

Setting Up Clampex for Data Acquisition

MultiClamp and digitizer connections with telegraphs

MultiClamp Tutorial

Setting up Clampex for Data Acquisition

By the end of the tutorial, you will be ready to acquire data and understand how to tailor setup configurations to meet your needs. We will explain standard setup for configuring the MultiClamp 700B amplifier with the Digidata 1550B and Clampex software.

We recommend installing the following software prior to proceeding:

- Clampex software (included with pCLAMP software)
- MultiClamp Commander software

Note: *This guide assumes you are using a Digidata 1550B series digitizer, that you have connected it to your computer, and that you have installed MultiClamp Commander software. If you are using an amplifier different than those featured, you should be able to extrapolate the instructions for use with other amplifiers.*



MultiClamp Tutorial Agenda

MultiClamp sequence

- [Digitizer–Amplifier Connections](#)
- [Configure Digitizer](#)
- [Configure Telegraphs](#)
- Create Signals
- Configure Protocols
 - Configure HumSilencer
- Configure Sequencing Keys

[Molecular Devices Technical Support](#)



MultiClamp 700B Setup

- Install basic software and connect basic hardware in preparation for data acquisition
 - Software
 - MultiClamp Commander
 - pCLAMP Clampex
 - Hardware
 - MultiClamp 700B Amplifier
 - DigiData 1550B digitizer
- Configure Telegraphs



pCLAMP Computer and Software System Requirements

Minimum System Requirements	Recommended System Requirements
PC with 2 GHz Pentium class CPU*	PC with 2 GHz (or faster) Pentium class CPU*
Windows XP Pro (32-bit)	Windows 7 or Windows 10 (32-bit or 64-bit)**
1.2 GB RAM	4 GB RAM or Higher
CD-ROM for installation	CD-ROM for installation
1024 X 768 display system for pCLAMP software 800 X 600 display system (small fonts) for Campex Software	1680 X 1050 display (or higher)
1 USB 1 Port for security key dongle 1 USB 2.0 Port for Digidata 1440 or 1550 series 1 USB 2.0 Port for Multiclamp	3 high-speed built-in USB ports

*Multiple processor systems are not supported

** PCLAMP version 10.7 and forward are supported by Windows 7 and Windows 10 only

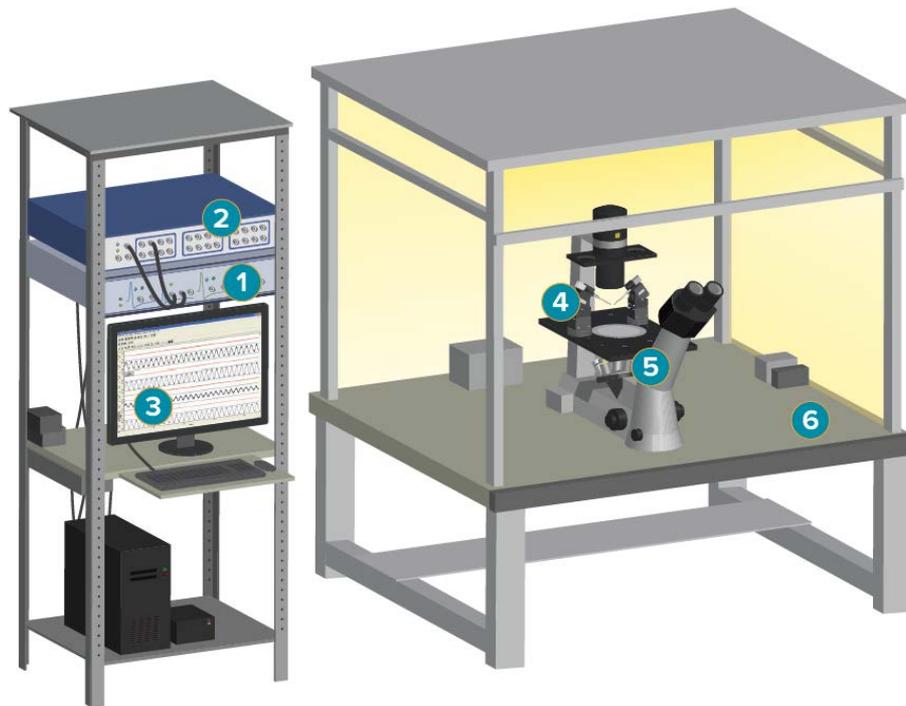


Software Installation

- For the most current version and information, access Molecular Devices Axon Knowledge Base
 - MultiClamp Commander:
http://mdc.custhelp.com/app/answers/detail/a_id/20059
 - pCLAMP:
http://mdc.custhelp.com/app/answers/detail/a_id/18779
- To purchase a dongle USB, submit a request at:
www.moleculardevices.com/systems/conventional-patch-clamp/pclamp-10-software



Patch clamp rig overview



1. Amplifier (MultiClamp 700B)
2. Digitizer (Digidata 1550B)
3. Computer
4. Headstage
5. Microscope with micro-manipulators
6. Faraday cage and air/anti-vibration table



