, to activate the HumSilencer controls in the Real Time Controls panel, and to start learning the AC-line noise.

During a recording, in non-episodic stimulation modes, clear or select the **Adapt** checkbox to control when the noise-pattern learning is active. Also during a recording, clear or select the **Subtract** checkbox to control whether noise canceling is active.

The HumSilencer system is designed to adapt quickly to changes in noise. In a country with a 60 Hz electrical grid, the response time is about 5/6th of a second to adapt to changes in the line noise. In a country with a 50 Hz electrical grid, the response time is about 1 second. However large fast transients are problematic as a result of this ability to adapt quickly to changes in noise. Any fast transient in the signal at the same time that the line-noise is learned contaminates the noise average at 1/50 amplitude. This transient situation is not an issue if the peak-to-peak broadband noise associated with the signal is greater than about 1/25 of the amplitude of a step or spike in the signal. If the transient step or spike is larger, it displays as an inverted miniature event in the noise-cancelled signal every 16.7 ms or 20 ms. To avoid this situation, clear the **Adapt** checkbox at least one second before recording fast biological signals that have a signal-to-noise ratio greater than about 25.

For more information and to understand how controls for Episodic stimulation mode and Gap-free data acquisition mode differ, see the *pCLAMP Data Acquisition and Analysis Software v11 User Guide*.

Chapter 2: Installation

The following procedures install the new software and drivers parallel to previously installed hardware and software, allowing you to continue to use the earlier Digidata® 1440A or 1550 Series digitizers and earlier versions of the AxoScope software or the pCLAMP software suite. However, if you no longer use older installed digitizers and corresponding software, uninstall them before you begin the following new installation procedure. AxoScope software Version 11 and pCLAMP software Version 11, only support the Digidata 1440A digitizer and newer.

Uninstalling Software

AxoScope software version 11 and the pCLAMP software version 11 only support Digidata 1440A Series digitizers and newer digitizers. The new software and drivers install without removing previously installed software and drivers, allowing you to continue to use any previously installed Digidata 1200, 132x, 1440A, or 1550 Series digitizers with earlier versions of AxoScope software or pCLAMP software. However, if you no longer use older installed digitizers and corresponding software, uninstall them using the Molecular Devices Uninstall utility before you begin the AxoScope software version 11 or the pCLAMP software version 11 installation procedure.

The uninstall procedure works similarly for previously installed AxoScope software and pCLAMP software. The file locations are similar, but the AxoScope software or pCLAMP software folders are identified by a different version number.

To uninstall the software:

1. Go to Windows **Start** > **All Programs** >**Molecular Devices** (or **Axon Laboratory**).
2. Open the folder for the software version to be uninstalled, such as pCLAMP **10.6**.
3. Select the version-appropriate Uninstall file, such as **Uninstall** pCLAMP **10.6 Software**.
4. Follow the procedures on-screen to finish uninstalling the software.

Installing AxoScope Software or pCLAMP Software Suite

The following procedures install the new software for AxoScope software version 11 or the pCLAMP software version 11. The Digidata 1550B digitizer drivers are included in the installation. If you have purchased the pCLAMP software version 11 suite, install it instead of the AxoScope software.

To install the software:

1. Download the software installation files.

   Tip: Contact Molecular Devices Technical Support for assistance.

2. Double-click the **AxoScope_11_<n>.exe** or **pCLAMP_11_<n>.exe** file. The installation menu appears.
3. Follow the on-screen instruction to install the software.

(pCLAMP Only) Installing the Security Key

If you install the pCLAMP software version 11, insert the provided Clampex 11 USB dongle (black, part number 5060221) into any USB port on the computer connected to the digitizer. Depending on your software license, you might receive two dongles, one for data acquisition and one for data analysis. The black Clampex software dongle must be connected to a USB port on the computer connected to the digitizer for data acquisition. Dongles for any previous versions of the Clampex software are invalid.

Installing the Digidata 1550B Digitizer

To install the Digidata 1550B digitizer:

1. Connect the power cord to the wall, and then to the Digidata 1550B digitizer rear panel **AC POWER** input connector.
2. Attach the USB 2.0 cable to a **USB 2** or **USB 3** port on the computer, and to the digitizer.
3. Switch on the power on the Digidata 1550B digitizer.
   The green **POWER** light is continuously on only when the digitizer is powered on and the USB cable is connected to a running computer.
   Windows automatically finds the new hardware, and installs the drivers.
4. Let the Digidata 1550B digitizer warm up for one hour before you perform experiments.
5. Configure AxoScope software version 11 or pCLAMP software version 11 for use with the Digidata 1550B digitizer.

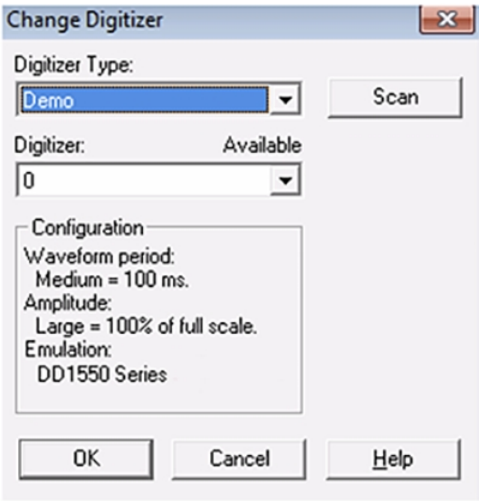
Configuring Software for Digidata 1550B Digitizer Use

CAUTION! After the unit is powered on, the first time it is initialized by the software, the analog output channels send out a brief negative spike (~-10 V/25 ms and -5 V/270 ms). Make sure that the analog outputs are not connected to any equipment that can be damaged by such voltages during the startup period.

