Digidata 1320A/1321A

Operator's Manual

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QUESTIONS? Phone: +1 (650) 571-9400
Fax: +1 (650) 571-9500
E-mail: tech@axon.com
Web: www.axon.com

If you encounter difficulties and need technical support, PLEASE read the **TROUBLESHOOTING** section on page 11 before you call Axon Instruments.

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VERIFICATION

This instrument is extensively tested and thoroughly calibrated before leaving the factory. Nevertheless, researchers should independently verify the basic accuracy of the instrument using suitable test signals.

DISCLAIMER

This equipment is not intended to be used and should not be used in human experimentation or applied to humans in any way.

CAUTION

Do not open the unit. There are no user-serviceable parts inside.

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Chapter 1

INTRODUCTION

Introduction to the Digidata 1320A/1321A

The Digidata 1320A and 1321A are high-resolution, low-noise digitizers intended for precision scientific applications. The Digidata 1320A digitizes at an aggregate speed of 250 kHz; the Digidata 1321A digitizes at an aggregate speed of 500 kHz. Unless otherwise indicated, references to the Digidata 1320A also apply to the Digidata 1321A.

The Digidata 1320A provides sixteen multiplexed, 16-bit analog inputs and two non-multiplexed, 16-bit analog outputs. There are sixteen digital input lines and sixteen digital output lines. All of these digital control lines are available on multi-pin connectors on the rear panel, but only Digital Outs 0 through 7 are available on BNC connectors. Axon Instruments software supports the Tag and Start digital inputs (Trigger In), as well as the Digital Out lines in both synchronous and asynchronous mode.

The Digidata 1320A is intended for benchtop use, but it is supplied with a simple rack-mounting kit.

The Digidata 1320A is compatible with multitasking operating systems and is supported by Clampex 8 and AxoScope 8 (and higher versions).

The Digidata 1320A communicates with the host computer through the SCSI bus. To minimize the likelihood of installation or performance problems, every Digidata 1320A is supplied from the factory with a SCSI adapter card that should be installed into the computer. Some users may choose to connect the Digidata 1320A to an existing SCSI port on the computer. In this case, Axon Instruments may not be able to provide technical support.

The Digidata 1320A is a plug-and-play device; it is automatically recognized by Windows 95, 98 and NT. Furthermore, the Digidata 1320A/1321A does not require an ISA slot, often not found in newer computers. With the Digidata 1320A, Clampex 8 users will now enjoy the ability to telegraph amplifier settings during data acquisition (4 telegraph inputs on rear panel). The 16-bit Digidata 1320A/1321A has lower noise and better resolution (greater dynamic range) than previous Digidata models. The Digidata 1321A is also much faster (500 kHz). Line frequency triggering is another new feature of the Digidata 1320A/1321A.

Components

- Digidata 1320A or 1321A
- SCSI cable, 10 ft. length.
- CD-ROM with AxoScope 8 (includes drivers)
- Manual (includes Warranty Registration Card)
- SCSI adapter card and the device driver diskette
- Rack Mount Kit
- Power cord

Minimum Computer Requirements

- IBM-compatible computer with a Pentium 133 MHz or faster
- One open PCI slot
- 32 MB RAM
- 200 MB hard disk
- Parallel port (if using with the parallel port key required by pCLAMP)
- 800 x 600 display system (small fonts)
- Windows 95, 98 or NT 4.0 operating system

Recommended Computer System

- IBM-compatible computer with a Pentium processor running at 200 MHz or faster
- One open PCI slot
- 64 MB RAM (or higher)
- 1 GB hard disk (or more)
- Parallel port (if using with the parallel port key required by pCLAMP)
- 1024 x 768 display system (large or small fonts)
- Windows 95, 98 or NT 4.0 operating system

Notes on the SCSI Adapter Card

One SCSI adapter card is provided with every Digidata 1320A/1321A. Be sure to read the Installation Guide (the driver diskette that comes with the SCSI card is important for installation). Some users may prefer using an existing SCSI port on the computer. *While it is possible to use other types of SCSI cards, Axon Instruments can provide technical support* ***only*** *for the SCSI card bundled with the Digidata 1320A*. The Digidata 1320A/1321A is compatible with the popular Adaptec 2940 or 2910 SCSI cards. However, the SCSI cable shipped with the Digidata 1320A/1321A does not fit the wide SCSI connector (it is possible to use a wide-to-narrow adapter or cable).