MultiClamp 700B Amplifier Rear Panel



Connect RS232 cable to
“Headstage #1”

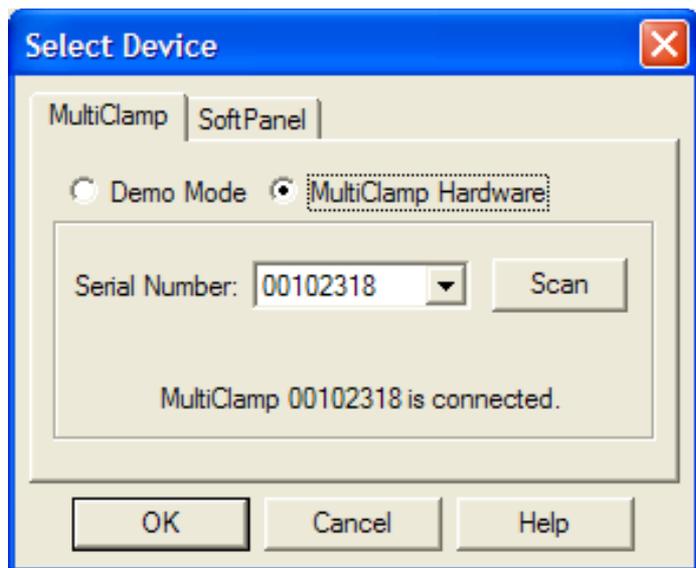
Connect computer to “USB”



Connecting your MultiClamp amplifier

Before we begin, switch on your MultiClamp 700B and open MultiClamp Commander. If Commander opens in demo mode (reported in the title bar), you will need to connect the amplifier to the software.

In Commander, click on the "Select Device" icon:



In the Select Device dialog:

1. Select "MultiClamp Hardware"
2. To locate the MultiClamp 700B, click on the "Scan" button

Note: *The serial number will be displayed when the amplifier is found.*

3. Press "OK" to exit



Digidata 1550B Digitizer Rear Panel



Connect computer to “USB 2”

Connecting your Digidata digitizer

Configure Clampex software

When Clampex software is first installed, it is in “Demo” mode. This mode uses simulated data and is excellent for exploring the application. Follow the next steps to connect to your digitizer for real data acquisition.

1. Connect your digitizer to the computer
2. Install the digitizer drivers
3. Plug the software security key (“dongle”) into a USB port on the computer
4. Make sure the digitizer is turned on, and then start Clampex software



Clampex Software

Configure your digitizer

1. Select "Digitizer..." from the Configure menu. (Figure 1)
2. In the Digitizer dialog (Figure 2), the Digitizer Type shows that the Clampex software is in Demo mode.

Figure 1

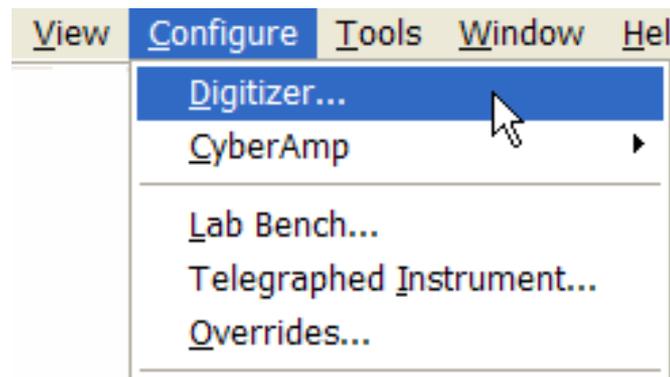
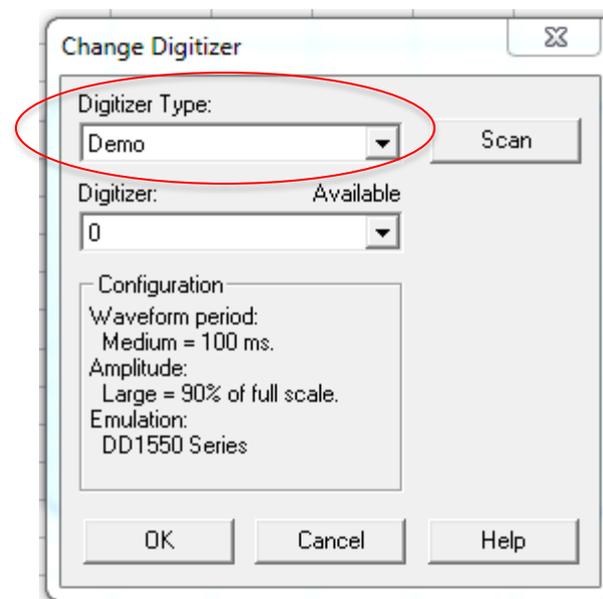


Figure 2



Clampex Software

Configure your digitizer

3. Select your Digitizer Type from the drop down menu (Figure 3):
 - Digidata 1550B Series
 - Digidata 1550A Series
 - Digidata 1550 Series
 - Digidata 1440 Series
4. Clampex software will report your Digidata digitizer properties under Configuration (Figure 4).
5. Click “OK” to continue.