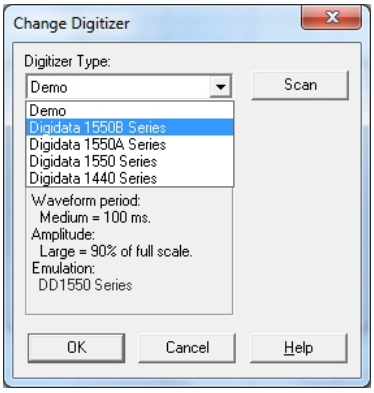
This configuration procedure applies to AxoScope software version 11 and Clampex software version 11. Demo configuration is active by default.

To configure the digitizer to work with AxoScope software or Clampex software:

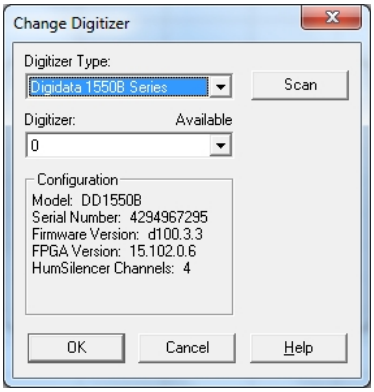
1. Double-click the AxoScope software or Clampex software icon on the computer desktop.
2. Click **Configure** > **Digitizer** to open the **Digitizer** dialog, then click **Change**.



3. Select **Digidata 1550B Series** from the **Digitizer Type** list.



4. Click **Scan** to detect the digitizer. The first detected digitizer is assigned **0** and listed as **Available**. The **Configuration** information changes from **Not present** to reporting the selected digitizer model number, serial number, firmware version, HumSilencer channel availability (0, 1, or 4), and the **OK** button is enabled.



5. Click **OK**.

   Updating the digitizer information can take up to one minute, after which the **Digitizer** dialog displays the active digitizer configuration details.

6. Click **OK**.

The front panel yellow **READY** light is continuously on only when the software connects to the digitizer. After warming up (allow one hour), the Digidata 1550B digitizer is ready for experiments.

Chapter 3: Interface Description

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Front Panel

The following is the front panel description of the Digidata 1550B digitizer.

There is a single rocker-style On/Off switch.

There are two indicator lights: **POWER** and **READY**.

- When the digitizer is powered on, and the USB cable is connected to the computer, the green **POWER** light is continuously on.
- When the digitizer is recognized by the software and ready for use, the yellow **READY** light is continuously on.

The front panel connectors are all BNCs.

Analog Inputs

There are eight 16-bit single-ended analog input channels. The BNC shields for the Analog Inputs are connected to the Analog ground. You can use all channels simultaneously without any reduction in throughput for each channel. These input channels are used to digitize biological signals. Depending on the Digidata 1550B digitizer model, when the HumSilencer Adaptive Noise Cancellation System is available, Analog Input Channels #0, or Analog Input Channels #0, #2, #4, and #6 are configurable to eliminate ground signal noise.

Analog Outputs

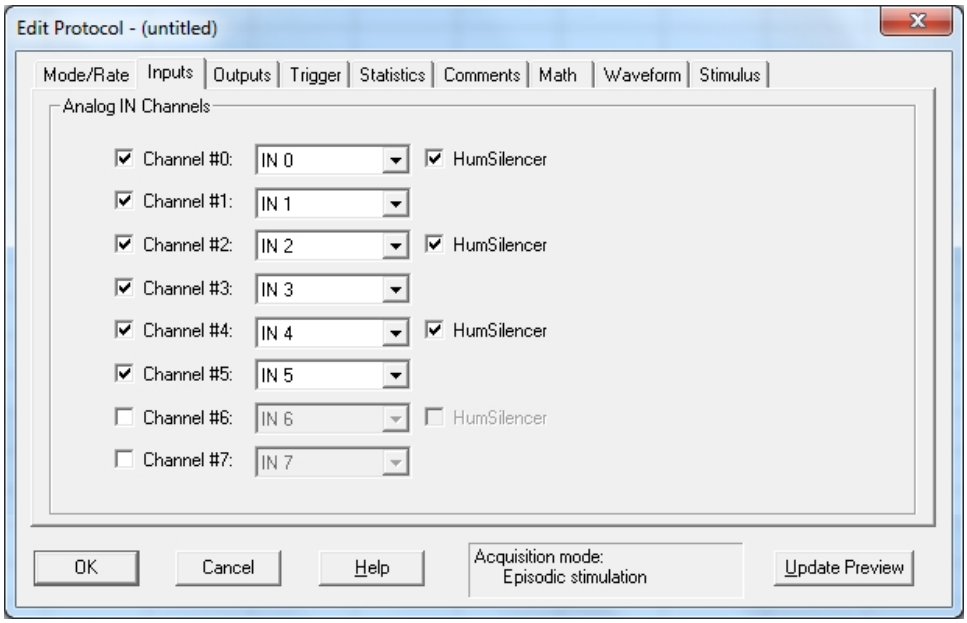
The front panel has eight 16-bit analog output channels. Each channel has an operational amplifier to buffer the output signal of the D/A converter. You can use the eight analog output channels simultaneously for waveform generation.

HumSilencer Adaptive Noise Cancellation System

The HumSilencer Adaptive Noise Cancellation System (ANC) is integrated into Analog Input Channels #0, #2, #4, and #6 of the Digidata 1550B digitizer, depending on the model, so no additional hardware is required. When it is in use, it eliminates electrical hum interference at 50 Hz or 60 Hz and the associated high-frequency harmonics. The ON/OFF switch for ANC is software-controlled. ANC works by learning the noise-patterns that are synchronous with the AC power, known as hum, caching a signal-averaged replica of the hum, and subtracting the noise replica from the signal in real time. It adapts to noise changes in about 1 second, within 50 power-cycles at 50 Hz or 60 Hz. It is designed to work with peak-to-peak hum amplitudes that, when combined with the signal of interest and other non-line-synchronous noise sources, are within the -10 to +10V range of the Digidata 1550B digitizer analog inputs. It is not a filter and does not have a filtering effect on acquired signals; nor does it cause waveform distortion, such as, frequency change, amplitude attenuation, phase shift, or DC-voltage shift.