Rack Mount Kit

The Digidata 1320A/1321A is designed to be a desktop unit. However, some users may want to mount the Digidata 1320A/1321A in a rack. With this application in mind, a Rack Mount Kit is provided. The rack mount panel is secured around the front panel. The extensions of the rack mount panel can then be secured to the rack.

The Rack Mount Kit includes the following parts:

1 rack mount panel
2 side brackets (with set screws)
4 screws

Follow these instructions for installation:

I. Remove the bezel (the frame that surrounds the front panel)

A. No tool is required.

B. Use one finger to pull one side of the bezel outward (see figure) to unhook it.

C. Remove the bezel.

D. *Do not remove the front panel.*

II. Mount the side brackets

A. Before inserting the side brackets, loosen the screws on the front panel (to allow clear access to the grooves on the side panels).

B. Insert one side bracket on each side of the Digidata 1320A.

C. Tighten the screws on the front panel.

D. The side brackets should be free to move along the grooves of the side panels.

III. Attach the rack mount panel

A. Slide the rack mount panel around the front panel.

B. Snap the bezel back in place around the front panel.

C. Pull the rack mount panel flush up against the bezel.

D. Position the side brackets up against the rack mount panel.

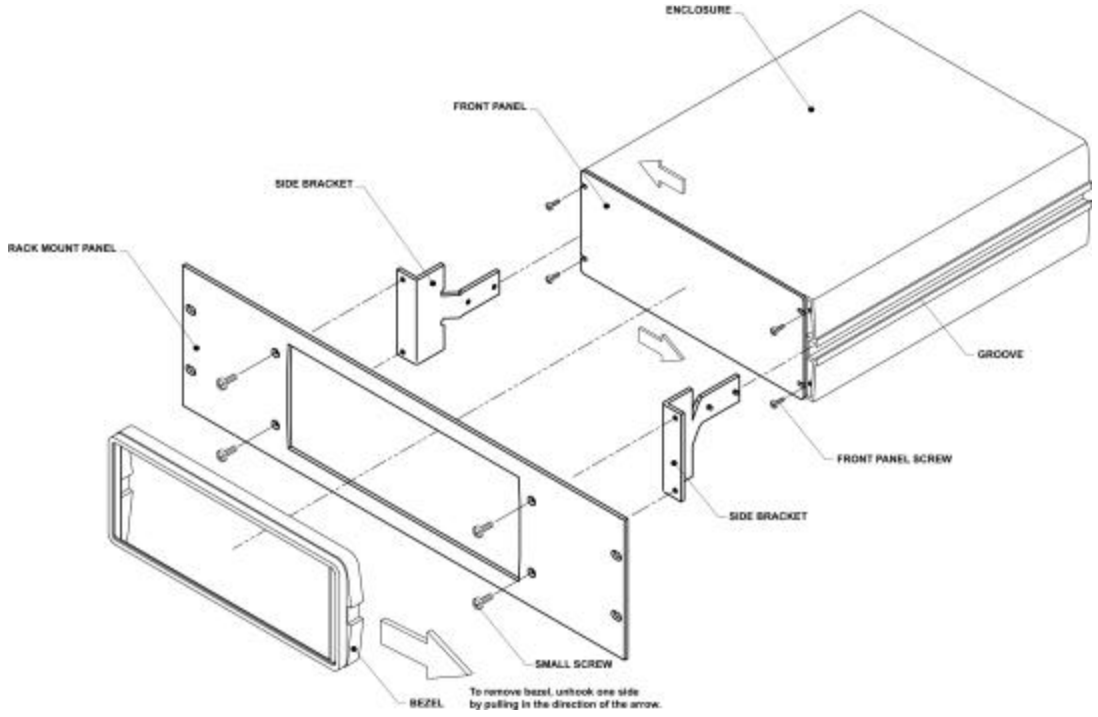
E. Use the four screws to secure the rack mount panel to the side brackets.