Note: If you receive a “Not present” notification under Configuration, click Scan.

No calibration is necessary with the Digidata 1550A, Digidata 1550B, Digidata 1550, or Digidata 1440 digitizers. This completes configuration of the Digidata digitizer, and it is now ready to be used with Clampex software. If you experience problems, please see the next slide for troubleshooting.

Figure 3

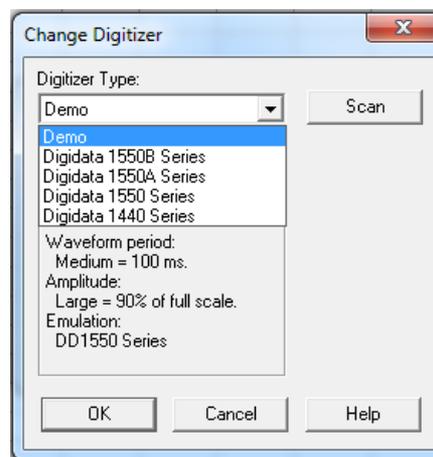
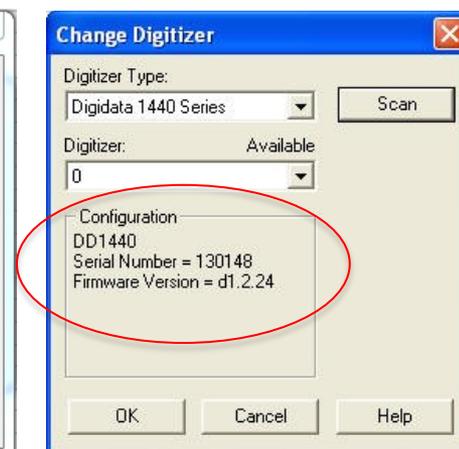
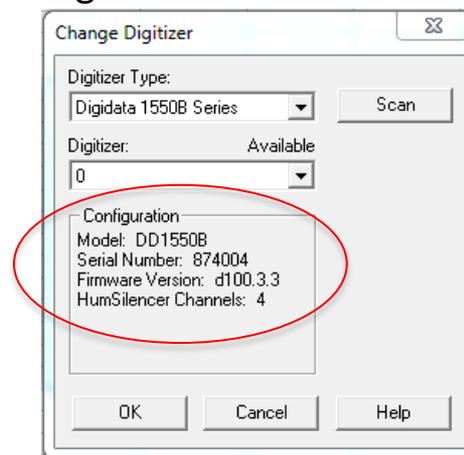


Figure 4.



Clampex Software

Troubleshooting digitizer configuration

Clicking “Scan” does not detect my Digidata digitizer.

Check that the power is on and the computer USB is connected to the digitizer.

How do I tell if the digitizer is on?

The green POWER LED on the front of the digitizer should be illuminated when the power is on.

How do I connect the computer to the digitizer?

The digitizer is connected to the computer using a USB 2.0 cable.

How can I tell if the Clampex software has recognized the digitizer?

When the digitizer is recognized by Clampex software, the yellow READY LED will be illuminated.

If problems persist, contact Molecular Devices technical support



Digitizer to Amplifier Connection

In this section, we will connect the cabling between the digitizer and MultiClamp. We will use one MultiClamp channel (i.e. headstage) in this configuration.



Digitizer to Amplifier Connection

We want the following signals:

