

# ABI 3948 DNA Synthesizer

Site Preparation and Safety Guide

© Copyright 2000. Applied Biosystems.

**For Research Use Only. Not for use in diagnostic procedures.**

ABI PRISM, the ABI PRISM design, Aquapore, AmpliCover, Anitron, Biobytes, Brownlee, FastPhoramidite, GeneScan, Genotyper, HLP, INHERIT, MicroAmp, MicroCoat, MPLC, NEWGUARD, ONESTEP, OPC, PCR-MATE, Phosphalink, POLYPORE, Precipitette, ProBlott, PROCISE, ProFocus, ProSort, ProSpin, SeqEd, Sequence Navigator, SPHERIS, SPHERI10, StockMarks, Stretch, Synergy, SynthAssist, and VeloSep are registered trademarks of PE Corporation or its subsidiaries in the U.S. and certain other countries.

ABI, ABI Masterpiece, AmpFSTR, Applied Biosystems, AutoAssembler, BaseSprinter, CATALYST, GeneAssist, LV40, MatchMaker, PDQ, Primer Express, and ProSorb are trademarks of PE Corporation or its subsidiaries in the U.S. and certain other countries.

AmpErase, AmpliTaq, EnviroAmp, GeneAmp and TaqMan are registered trademarks, and AmpliTaq Gold is a trademark of Roche Molecular Systems, Inc.

All other trademarks are the sole property of their respective owners.

# Contents

## **1 Site Preparation**

Before You Start.....	1-1
Preinstallation .....	1-1
Operator Training.....	1-1
Performance Verification .....	1-1
Ordering Supplies .....	1-1
Unpacking .....	1-1
Technical Support .....	1-2
To Reach Us On the Web.....	1-2
Hours for Telephone Technical Support .....	1-2
To Reach Us by Telephone or Fax in North America .....	1-2
Documents on Demand .....	1-3
To Reach Us by E-Mail .....	1-4
Regional Offices Sales and Service .....	1-4
Preinstallation Components Checklist .....	1-7
About this Checklist .....	1-7
Checklist .....	1-7
Items Shipped with this Instrument .....	1-9
Summary .....	1-9
Hazardous Chemicals Warning .....	1-9
Installation Chemical Kit.....	1-9
Items Needed but Not Supplied .....	1-11
Resupply .....	1-11
Water .....	1-11
Equipment and Supplies .....	1-11
Laboratory Safety .....	1-12
Onsite Representative .....	1-12
Required Safety Equipment.....	1-12
Laboratory Space Required .....	1-13
Dimensions and Weight.....	1-13
Location of Instrument .....	1-13
Clearance .....	1-13
Typical Laboratory Layout .....	1-13
Electrical Requirements .....	1-15
Power .....	1-15
Grounding .....	1-15
Power Cords.....	1-15
Voltage Quality .....	1-15

Voltage Spikes . . . . .	1-15
Power Outages . . . . .	1-16
Laboratory Environmental Requirements . . . . .	1-17
Altitude . . . . .	1-17
Temperature and Humidity . . . . .	1-17
Pollution . . . . .	1-17
Heat . . . . .	1-17
Emission/ Immunity Statement . . . . .	1-17
Laboratory Ventilation . . . . .	1-18
Venting . . . . .	1-18
Fume Hood . . . . .	1-18
Duct System . . . . .	1-18

## ***2 Instrument Safety***

Instrument Safety . . . . .	2-1
Safe Operation . . . . .	2-1
User Attention Words . . . . .	2-1
Instrument Labeling . . . . .	2-1
Safety Labels . . . . .	2-1
Signal Words . . . . .	2-1
Labels That May Be Found On Your Instrument . . . . .	2-2
Safety Alert Symbols . . . . .	2-3
Electrical Symbols . . . . .	2-3
Non-electrical Symbols . . . . .	2-3
Input/Output Connections . . . . .	2-4
Location . . . . .	2-4
Gas Safety . . . . .	2-5
Pressurized Gas Safety . . . . .	2-5
Gaseous Waste Safety . . . . .	2-5
Disposing of Gaseous Waste . . . . .	2-6
Instrument Waste and Exhaust System . . . . .	2-6
Exhaust Line Tubing . . . . .	2-6
Connecting the Exhaust line . . . . .	2-6
Pressurized Gas and Accessories Needed but Not Supplied . . . . .	2-7
Gas Cylinder . . . . .	2-7
Pressure Regulator . . . . .	2-7
Attaching the Cylinder . . . . .	2-7