Note: The HumSilencer system controls do not display in the AxoScope software or the Clampex software Demo configuration, nor do they display without a connection to and configuration with a Digidata 1550B digitizer that has the HumSilencer module installed.

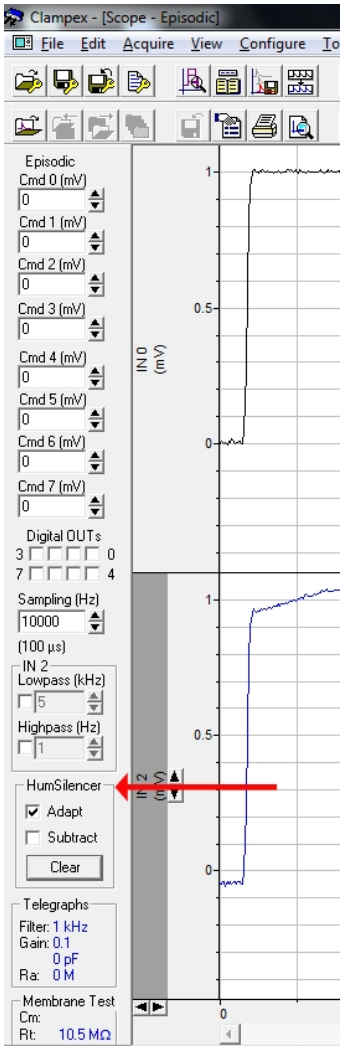
The HumSilencer system control-enabling checkbox is part of the AxoScope software version 11 and the Clampex software version 11, located in the **Edit Protocol** > **Inputs** dialog tab. A blank checkbox indicates that the Real Time Controls panel items for ANC are disabled. The HumSilencer checkboxes correspond to the type of ANC channels module with which the instrument is equipped (0, 1, or 4).



Edit Protocol > Input dialog tab checkboxes used to enable the Real Time Controls panel items for the HumSilencer system

CAUTION! The Real Time Controls panel items under **HumSilencer** do nothing if you clear the **Edit Protocol** > **Inputs** > **HumSilencer** dialog tab checkboxes for an **Analog IN Channel**.

When AxoScope software or Clampex software starts, the **HumSilencer** > **Adapt** checkbox on the Real Time Controls panel is available and learning the line-frequency noise.



The HumSilencer system Real Time Controls panel items in active learning mode, but not actively canceling noise

The Real Time Controls panel items for the HumSilencer system include:

The HumSilencer system Real Time Controls panel items in active learning mode and actively canceling noise

- **Adapt** — Select this checkbox to turn on real-time noise pattern learning.
  To turn off the real-time noise pattern learning, clear the **Adapt** checkbox.

  Note: The **Episodic stimulation** mode in Clampex software automatically clears the **Adapt** checkbox.

  Clear the **Adapt** checkbox when you have big steps or spikes in the signal, because fast changes will be visible at as an excursion scaled to -1/50 of the fast signal amplitude in the output and will take 50 power cycles (about 1 second) to age out of the rolling averaged noise replica.

  Also clear the **Adapt** checkbox when you have line-synchronous signal components that are of interest.

- **Subtract** — Select this checkbox to turn on adaptive noise cancellation.
  To turn off adaptive noise cancellation, clear the **Subtract** checkbox.
- **Clear** — Click to reset the collected cache of the learned real-time noise-patterns. **HumSilencer Start** and **HumSilencer Stop** comment tags display in the Clampex software or AxoScope software data file.

For details, see the *pCLAMP Data Acquisition and Analysis Software v11 User Guide*.

Digital Outputs

Digital Outputs 0–7 are on the front panel of the Digidata 1550B digitizer. You can set these output levels to high (+5 V) or low (0 V) TTL-level compatible states. Use these to trigger a wide variety of external devices.

Start and Tag Input Triggers

START and TAG are digital input triggers compatible with TTL-level signals.

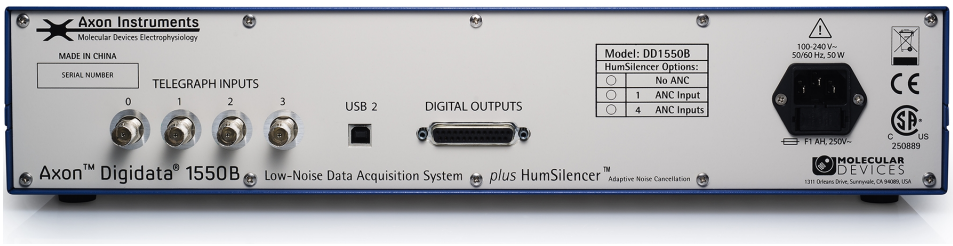
- The START input is used to begin data acquisition from an external trigger source.
- The TAG input is used to automatically mark events (for example, perfusion ON) within the data.

Scope Output

The SCOPE output is a digital signal that reflects specific actions in AxoScope software and Clampex software, such as the beginning of an acquisition recording, sweep, event, or level. Use this to trigger an oscilloscope or to synchronize data acquisition with other devices.

Rear Panel

There are several connectors on the rear panel of the Digidata 1550B digitizer: four BNCs, one USB connector, one 25-pin connector, and one **AC POWER** input.



Telegraph Inputs

The Digidata 1550B digitizer has a dedicated A/D converter that provides four telegraph input channels on the rear panel. These telegraph input channels provide gain, frequency, and capacitance values from manually-controlled amplifiers (for example, Axopatch™ 200B). These inputs are independent of the 8 analog input channels. Computer-controlled amplifiers (such as, MultiClamp™ 700A/B Microelectrode Amplifier and Axoclamp™ 900A Microelectrode Amplifier) use software telegraph signals instead of such hard-wired telegraph signals.