— Voltage Clamp

Digitizer Inputs

Membrane current—primary output

Membrane potential—secondary output

Digitizer Output

Command potential

— Current Clamp

Digitizer Inputs

Membrane potential—primary output

Membrane current—secondary output

Digitizer Output

Command current



Digitizer to Amplifier Connection

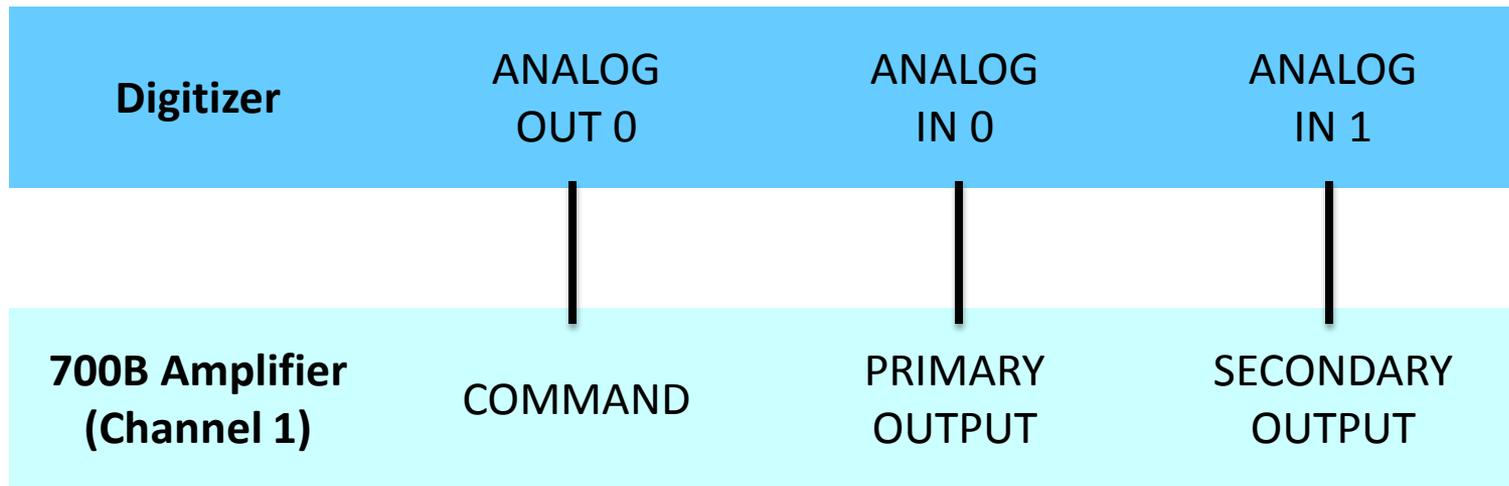
Clampex allows for more than one signal to be sent, at different times, on each channel. Because current clamp and voltage clamp modes are not active at the same time, signals associated with these modes can share channels.

The following signals can share channels:

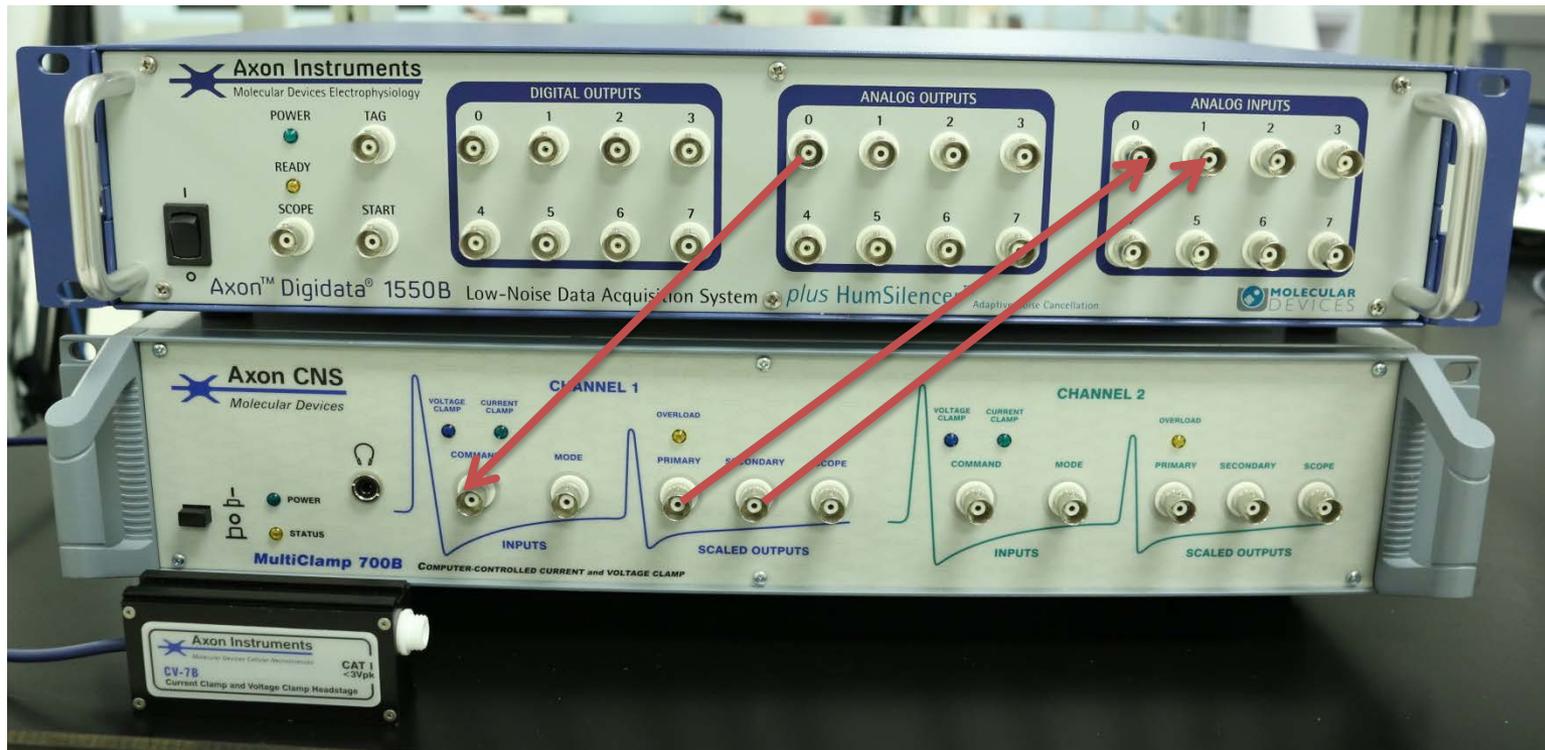
- Primary input signals for current and voltage clamp
- Secondary input signals for current and voltage clamp
- Command signals for current and voltage clamp