## ***3 Chemical Safety***

Introduction . . . . .	3-1
Please read . . . . .	3-1

Hazardous Chemicals . . . . .	3-2
Overview . . . . .	3-2
Handling Hazardous Chemicals . . . . .	3-2
Hazardous Waste . . . . .	3-3
Overview . . . . .	3-3
Handling Hazardous Waste . . . . .	3-3
Storing Hazardous Waste . . . . .	3-3
Instrument Waste Profile Overview . . . . .	3-4
General Information. . . . .	3-4
Waste Profile Sections . . . . .	3-4
Material Safety Data Sheets Overview. . . . .	3-10
General Information. . . . .	3-10
MSDS Sections . . . . .	3-10
MSDSs for the ABI 3948 DNA Synthesizer . . . . .	3-11
MSDSs for Applied Biosystems Chemicals . . . . .	3-11
MSDSs for Chemicals Not Supplied by Applied Biosystems. . . . .	3-11

## ***A Acronyms and Abbreviations***

Acronyms and Abbreviations Used in Waste Profiles and MSDSs . . . . .	A-1
Introduction . . . . .	A-1
Organizations, Regulations, and Scientific Terminology . . . . .	A-1
Units of Measurement . . . . .	A-2
Chemicals . . . . .	A-3



# *Site Preparation*

---

# 1

## **Before You Start...**

---

**Preinstallation** Before the instrument is installed, the installation site must be prepared so that the instrument can operate correctly and safely. Careful attention to the requirements presented here will simplify the installation procedure.

---

**Operator Training** Training of operators is one of the primary goals of installation. Persons who are to be trained to operate the instrument should set aside two uninterrupted days to work with the Applied Biosystems service representative. If this is not possible, the installation should be rescheduled.

---

**Performance Verification** Calibration of the instrument and verification of performance will be performed by an Applied Biosystems service representative during the installation.

---

**Ordering Supplies** Reagents shipped with this instrument will be consumed during the process of setup and verification. Before installation, be sure to order additional chemicals and other supplies necessary for the ongoing operation of the instrument.

---

**Unpacking** Do not unpack instruments. Inspect instrument cartons and report any damage to your Applied Biosystems service representative. For information and instructions about unpacking the Installation Chemical Kit, see "Items Shipped with this Product" later in this chapter.

---

## Technical Support

**To Reach Us on the Web** Applied Biosystems web site address is:

<http://www.appliedbiosystems.com/techsupport>

We strongly encourage you to visit our web site for answers to frequently asked questions, and to learn more about our products. You can also order technical documents and/or an index of available documents and have them faxed or e-mailed to you through our site (see the "Documents on Demand" section below).

**Hours for Telephone Technical Support** In the United States and Canada, technical support is available at the following times.

Product	Hours
Chemiluminescence	9:00 a.m. to 5:00 p.m. Eastern Time
LC/MS	9:00 a.m. to 5:00 p.m. Pacific Time
All Other Products	5:30 a.m. to 5:00 p.m. Pacific Time

See the "Regional Offices Sales and Service" section below for how to contact local service representatives outside of the United States and Canada.

**To Reach Us by Telephone or Fax in North America** Call Technical Support at 1-800-831-6844, and select the appropriate option (below) for support on the product of your choice at any time during the call. (To open a service call for other support needs, or in case of an emergency, press **1** after dialing 1-800-831-6844.)