F. Tighten the set screws (that are part of the side brackets) up against the side panels.

IV. Secure entire unit in the rack

A. Place the unit (Digidata 1320A plus attached rack mount assembly) in the rack.

B. Secure the rack mount panel to the rack with the four rack screws (not included).


ENCLOSURE
FRONT PANEL
SIDE BRACKET
RACK MOUNT PANEL
GROOVE
FRONT PANEL SCREW
SIDE BRACKET
SMALL SCREW
BEZEL
To remove bezel, unhook one side by pulling in the direction of the arrow.

Chapter 2

INSTALLATION

Step-by-Step Instructions

The Digidata 1320A comes with AxoScope for Windows (95, 98, NT). The Digidata 1320A is also supported by Clampex 8 and above. If you have a Digidata 1200A/B system, it is OK to leave the Digidata 1200A/B board in the computer and DriverLinx installed during the Digidata 1320A/1321A installation (if desired). Note: Clampex 8 users do not need to separately install AxoScope (AxoScope is automatically installed with pCLAMP 8 and above).

Please follow these steps for installing the Digidata 1320A under Windows 95, 98 or NT 4.0. **Start with the computer turned off.**

I. Remove the Digidata 1200 board (optional).

II. Install the SCSI adapter card.
    A. Follow the Installation Guide for the SCSI adapter installation.
    B. Turn on the computer.
        1. In Windows 95 and 98, “New Hardware” (the SCSI adapter) should be detected during boot-up.
        2. Follow the instructions included with the SCSI adapter for installation of the SCSI drivers (if necessary).

III. Install AxoScope or pCLAMP 8.

A. Insert the AxoScope or pCLAMP CD ROM.

1. The setup dialog should automatically appear.
2. If the setup dialog does not automatically appear, double-click on the "My Computer" icon on the Windows desktop. Double-click on the icon for your CD-ROM drive. The installation menu will appear.

B. Install AxoScope 8 or pCLAMP 8 (click on the third button).

1. The Digidata 1320A/1321A drivers are automatically installed.
2. At the end of the installation, a prompt appears asking if you want to reboot. Select ***No***.
3. Shut down and turn off the computer to connect the Digidata 1320A (it is not advisable to plug into the SCSI port while the computer is on).

IV. Connect the Digidata 1320A/1321A.

A. Carefully connect the SCSI cable to the Digidata 1320A/1321A and to the SCSI port.

B. Turn on the Digidata 1320A/1321A.

C. Turn on the computer.

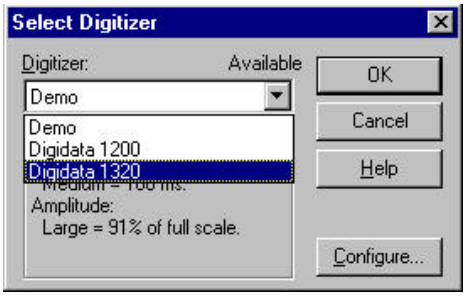
D. New Hardware should be found and detected as the Digidata 1320A (Windows 95/98 displays a message; Windows NT does not).