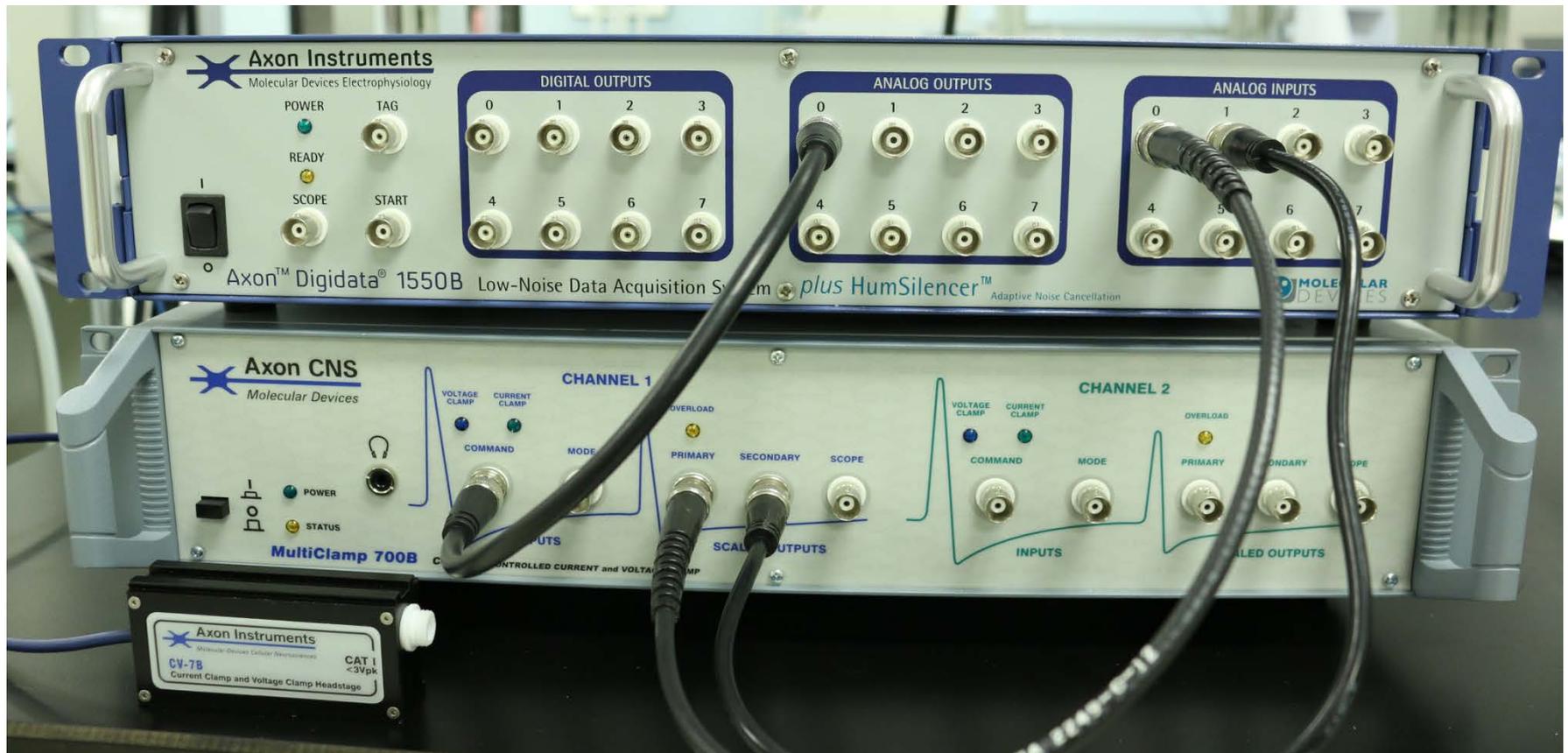
Digitizer to Amplifier Connection



Digitizer to Amplifier Connection



Digitizer to Amplifier Connection



Multiclamp Software

Configure Telegraphs

MultiClamp 700B telegraphs are software messages sent from MultiClamp Commander to Clampex, registering key amplifier settings. The telegraphs are integrated into Clampex to automate the greater proportion of signal setup (as shown on the next slides).

The gain telegraph is the most important and is used to automatically rescale the Clampex Scope window as gains settings are changed. It also ensures recorded data files are correctly scaled. Lowpass filter and whole-cell capacitance compensation settings are reported in the Real Time Controls and written into recorded file headers—as is the output gain.

MultiClamp also has telegraphs for amplifier mode and for the units and scale factors for command and acquisition signals. We use these telegraphs in our setup in the following slides.