USB 2 Port

There is a single USB 2.0 type B port on the rear panel to attach a USB 2.0 cable to allow connection to the USB 2 port on the host computer.

Digital Outputs

A DB 25-pin connector provides as an alternative way to access the software-controlled digital outputs.

Note: Only digital outputs 0 through 7 are supported in existing Molecular Devices software. To make your own cable, see Specifications on page 33.

AC Power

There is a single AC power input connector on the rear panel for the supplied AC power line cord.

Chapter 4: Maintenance

Before you operate the instrument or perform maintenance operations, make sure that you are familiar with the safety information in this guide. See Safety Information on page 5.

Do only the maintenance described in this guide. Maintenance procedures other than those specified in this guide must be done by qualified Molecular Devices personnel only. See Obtaining Support on page 38.

WARNING! Service or maintenance procedures other than those specified in this guide can be done only by Molecular Devices qualified personnel. When service is required, contact Molecular Devices Technical Support.

Functionality Tests

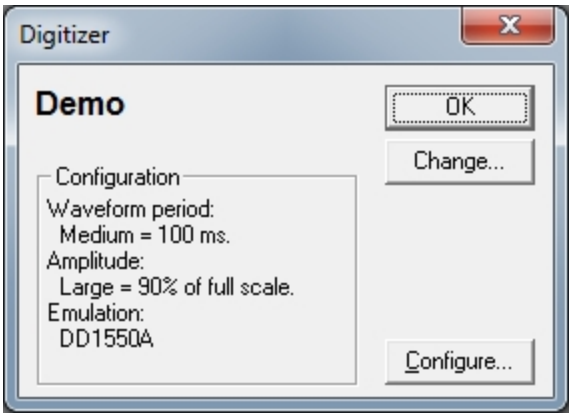
Run functionality tests to verify digitizer signals.

Configure With the Software

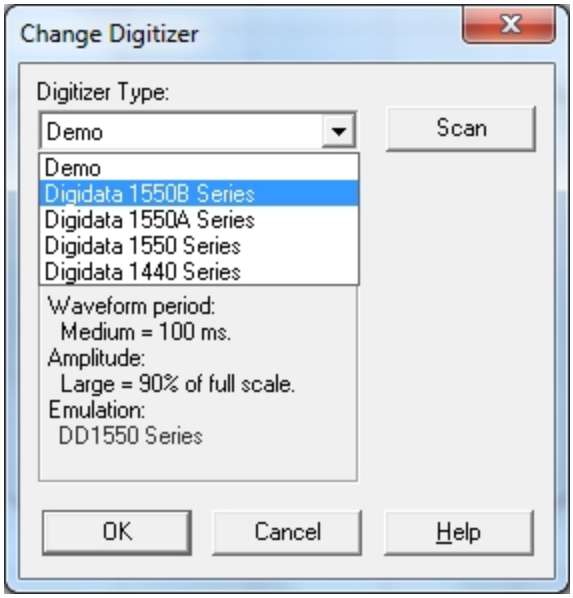
If you are able to configure the Digidata 1550B in the pCLAMP software, then the digitizer is properly installed. Continue to the next test.

To configure the digitizer to work with AxoScope software or Clampex software:

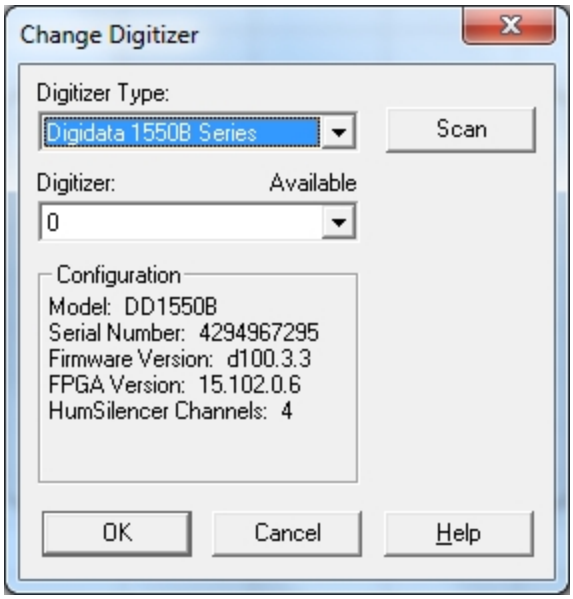
1. Run AxoScope software or Clampex software.
2. Click **Configure** > **Digitizer** to open the **Digitizer** dialog, then click **Change**.



3. In the **Change Digitizer** dialog, select **Digidata 1550B Series** from the **Digitizer Type** list.



4. Click **Scan** to detect the digitizer.
   The first detected digitizer is assigned **0** and listed as **Available**. The **Configuration** information changes from **Not present** to reporting the selected digitizer model number, serial number, firmware version, channel availability (0, 1, or 4), and the **OK** button is available.



5. Click **OK** to close the dialog box.

The front panel yellow **READY** light is continuously on only when the software connects to the digitizer.