V. Configure Digitizer

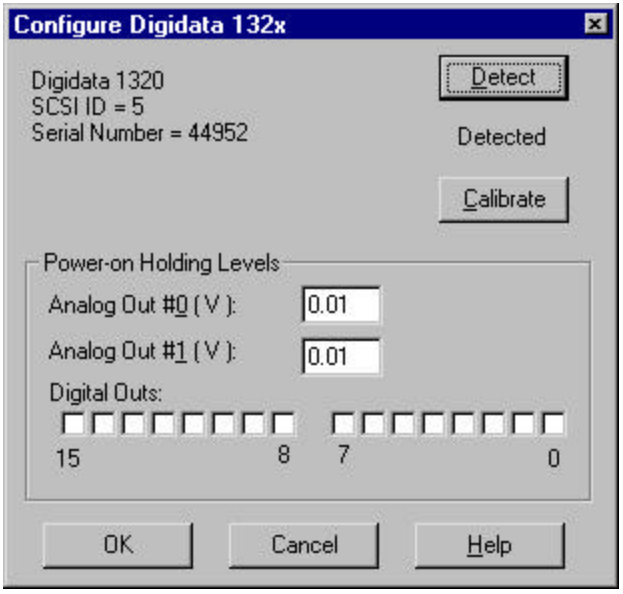
A. **For optimal performance, leave the Digidata 1320A powered on for at least 10 minutes before configuring the digitizer in AxoScope or Clampex. Disconnect all cables except the power and SCSI cables.**

B. Open AxoScope 8 (or Clampex 8).

C. Go to Configure/Digitizer and select Digidata 1320 in the Digitizer field.



D. Press the Configure button. In the *Configure Digidata 132x* dialog, press the Detect button. The word "Detected" will appear and the OK button will be enabled.



E. Press the Calibrate button.

1. This calibrates the gain and DC offset of the digital-to-analog converter (DAC). The calibration takes two seconds.
2. Press the OK buttons until all the dialogs are closed.
3. We recommend that the Digidata 1320A be calibrated whenever there is a change in the environment, such as moving it to another room or installing it on another computer.

F. The Digidata 1320A is now ready to perform experiments.

Chapter 3

TROUBLESHOOTING

Functional Checkout

Step 1

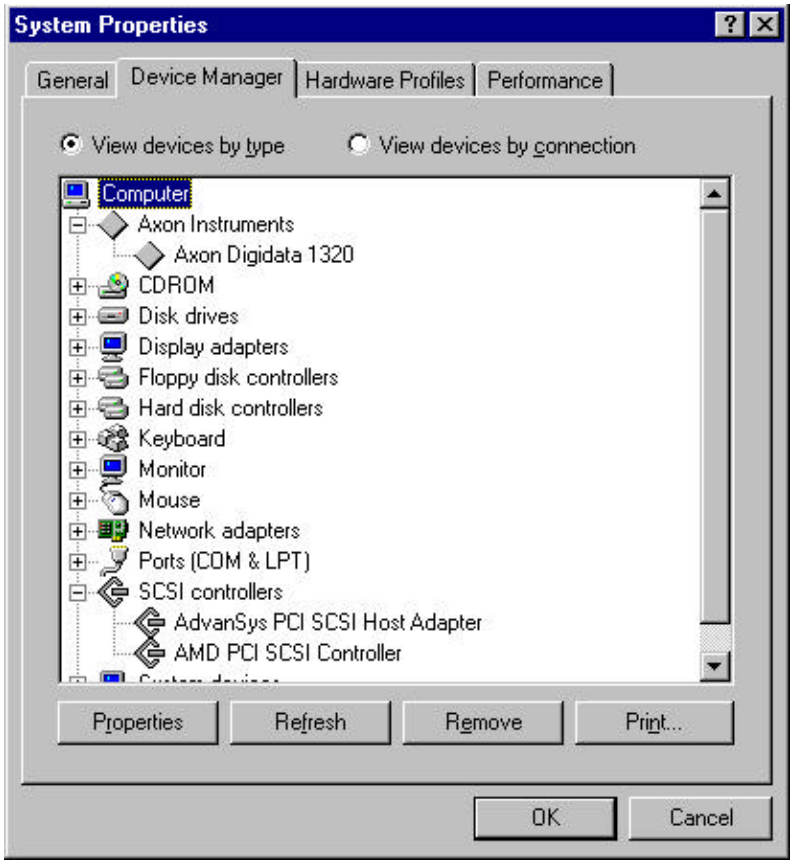
If you are able to configure the Digidata 1320A/1321A in either AxoScope or Clampex then the Digidata 1320A/1321A is properly installed. Go to Configure/Digitizer. Choose Digidata 1320 in the Digitizer field and then press the Configure button. The *Configure Digidata 132x* dialog reports whether a 1320A or 1321A is installed. It also displays the SCSI ID number and the serial number of the device. The Power-on Holding Levels set the voltage on both Analog Out channels at the time that the Digidata 1320A/1321A is turned on. The Digital Outs can also be set to High by clicking on the various boxes above the numbers corresponding to each digital output.