Multiclamp Software

Configure Telegraphs – Primary Signal

1. Select “Telegraphed Instrument...” from the Clampex Configure menu (Figure 1).

Note: All telegraphs must be configured for a specific digitizer input channel.

2. Enable telegraphs for the channel receiving the amplifier primary output by connecting the MultiClamp Primary Output to the correct input channel. In this instance we are using input channel Analog In#0 ([See Digidata Connections](#)). To do this, select “Analog In #0” from the Input Channels list (Figure 2).

Figure 1

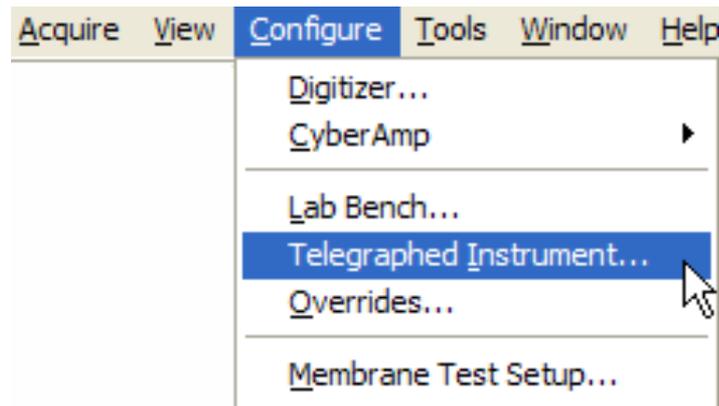
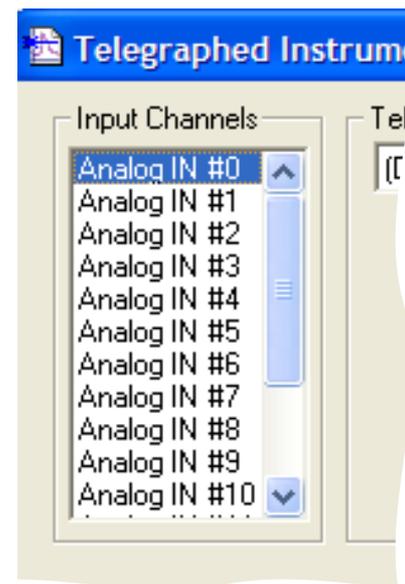


Figure 2



Multiclamp Software

Configure Telegraphs – Primary Signal

3. Select “Axon MultiClamp 700B” from the Telegraphed Instrument drop down menu (Figure 3).

Note: Once you have made the selection, the option to link protocols to amplifiers becomes available (Figure 4).

Figure 3

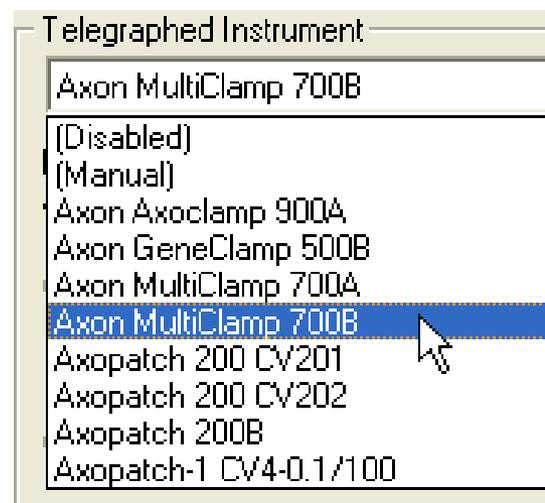
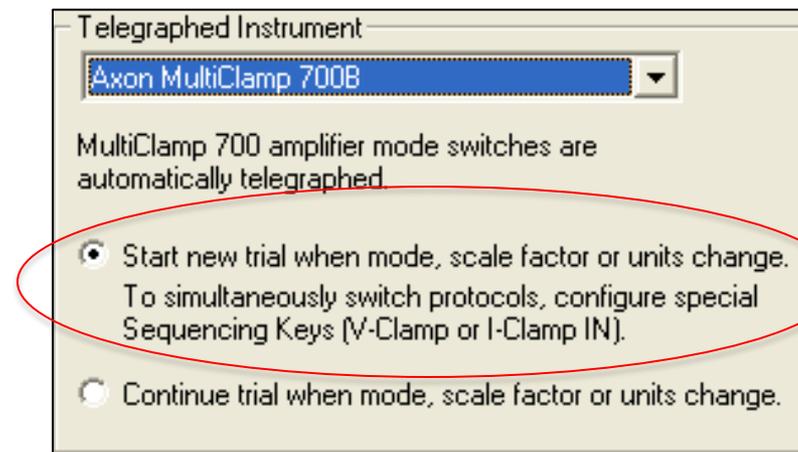