For Support On This Product	Dial 1-800-831-6844, and...	
ABI PRISM® 3700 DNA Analyzer	<b>Press</b>	<b>FAX</b>
	<b>8</b>	650-638-5891
ABI PRISM® 3100 Genetic Analyzer	<b>Press</b>	<b>FAX</b>
	<b>26</b>	650-638-5891
BioInformatics (includes BioLIMS™, BioMerge™, and SQL GT™ applications)	<b>Press</b>	<b>FAX</b>
	<b>25</b>	505-982-7690
DNA Synthesis	<b>Press</b>	<b>FAX</b>
	<b>21</b>	650-638-5981
Fluorescent DNA Sequencing	<b>Press</b>	<b>FAX</b>
	<b>22</b>	650-638-5891
Fluorescent Fragment Analysis (includes GeneScan® applications)	<b>Press</b>	<b>FAX</b>
	<b>23</b>	650-638-5891
Integrated Thermal Cyclers	<b>Press</b>	<b>FAX</b>
	<b>24</b>	650-638-5891



For Support On This Product	Dial 1-800-831-6844, and...	
PCR and Sequence Detection	<b>Press</b> <b>5</b> , or call 1-800-762-4001, and press 1 for PCR, or 2 for Sequence Detection	<b>FAX</b> 240-453-4613
FMAT	<b>Telephone</b> 1-800-899-5858, and press 1, then press 6	<b>FAX</b> 508-383-7855
Peptide and Organic Synthesis	<b>Press</b> <b>31</b>	<b>FAX</b> 650-638-5981
Protein Sequencing	<b>Press</b> <b>32</b>	<b>FAX</b> 650-638-5981
Chemiluminescence	<b>Telephone</b> 1-800-542-2369 (U.S. only), or 1-781-271-0045 (Tropix)	<b>FAX</b> 781-275-8581 (Tropix) 9:00 a.m. to 5:00 p.m. ET
LC/MS	<b>Telephone</b> 1-800-952-4716	<b>FAX</b> 650-638-6223 9:00 a.m. to 5:00 p.m. PT

**Documents on Demand** Free 24-hour access to Applied Biosystems technical documents, including MSDSs, is available by fax or e-mail.

You can access Documents on Demand through the internet or by telephone:

If you want to order...	Then...
through the internet	Use <a href="http://www.appliedbiosystems.com/techsupport">http://www.appliedbiosystems.com/techsupport</a> You can search for documents to order using keywords. Up to five documents can be faxed or e-mailed to you by title.
by phone from the United States or Canada	<ol style="list-style-type: none"> <li>Call 1-800-487-6809 from a touch-tone phone. Have your fax number ready.</li> <li>Press <b>1</b> to order an index of available documents and have it faxed to you. Each document in the index has an ID number. (Use this as your order number in step "d" below.)</li> <li>Call 1-800-487-6809 from a touch-tone phone a second time.</li> <li>Press <b>2</b> to order up to five documents and have them faxed to you.</li> </ol>

<b>If you want to order...</b>	<b>Then...</b>
by phone from outside the United States and Canada	<p>a. Dial your international access code, then 1-858-712-0317 from a touch-tone phone.</p> <p>Have your complete fax number and country code ready (011 precedes the country code).</p> <p>b. Press <b>1</b> to order an index of available documents and have it faxed to you. Each document in the index has an ID number. (Use this as your order number in step "d" below.)</p> <p>c. Call 1-858-712-0317 from a touch-tone phone a second time.</p> <p>d. Press <b>2</b> to order up to five documents and have them faxed to you.</p>

**To Reach Us by E-Mail** Contact technical support by e-mail for help in the following product areas.

<b>For this product area</b>	<b>Use this e-mail address</b>
Chemiluminescence	info@appliedbiosystems.com
Genetic Analysis	galab@appliedbiosystems.com
LC/MS	apisupport@sciex.com
PCR and Sequence Detection	pclab@appliedbiosystems.com
Protein Sequencing, Peptide and DNA Synthesis	corelab@appliedbiosystems.com

**Regional Offices Sales and Service** If you are outside the United States and Canada, you should contact your local Applied Biosystems service representative.