Step 2

Check to make sure that you have the latest ASPI drivers on your system. This should have occurred during the installation of AxoScope or pCLAMP 8 (step III of the installation procedure). Run **aspichk.exe** (found in the ASPIChk folder in the WinASPI folder on the AxoScope 8 or pCLAMP 8 CD). If you do not have the latest ASPI drivers installed on your computer, ASPIChk will tell you. In this case, open the I386 folder (in the WinASPI folder) and run **aspiinst.exe** to install the WinASPI files.

Step 3

Check that the Digidata 1320A and SCSI card are properly installed. Windows 95/98 users should go to the Device Manager (Start/Settings/Control Panel/System/Device Manager). The figure shows an example of the Device Manager window. First, click on the plus (+) sign next to **Axon Instruments**. You should see **Axon Digidata 1320**. Then, click on the plus sign next to **SCSI controllers**. You should see the label corresponding to the SCSI adapter card shipped with the Digidata 1320A.



Windows NT users can verify the correct installation of the SCSI card in a similar manner by going to the Control Panel and looking at the SCSI controller list.

Troubleshooting

If you have any problem with the operation of the Digidata 1320A, follow this section to check out some possible problems and solutions. If your problem is still not resolved, **please go through the "Before You Call" checklist below prior to contacting us** .

1. If you suspect that the Digidata is not working properly, isolate the problem! Disconnect any external instruments and test the Digidata by itself. If you suspect problems with the analog or digital outputs, use a voltmeter or oscilloscope to monitor the signal. If you suspect a problem with the analog or digital inputs, hook up a known signal source such as a signal generator, or even the analog output if you know it is working properly.

2. **The Power light on the front panel is off.**

   Check the fuse. The fuse box is found in the middle of the Power Unit on the rear panel. Simply remove the power cord and then reach underneath the fuse box to open.

3. **The screen shows a straight line instead of the input signal.**

   Are all external connections properly made? Check cables for continuity problems. Make sure the SCSI cable is securely attached to both the card and the interface box. Try rebooting the computer and restarting the Digidata.

4. **Noise is introduced when the data is digitized.**

   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 below for more information on proper grounding practices.

5. **The Ready light on the front panel flashes continually during operation.**

   The Digidata 1320A/1321A is in a problem state. Call Technical Support at Axon Instruments for a Return Merchandise Authorization (RMA) number before returning the unit for repairs.

6. **The Digidata does not work at all or it locks up the computer when doing certain operations.**

   Try resetting the Digidata by turning it off and then back on. Then reboot the computer. Refer to the Installation Guide to verify that the SCSI adapter card is installed properly. Call Technical Support at Axon Instruments if the problem persists.

7. **In Clampex 8, the Digitizer Gain cannot be changed**.

   This is possible with the 12-bit Digidata 1200A/B. However, the gain amplifier in the Digidata 1320A/1321A does not support programmable gain. The ability to increase the Digitizer Gain is not as important with the high dynamic range of the 16-bit Digidata 1320A/1321A. Amplification should be readily achieved with the amplifier.

8. When troubleshooting the Digidata or your software, it is best to simplify your software configuration by turning off all other programs. It may appear that there are no other programs running in the background. However, this may not be the case. To see if other programs are running in the background click on an empty place on the desktop and then press Ctl-Alt-Del (holding these three keys down at the same time). This will open the Task Manager in Windows 95 and 98. In Windows NT you then need to click on the Task Manager button. Close all unnecessary programs running in the background.