Figure 4

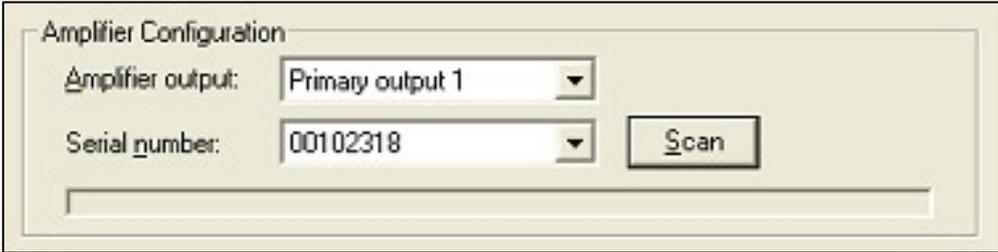


Multiclamp Software

Configure Telegraphs – Primary Signal

4. In the Amplifier Configuration section, identify the amplifier channel (i.e. headstage) and signal type for the selected digitizer channel. Select “Primary output 1” from the drop down menu (Figure 5).
5. Select the “Scan” button. The MultiClamp serial number will be shown once the amplifier has been found.

Figure 5



Amplifier Configuration

Amplifier output: Primary output 1

Serial number: 00102318

Scan

Multiclamp Software

Configure Telegraphs – Primary Signal

6. MultiClamp telegraphs scale factors for command signals and output signals. Enable Clampex to receive these telegraphs in Output Channels section.
7. The digitizer input receives output from headstage 1 (i.e. amplifier channel 1). The command signal for this headstage is fed from digitizer output Analog OUT #0, which happens to be the only command signal we have connected ([See Digidata Connections](#)). Select “Analog OUT #0” from the Command drop down menu (Figure 6).

This completes telegraph setup for the primary signal. Before we finish, we will set up the Secondary Signal.

Figure 6



Multiclamp Software

Configure Telegraphs – Secondary Signal

1. Check that the MultiClamp Secondary Output BNC is connected to the digitizer channel Analog IN #1 ([See Digidata Connections](#)). Select “Analog IN #1,” under the Input Channels drop down menu (Figure 1).
2. In the Telegraphed Instrument section, select “Axon MultiClamp 700B” under the drop down menu (Figure 1).
3. In the Amplifier Configuration section, select “Secondary output 1” under the Amplifier output drop down menu (Figure 2).
4. Enter the amplifier serial number as shown for the Primary Signal (Figure 2).

Figure 1

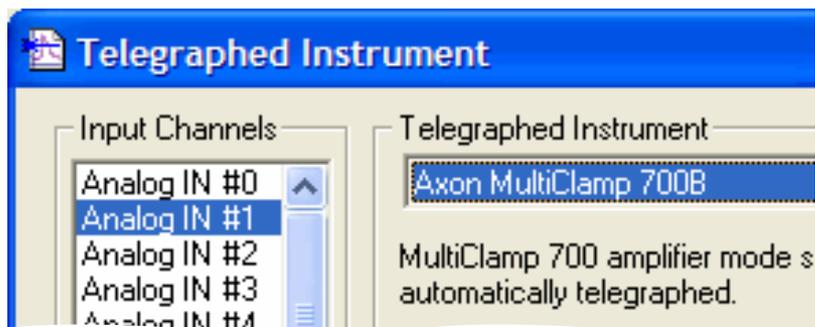
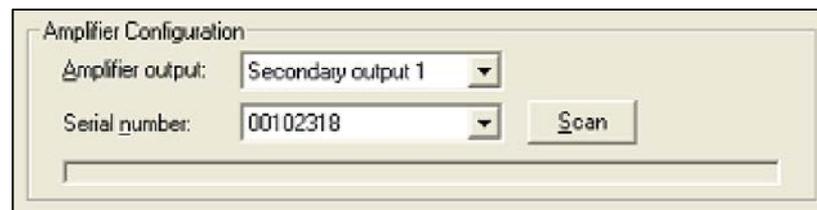


Figure 2



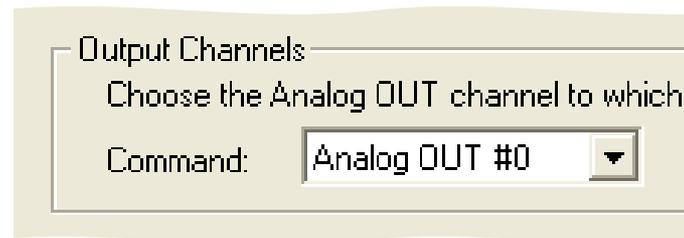
Multiclamp Software

Configure Telegraphs – Secondary Signal

5. In the Output Channels section, select “Analog OUT #0” in the Command drop down menu (Figure 3).

Note: *The digitizer command has not changed for the secondary signal, so the same Analog OUT is used as the command source.*

6. Select “OK” to close the Telegraphed Instrument dialog box.



This completes telegraph setup. We have configured Clampex to receive telegraphs for the primary amplifier output signal, secondary amplifier output signal, and the command signal.



Software Updates

At Molecular Devices, we frequently provide software updates for improvements and to fix reported problems.

pCLAMP 10 and Multiclamp Commander software have reminder settings to check for updates on our website. Alternatively, you may manually update the software.