Verify Computer USB Port

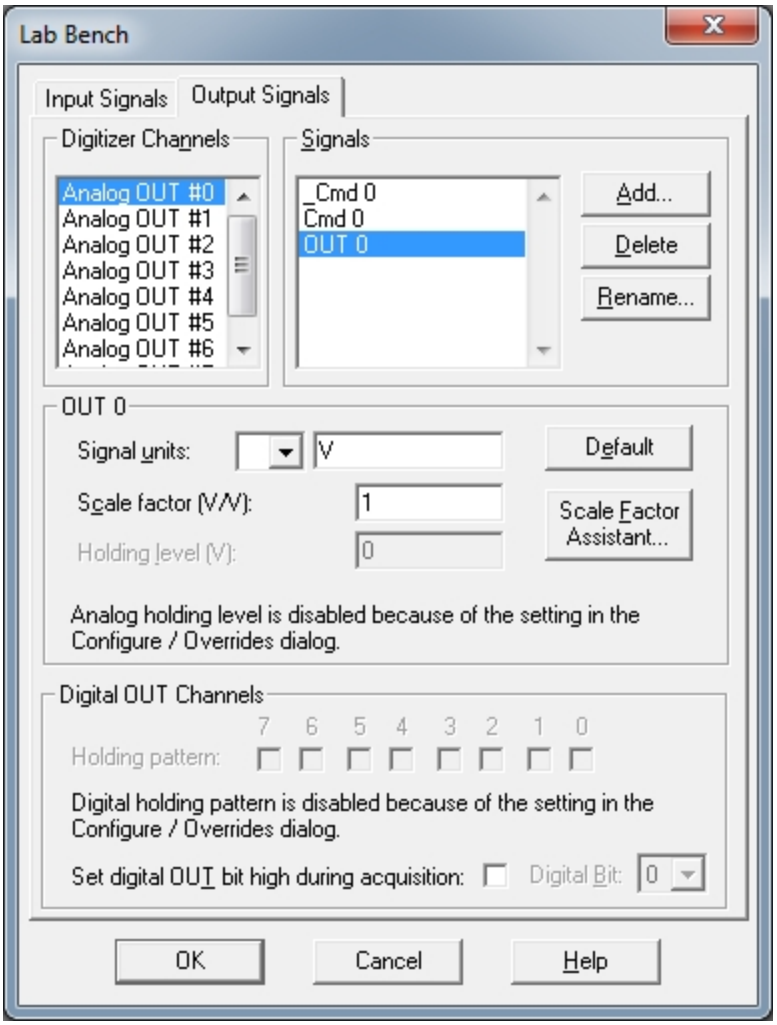
To verify that the computer has a USB 2 or USB 3 port:

1. In Windows 10, right-click **This PC** and select **Properties**.
2. In the **System** > **Control Panel** dialog, click **Device Manager**.
3. Expand the **Universal Serial Bus controllers** tree.
4. Find an entry for a **USB 2.0** or **USB 3.0** controller.

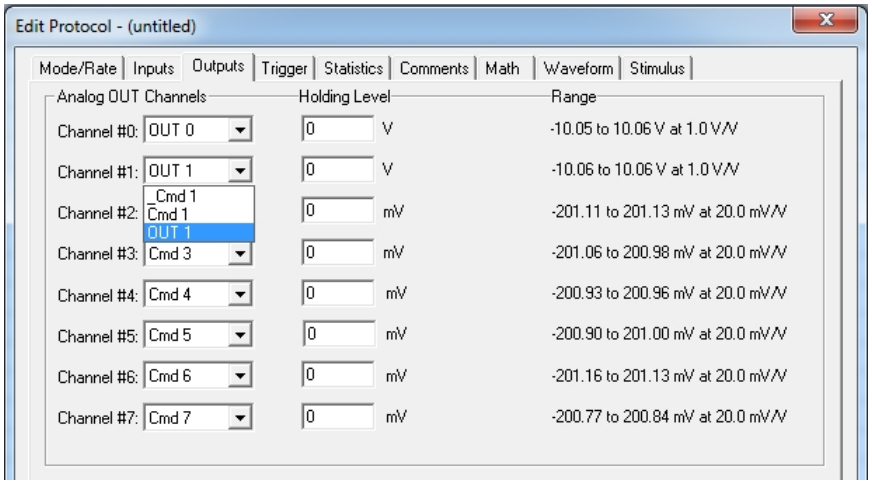
Test Output Signal Functionality

To test analog and digital outputs signals with either AxoScope software or Clampex software:

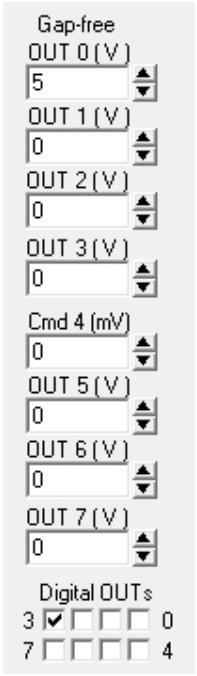
1. Click  **Lab Bench** (or click **Configure** > **Lab Bench**) and select the **Output Signals** tab. For each of the **Digitizer Channels** (for example, **Analog OUT #0**), select a matching **Signal** (for example, **OUT 0**), and configure that signal with unity scaling (for example, **Scale factor (V/V): 1**).



2. Set up a protocol through the **Acquire** > **New Protocol** menu command, and then on the **Mode/Rate** tab, select the **Gap-free** mode. On the **Outputs** tab, for each of the **Analog OUT Channels**, select the matching signal (for example, **OUT 1**) from its list.



3. Attach the digitizer outputs to an oscilloscope or 10-bit digital volt meter (DVM).



4. For each output signal, use the Real Time Controls panel to change voltage levels.
   - For analog outputs, either use the spinners, or enter a value and press **ENTER**.
   - For digital outputs, click on the box that corresponds to the digital bit to test. Verify the output signal levels on the oscilloscope or DVM.