Hint: For optimal acquisition performance in Clampex and/or AxoScope do the following:

1. Configure/Lab Book Options→ select *Never log any events*
2. Configure/Program Options→ select *Disable screen saver during data acquisition*

Grounding and Minimizing Noise

To avoid ground-loops, we recommend that you plug-in the Digidata 1320A to the same power-strip as the PC. Also, be aware that each Analog Input BNC on the Digidata 1320A 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 them together with only ONE BNC connection. Observe if the hum (50 – 60 Hz noise) is eliminated. Also observe if the hum is produced by pickup from the headstage by shielding the headstage and watching the magnitude of the hum.

If the hum is eliminated at this step, then connect the second BNC cable. If hum is now observed, this is probably a ground loop that is picking up an alternating magnetic field. Next try to eliminate the source of the alternating magnetic field: a cheap transformer, an electric motor, such as found in a nearby fan or refrigerator. Try to rearrange the two BNC cables to determine if their positioning tells you anything about the source of the alternating field. High frequency components (20 to 50 kHz) may also appear if there is a ground loop. These originate from the switching power supply of the computer and can be picked up in the analog signal inputs of the Digidata 1320A.

If removing the source of the alternating field is not possible, eliminate the ground loop by making 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 its 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.

For users of Axon Instruments amplifiers, more information regarding noise reduction procedures can be found in the manuals for the Axopatch 200B, Axopatch 1D, and Axoclamp 2B.

Before you call…

Please write down the following information before you call for technical support. This information can help us identify possible problems and will quickly expose known conflicts.

1. What is the serial number of the Digidata?
2. Gather the following computer information: The brand and model of computer you use; the type (*i.e.*, Pentium) and speed of the microprocessor (*i.e.*, 300 MHz); how much RAM is installed; what operating system is loaded (Windows 95, 98, or NT)
3. What other cards are installed in the computer? (*i.e.*, network, sound, SCSI, etc). If possible, find out what I/O addresses, DMA channels and IRQs are being used.
4. Clampex users: connect Analog Out 0 to Analog In 0. Then run an Episodic mode protocol with a waveform specified. Do you see the waveform when you hit the view button?

5. If you can reproduce a problem by following a series of steps using software, record these steps so that we can reproduce the problem.

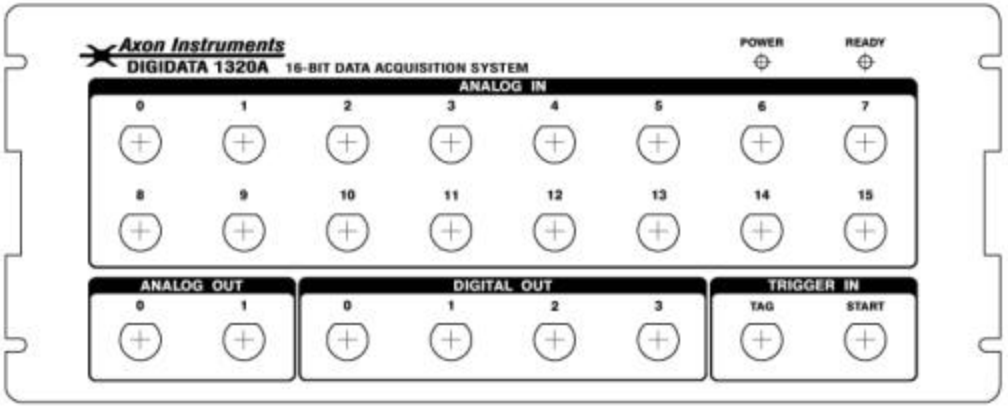
After following these steps, call Axon Instruments at 650-571-9400 or send e-mail to: tech@axon.com.

Chapter 4

INTERFACE DESCRIPTION

Front Panel

The **front panel** connectors are all BNCs. There are two LEDs: POWER and READY. Upon power-up, the READY LED will blink for a few seconds, then it should remain on continuously. If it does not, please see TROUBLESHOOTING in Chapter 3.