To update pCLAMP 10

1. Open Clampex
2. Go to the Help menu and select “About Clampex”. Note the full version number and close the window.
3. Go to the Molecular Devices Knowledge Base website at:
http://mdc.custhelp.com/app/answers/detail/a_id/18779
4. If the version number on the web page is newer than yours, download and install the update.

To update MultiClamp 700B Commander

1. Go to *Options > About*
2. Note the full version number
3. Go to the Molecular Devices Knowledge Base website at:
http://mdc.custhelp.com/app/answers/detail/a_id/20059
4. If the version number on the web page is newer than yours, download and install the update.



Contact

Molecular Devices
1311 Orleans Drive
Sunnyvale CA 94089 USA

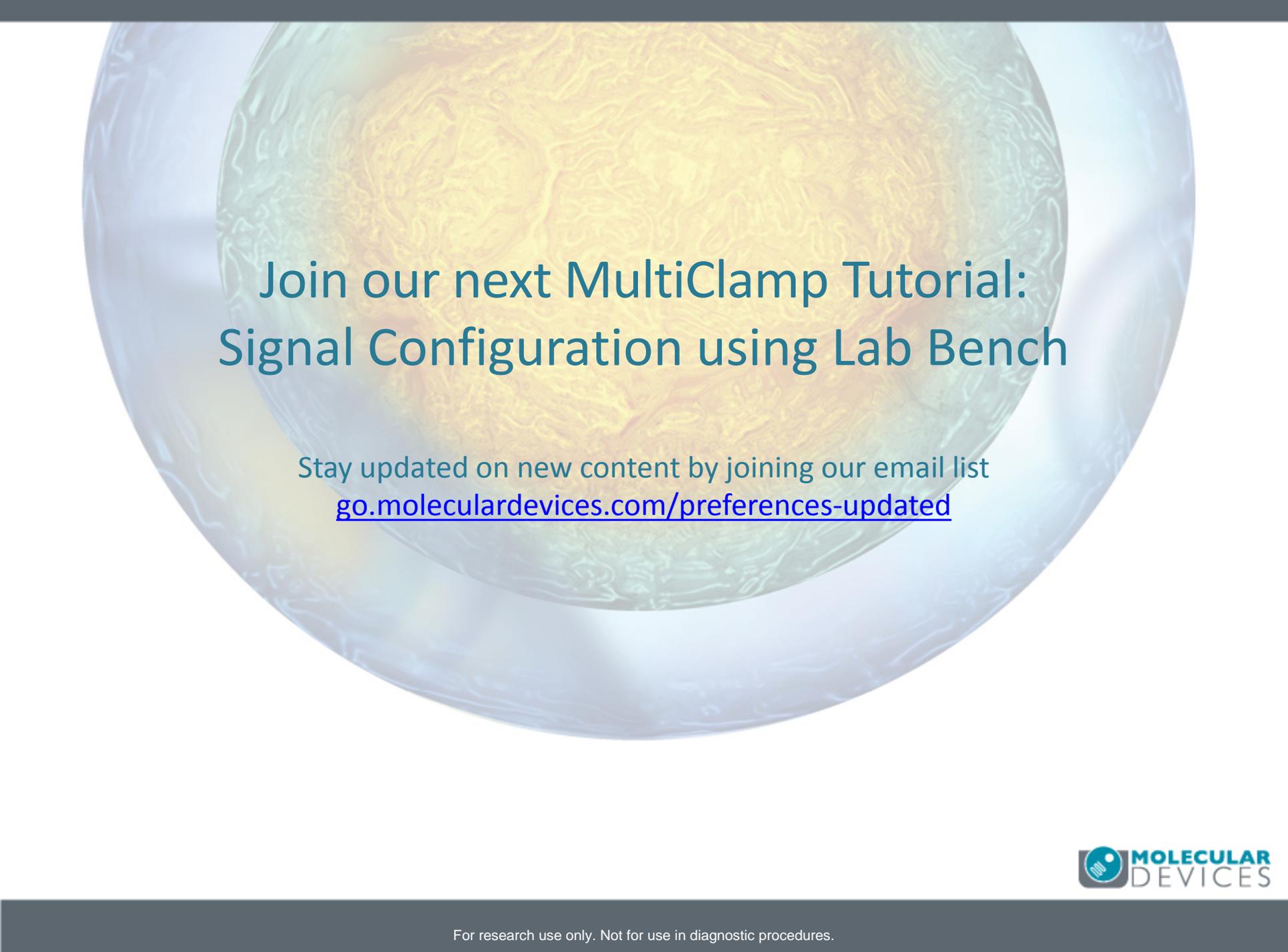
Phone: 1-408-747-1700
1-800-635-5577 (US, toll-free)
+44 (0) 118 944 8000 (Europe)

E-mail: support@moldev.com

Technical Support (including knowledge base and regional technical support contact):
<http://www.moleculardevices.com/support.html>

Web site: moleculardevices.com/





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