Test Input Signal Functionality

To test analog inputs signals with either AxoScope software or Clampex software:

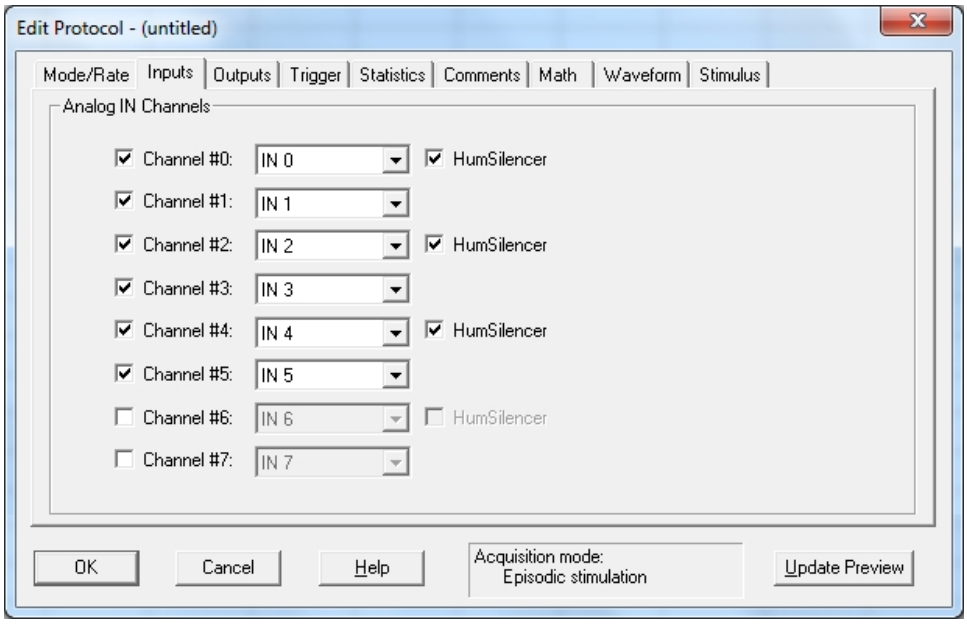
1. Click  **Lab Bench** (or click **Configure** > **Lab Bench**) and select the **Output Signals** tab. For each of the **Digitizer Channels** (for example, **Analog OUT #0**), select a matching **Signal** (for example, **OUT 0**), and configure that signal with unity scaling (for example, **Scale factor (V/V): 1**).
2. Click  **Edit Protocol** (or click **Acquire** > **Edit Protocol**) and then, on the **Inputs** tab, for each of the **Analog IN Channels**, select the matching signal (for example, **IN 0**) from its list.
3. Connect a BNC cable from the analog outputs to the analog inputs to test.
4. Click  **Record** (or click **Acquire** > **Record**) to acquire data. For each analog output signal, in the software, use the Real Time Controls panel to change voltage levels. Either use the spinners or enter a value and then press **ENTER**.
5. Click  **Last Recording** (or click **File** > **Last Recording**) to open the data file. Test the input signal levels using the cursors in the window. To display a subset of the signals, right-click on the data display area, select **Properties** and select the **Show/Hide** tab.

Test HumSilencer Adaptive Noise Cancellation System Functionality

Not all Digidata 1550B include the HumSilencer Adaptive Noise Cancellation System (ANC). A sticker on the back of the digitizer specifies if the ANC system is installed and the number of ANC inputs available in the digitizer.

To test ANC input functionality:

1. In the Real Time Controls panel select the **HumSilencer** > **Adapt** checkbox.
2. Click  **Edit Protocol** (or click **Acquire** > **Edit Protocol**) and then, on the **Inputs** tab. Select the Analog IN Channel #0 > HumSilencer checkbox, or if the instrument uses four ANC inputs, select the **Analog IN Channel #0, #2, #4, #6** > **HumSilencer** checkboxes.



3. Select the **Mode/Rate** tab. Select **Acquisition Mode** > **Gap-free**, and **Trial Length** > **Use available disk space**.
4. Click **OK**.
5. Place a 50 Hz or 60 Hz noise generator, such as a power supply, near the headstage.
6. Click  **Record** to acquire data.
   The line frequency noise should display on the Scope screen.
7. In the Real Time Controls panel, click **HumSilencer** > **Subtract**.
   The line frequency noise should be eliminated.

Grounding and Minimizing Noise

The line-frequency noise, or hum, should be eliminated when the HumSilencer Adaptive Noise Cancellation System is enabled and activated.

To avoid ground-loops, you should plug the Digidata 1550B digitizer into the same power strip as the amplifier. Be aware that each Analog Input BNC on the Digidata 1550B digitizer is a single-ended input (all BNC shells are connected to signal ground).

When noise in the system occurs, the first step is diagnosis. Take all instruments out of their racks, and connect to one of them with only one BNC connection. Observe if the hum (50–60 Hz noise) is eliminated. Also observe if the hum is produced from headstage pickup by shielding the headstage and watching the magnitude of the hum.

If the hum is eliminated, connect the second BNC cable. If the hum is observed, there is probably a ground loop that is picking up an alternating magnetic field. Try to eliminate the source of the alternating magnetic field from a transformer or an electric motor, such as found in a nearby fan or refrigerator. Try to rearrange the two BNC cables to determine if their position tells you anything about the source of the alternating field. High frequency components (20–50 kHz) might also appear if there is a ground loop. These can originate from the switching power supply of the computer, or from a monitor, and can be picked up in the analog signal inputs of the Digidata 1550B digitizer.

If you cannot remove the source of the alternating field, eliminate the ground loop by constructing one of the connections between the two instruments without a shield. Make this either with a naked unshielded wire, or with a BNC cable that has the shielding cut at one end. Make a break in the shielding away from the interface, near the connection on the instrument suspected of creating the ground loop.

You should check quality of the AC power. In particular, check for proper grounding of the outlets.

For users of Molecular Devices microelectrode amplifiers, see the user guides for the MultiClamp amplifier, Axopatch amplifier, and Axoclamp amplifier for more information regarding noise reduction.

Replacing Fuses

WARNING! High Voltage. Turn the power switch off and disconnect the power cord before performing any maintenance procedure that requires removal of any panel or cover or disassembly of any interior instrument component.