Analog Input

There are sixteen 16-bit analog input channels. The BNC shields for the Analog Inputs are connected to the Analog ground. Each channel has a single-pole active filter (340 kHz, -3dB), which minimizes cross-talk between the inputs.

These input channels are used to digitize signals for Clampex or AxoScope.

Analog Output

The front panel has two 16-bit analog output channels. The average output noise is 150 µV peak-to-peak in a 10 kHz bandwidth measured with a single pole filter (with no voltage command applied). Each channel has an operational amplifier to buffer the output signal of the D/A converter. The two analog output channels can be used simultaneously for waveform generation in Clampex.

Digital Output

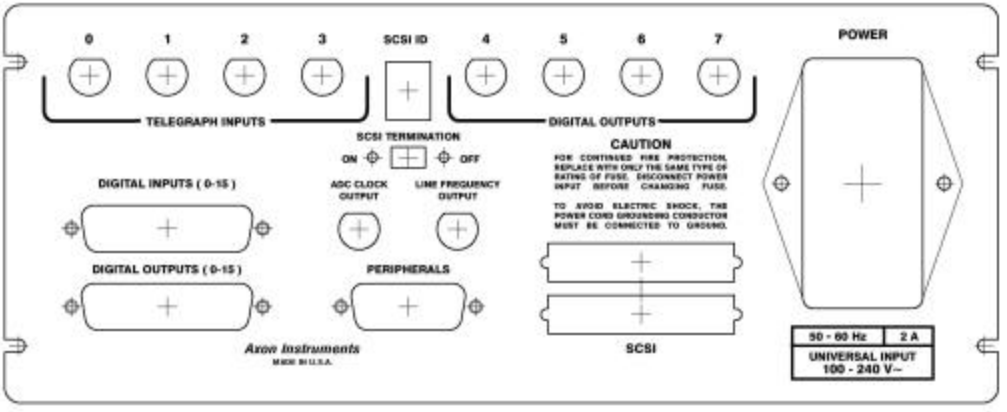
Digital Outputs 0-3 are found on the front panel of the Digidata 1320A/1321A. The 5 V CMOS level can be used to trigger external devices and the control is provided in Clampex.

Trigger In

TAG or START are inputs compatible to TTL-level signals. The TAG input can be used to mark events (*i.e.*, perfusion ON) in Clampex and AxoScope. The START input can be used to begin data acquisition.

Rear Panel

There are several sets of connectors on the **rear panel** of the Digidata 1320A: ten BNCs, two 25-pin connectors, one 15-pin connector for peripherals, and two SCSI connectors.



Telegraph Inputs

The Digidata 1320A/1321A has a dedicated 12-bit A/D converter that provides four telegraph input channels on the rear panel. These telegraph input channels provide gain, frequency or capacitance values from Axon Instruments amplifiers (*i.e.*, Axopatch 200B). These inputs are independent of the 16 analog input channels.

Digital Outputs

Digital Outputs 4-7 are found on the rear panel of the Digidata 1320A/1321A. Therefore, there are a total of eight Digital Output BNC connectors provided by the Digidata 1320A/1321A (four on the front panel and four on the rear panel). The CMOS level outputs are set to high (+ 5 V) or low (0 V). They can be used to trigger external devices and the control is provided in Clampex.

ADC Clock Output

Buffered acquisition timer output is available from this BNC on the rear panel. This 5 V CMOS level signal can be used to synchronize external devices to the sampling clock of the A/D converter.

Line Frequency Output

Line voltage frequency output is available from this BNC. This CMOS level output provides a 50-60 Hz digital signal (square pulse) that represents the frequency from the AC mains power. This signal can be used to trigger external devices at the line frequency. If you wish to trigger the Digidata synchronously with the line frequency, it is preferable to use the internal line frequency trigger which can be selected as one of the trigger sources in the Clampex or AxoScope software.