If the instrument fails to switch on, or if the power fails while the instrument is running, check that the power cable connection to the AC input port in the back of the instrument is secure and verify that the power outlet is functioning.

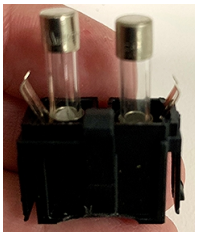
The Digidata 1550B digitizer uses a pair of fuses located in a fuse carrier under the AC input port

For Digidata 1550B digitizer fuse specifications, see AC Power on page 36.

Item	Description
1	Fuses in carrier installed
2	Fuses in carrier released
3	Fuses in carrier removed

To replace the Digidata 1550B digitizer fuse:

1. Switch off the power from the front of the instrument.
2. Unplug the power cord from the AC input port.
3. Press the carrier-release side-tabs towards each other and pull out the fuse carrier to remove it from the instrument.
4. Remove the old fuses from the carrier.



5. Place new fuses into the carrier.
6. Reinstall the fuse carrier in the instrument. Push the carrier into the slot until you hear the side-tabs click.
7. Reconnect the power cord to the AC input port.
8. Switch on the power from the front of the instrument.

Note: If the instrument does not power on contact Molecular Devices Technical Support.

Chapter 5: Troubleshooting

This section describes some common problems that can occur and possible solutions that you can do yourself.

Isolating the Problem

Start digitizer troubleshooting by trying to isolate the problem.

1. Simplify the software configuration by turning off all other programs. Confirm no other programs are running in the background from the Task Manager. In Windows, click on an empty place on the desktop; press **CTRL**+**ALT**+**DEL** and then click **Task Manager**.
2. On the **Applications** tab, close all unnecessary programs, including virus checkers that can also affect system performance.
3. Disconnect all external instruments and test the digitizer and computer combination by itself.
4. Swap the unit with a known good unit to help determine whether the problem is with the digitizer or the computer.

Problems From The Front Panel Lights

The following are possible solutions for common front panel lights problems.

Power Light is Off

If the Power light on the front panel is off, check that the power cables and USB cables are securely connected and verify that the system is properly powered on.

Ready Light is Flashing

When the Ready light on the front panel flashes, the Digidata 1550B digitizer is in a major fault state. Contact Molecular Devices Technical Support.

Problems With Analog or Digital Outputs

Check the Lab Bench and protocol. Use a voltmeter or oscilloscope to examine the output signals.

CAUTION! Be aware that oscilloscopes can potentially introduce unwanted ground loops and noise.

Problems With Analog or Digital Inputs

Check the **Lab Bench** and protocol. Connect a known signal source to an analog input, such as a signal generator, or even the digitizer analog output, if you know it is working properly.

Screen Shows a Straight Line Instead of the Input Signal

- Check if all external connections are properly secured.
- Swap BNC cables to check BNC cables for continuity problems.
- Make sure the USB cable is securely attached to both the computer and the interface box.

Screen Shows Different Signal Shape Than Expected

Verify that the acquisition software is not configured for a demo digitizer (**Configure** > **Digitizer**). Demo mode reproduces a command waveform with added noise, or generates artificial spike trains. Also check the software for any inappropriate filtering. The sampling rate has to be at least 2x of the filter rate, and typically is 5x – 10x more.

Noise Introduced When Data Digitized

- Verify that the acquisition software is not configured for a demo digitizer (**Configure** > **Digitizer**). Demo mode reproduces a command waveform with added noise or generates artificial spike trains.
- If noise is added to the signal on the analog input, make sure that all cables are routed away from switching power supplies, power cords, monitors, or any other major sources of noise.
- Check for proper ground connections. See Grounding and Minimizing Noise on page 27.

HumSilencer Does Not Eliminate Expected Line-Frequency Noise

To test HumSilencer line-frequency noise:

1. Verify that the **Analog IN Channel #0** > **HumSilencer** checkbox is selected in the **Edit Protocol** > **Inputs** dialog tab.
2. Verify that the **HumSilencer** > **Subtract** checkbox is selected in the Real Time Controls panel.
3. Select the **HumSilencer** > **Adapt** checkbox in the Real Time Controls panel, then click **Clear**.
4. Click **Record** or **View** to see if the noise problem is corrected.

Problems with Digitizer

Try the following if the digitizer does not work, locks up the computer, or exhibits other unexpected behavior:

- Double-check that you use a USB 2.0 braided shielded cable. Improper shielding can lead to USB communication problems that appear as a variety of odd behaviors, ranging from minor to severe.
- Reset the digitizer by turning it off and then back on. Then restart the computer.
- For Windows, reset the Windows registry digitizer settings back to the manufacturer defaults (for example, **Start** > **All Programs** > **Molecular Devices** > **pCLAMP 11** > **Reset to Program Defaults**).
- Clear relevant registry items one at a time and then reconfigure the digitizer and any Telegraphed instrument. Try clearing items such as Digitizers, Clampex software, AxoScope software, pCLAMP software, and Common Settings.

  Note: For software items, all customized window settings are lost, but signal names and protocols save.

- Run a check on the computer hard drive structure and RAM.
- Call Molecular Devices Technical Support if the problem persists.

Problems With Data Throughput

Try the following if you experience data throughput problems.

- If decreasing the number of analog input channels or the sampling rate improves performance, you likely have a data throughput problem. Verify that the digitizer is connected to a high-speed USB 2.0 port on the computer. See Installing the Digidata 1550B Digitizer on page 12. If the digitizer is connected to a USB hub, remove any other devices connected to the hub, or bypass the hub.
- Try the digitizer on a faster computer. CPU speed is only one part of the system. Other relevant components include hard drive speed, RAM speed, and front-side bus speed.
- To improve data-throughput related acquisition performance problems in Clampex software or AxoScope software try the following:
  - In **Configure** > **Lab Book Options**, select **Never log any events**.
  - In **Configure** > **Program Options**, select **Disable screen saver during data acquisition**.