Digital Outputs (0-15)

This is a 25-pin female-type connector with the following pin assignments:

pin	Digital Output
1	15
2	13
3	11
4	9
5	Line trigger
6	Analog ground
7	Analog ground
8	7
9	5
10	3
11	1
12	Analog ground
13	Analog ground
14	14
15	12
16	10
17	8
18	Analog ground
19	Analog ground
20	Analog ground
21	6
22	4
23	2
24	0
25	Analog ground

Digital Inputs (0-15)

This is a 25-pin male-type connector with the following pin assignments:

pin	Digital Input
1	0
2	2
3	4
4	6
5	No connect
6	Analog ground
7	Analog ground
8	8
9	10
10	12
11	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	13
24	15
25	Analog ground

Peripherals

This port provides a connection to peripheral devices (such as a signal conditioner and/or BioAmp).

SCSI ID

This number identifies the SCSI device ID of the Digidata 1320A/1321A. The default setting is 4. All devices on the SCSI bus must have a unique ID.

SCSI Ports

On the rear panel there are two SCSI ports, which are identical. Either one is OK for connecting the Digidata 1320A/1321A to a SCSI host adapter card in the computer via the SCSI cable. The additional port is for connecting additional SCSI devices to the SCSI bus.

SCSI Termination

The Digidata 1320A/1321A's SCSI-2 interface comes with active termination on-board for reliable and high-speed data transfer. The switch on the rear panel provides for enabling and disabling termination. We recommend that this switch remain in the ON position. In a SCSI bus, only the devices at both ends of the bus require termination. If there is more than one SCSI device on the SCSI bus, we recommend that the Digidata 1320A/1321A be placed at the end of the SCSI chain.

Power Supply

The power supply is universal input. Therefore, both 110 and 220 V power sources are OK to use.

Chapter 5

SPECIFICATIONS

Analog Input

Number of input channels:	16 single-ended
Resolution:	16-bit, 1 in 65536
Acquisition rate, 1320 (aggregate):	250 kHz
Acquisition rate, 1321 (aggregate):	500 kHz
Input range:	-10.000 V to +10.000 V
Input resistance:	1 MΩ
Gain value:	1
Integral linearity error:	
Digidata 1320A:	±4 LSB (max)
Digidata 1321A:	±1 LSB (max)
No Missing Codes:	
Digidata 1320A:	15-bit
Digidata 1321A:	16-bit
Signal-to-(Noise+Distortion) (f_{IN}=100 kHz):	
Digidata 1320A:	84 dB (min)
Digidata 1321A:	91 dB (min)

Analog Output

Number of channels:	2
Resolution:	16-bit
Output voltage ranges:	-10.000 V to +10.000 V
Output impedance:	< 0.1 Ω
Output short circuit to signal ground:	±25 mA
Integral nonlinearity:	±0.003% FSR (±1 LSB, max)

Digital Inputs

Number of bits:	16
Input type:	TTL compatible

Digital Outputs

Number of bits:	16
Output driver:	HC compatible
Output current:	±4 mA

Trigger In

Input type:	TTL compatible
TAG:	always level sensitive
START:	2 modes: edge and level

WARRANTY

We warrant every Digidata 1320A/1321A to be free from defects in material and workmanship under normal use and service. For 12 months from the date of receipt we will repair or replace without cost to the customer any of these products that are defective and which are returned to our factory properly packaged with transportation charges prepaid. We will pay for the return shipping of the product to the customer. If the shipment is to a location outside the United States, the customer will be responsible for paying all duties, taxes and freight clearance charges if applicable.

Before returning products to our factory the customer must contact us to obtain a Return Merchandise Authorization (RMA) number and shipping instructions. Failure to do so will cause long delays and additional expense to the customer.

This warranty shall not apply to damage resulting from improper use, improper care, improper modification, connection to incompatible equipment, or to products which have been modified or integrated with other equipment in such a way as to increase the time or difficulty of servicing the product.

This warranty is in lieu of all other warranties, expressed or implied.

Axon Instruments, Inc.