Chapter 6: Specifications

This section lists instrument specifications, electrical requirements, instrument dimensions, and space requirements for the Digidata 1550B digitizer.

Operational and Environmental

Operational and Environmental Specifications

Item	Description
Weight	3.6 kg
Dimensions (H x W x D)	109 mm x 483 mm x 363 mm
Mains Power Input	100 – 240 VAC, 50/60 Hz, Max. 50 W
Mains Voltage Fluctuations	Not to exceed 10% of nominal supply voltage
Equipment Class	1
Pollution Degree	2
Installation Category	2
Operating Environment	Indoor Use Only
Altitude	Not to exceed 2000 m
Operating temperature	15 to 30°C (59 to 86°F)
Humidity	< 80% RH at 25°C (77°F)
Ingress Protection	IP20

Analog Inputs

Analog Inputs Specifications

Item	Description
Number of channels	8[1]
Type of channels	single-ended
Resolution	16-bit, 1 in 65536
Sample rates per channel	1 Hz to 500 kHz
Input range	-10.000 V to +10.000 V
Input resistance (DC)	> 1 MΩ
Gain value	1
Digitization noise	< ±1 mV Avg (p-p)
Crosstalk noise	< ±1 mV Avg (p-p)

1. Depending on the model, Analog Input Channels #0 #2, #4, and #6 are configurable with the HumSilencer system.

Analog Outputs

Analog Outputs Specifications

Item	Description
Number of channels	8
Resolution	16-bit
Sample rates per channel	1 Hz to 500 kHz
Output range	–10.000 V to +10.000 V
Output impedance (DC)	< 0.5 Ω
Output short circuit to signal ground	±25 mA

Digital Inputs

Digital Inputs Specifications

Item	Description
Input type	5 V nominal, >4 V high threshold
START trigger	rising-edge sensitive
TAG trigger	rising-edge sensitive

Digital Outputs

Digital Outputs Specifications

Item	Description
Number of bits	16 (8 supported in software)
Output driver	Advanced CMOS (AC) compatible
Output current	±4 mA
SCOPE trigger	Shared bit on DO #15

A DB 25-pin connector is provided on the rear panel with the following pin assignments:

Pin Assignments Specifications

Pin Number	Digital Output
1	0
2	2
3	4
4	6
5	N/C
6	Analog ground
7	Analog ground
8	8
9	10
10	12
11	Internal Use (or 14)
12	Analog ground
13	Analog ground
14	1
15	3
16	5
17	7
18	Analog ground
19	Analog ground
20	Analog ground
21	9
22	11
23	Internal Use (or 13)

Pin Assignments Specifications (continued)

Pin Number	Digital Output
24	Scope Output (or 15)[1]
25	Analog ground

1. Pin 24 is configured as the front panel SCOPE output, using the hardware's 16th digital bit (15).

Telegraph Inputs

Telegraph Inputs Specifications

Item	Description
Number of channels	4
Sample rates per channel	40 kHz
Input range	±10.0 V

HumSilencer Adaptive Noise Cancellation Module

HumSilencer Adaptive Noise Cancellation Specifications

Item	Description
Maximum Input Signal (total of noise + signal)	±10 V
Maximum Noise Amplitude	20 V peak-to-peak (on a 0 V signal)
Noise Cancellation	Line-frequency (50 Hz / 60 Hz) and harmonics up to 10 kHz
Cancellation Response Time	< 1 second

AC Power

The AC Power is supplied from a single AC input connector on the rear panel for the supplied AC power line cord.

AC Power Specifications

Item	Description
Voltage input rating	100 V–240 V AC, 50/60 Hz 50 W Max.
Replaceable fuse type	Cartridge, fast acting
Fuse dimensions	6.3 mm x 35 mm
Fuse rating	1.0 Ampere, 250 V

Electromagnetic Compatibility

Regulatory for Canada (ICES/NMB-001:2020)

This ISM device complies with Canadian ICES-001.

Cet appareil ISM est confomre à la norme NMB-001 du Canada.

ISM Equipment Classification (Group 1, Class A)

This equipment is designated as scientific equipment for laboratory use that intentionally generate and/or use conductively coupled radio-frequency energy for internal functioning, and are suitable for use in all establishments, other than domestic and those directly connected to a low voltage power supply network which supply buildings used for domestic purposes.

Information to the User (FCC Notice)

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 18 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense. Changes or modifications made to this equipment not expressly approved by the party responsible for compliance may void the FCC authorization to operate this equipment.

Obtaining Support

Molecular Devices is a leading worldwide manufacturer and distributor of analytical instrumentation, software, and reagents. We are committed to the quality of our products and to fully supporting our customers with the highest level of technical service.

Our Support website—support.moleculardevices.com/—describes the support options offered by Molecular Devices, including service plans and professional services. It also has a link to the Molecular Devices Knowledge Base, which contains documentation, technical notes, software upgrades, safety data sheets, and other resources. If you still need assistance, you can submit a request to Molecular Devices Technical Support.

Please have your instrument serial number or Work Order number and your software version number available when you call.

Before you call

To help identify possible problems and known conflicts, before you contact Molecular Devices Technical Support, be ready to provide the following information:

- What is the model and serial number of the digitizer? The serial number is on a small barcode sticker on the digitizer back panel.
- The specific software name and version of the software running the digitizer. For example, Clampex software Version 11.x. Click **Help** > **About Clampex**.
- If you can reproduce a problem by following a series of steps, please note the steps.
- Email a copy of the protocols and data files that illustrate the problem.

Clampex software users:

1. Connect **Analog Out 0** to **Analog In 0**.
2. From **Acquire** > **New Protocol**, run an **Episodic stimulation** mode protocol with a default waveform specified.
3. Click **View Only**. Do you see the default waveform?

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