<b>The Americas</b>	
United States Applied Biosystems 850 Lincoln Centre Drive Foster City, California 94404  Tel: (650) 570-6667 (800) 345-5224 Fax: (650) 572-2743	Latin America (Del.A. Obregon, Mexico)  Tel: (305) 670-4350 Fax: (305) 670-4349

<b>Europe</b>	
Austria (Wien)  Tel: 43 (0)1 867 35 75 0 Fax: 43 (0)1 867 35 75 11	Hungary (Budapest)  Tel: 36 (0)1 270 8398 Fax: 36 (0)1 270 8288
Belgium  Tel: 32 (0)2 712 5555 Fax: 32 (0)2 712 5516	Italy (Milano)  Tel: 39 (0)39 83891 Fax: 39 (0)39 838 9492
Czech Republic and Slovakia (Praha)  Tel: 420 2 61 222 164 Fax: 420 2 61 222 168	The Netherlands (Nieuwerkerk a/d IJssel)  Tel: 31 (0)180 331400 Fax: 31 (0)180 331409
Denmark (Naerum)  Tel: 45 45 58 60 00 Fax: 45 45 58 60 01	Norway (Oslo)  Tel: 47 23 12 06 05 Fax: 47 23 12 05 75

<b>Europe</b> <i>(continued)</i>	
Finland (Espoo) Tel: 358 (0)9 251 24 250 Fax: 358 (0)9 251 24 243	Poland, Lithuania, Latvia, and Estonia (Warszawa) Tel: 48 (22) 866 40 10 Fax: 48 (22) 866 40 20
France (Paris) Tel: 33 (0)1 69 59 85 85 Fax: 33 (0)1 69 59 85 00	Portugal (Lisboa) Tel: 351 (0)22 605 33 14 Fax: 351 (0)22 605 33 15
Germany (Weiterstadt) Tel: 49 (0) 6150 101 0 Fax: 49 (0) 6150 101 101	Russia (Moskva) Tel: 7 095 935 8888 Fax: 7 095 564 8787
Spain (Tres Cantos) Tel: 34 (0)91 806 1210 Fax: 34 (0)91 806 1206	South Africa (Johannesburg) Tel: 27 11 478 0411 Fax: 27 11 478 0349
Sweden (Stockholm) Tel: 46 (0)8 619 4400 Fax: 46 (0)8 619 4401	United Kingdom (Warrington, Cheshire) Tel: 44 (0)1925 825650 Fax: 44 (0)1925 282502
Switzerland (Rotkreuz) Tel: 41 (0)41 799 7777 Fax: 41 (0)41 790 0676	South East Europe (Zagreb, Croatia) Tel: 385 1 34 91 927 Fax: 385 1 34 91 840
Middle Eastern Countries and North Africa (Monza, Italia) Tel: 39 (0)39 8389 481 Fax: 39 (0)39 8389 493	Africa (English Speaking) and West Asia (Fairlands, South Africa) Tel: 27 11 478 0411 Fax: 27 11 478 0349
All Other Countries Not Listed (Warrington, UK) Tel: 44 (0)1925 282481 Fax: 44 (0)1925 282509	

<b>Japan</b>
Japan (Hatchobori, Chuo-Ku, Tokyo) Tel: 81 3 5566 6100 Fax: 81 3 5566 6501

<b>Eastern Asia, China, Oceania</b>	
Australia (Scoresby, Victoria) Tel: 61 3 9730 8600 Fax: 61 3 9730 8799	Malaysia (Petaling Jaya) Tel: 60 3 758 8268 Fax: 60 3 754 9043
China (Beijing) Tel: 86 10 6238 1156 Fax: 86 10 6238 1162	Singapore Tel: 65 896 2168 Fax: 65 896 2147

<b>Eastern Asia, China, Oceania</b>	
Hong Kong Tel: 852 2756 6928 Fax: 852 2756 6968	Taiwan (Taipei Hsien) Tel: 886 2 2698 3505 Fax: 886 2 2698 3405
Korea (Seoul) Tel: 82 2 593 6470/6471 Fax: 82 2 593 6472	Thailand (Bangkok) Tel: 66 2 719 6405 Fax: 66 2 319 9788

---

## Preinstallation Components Checklist

**About this Checklist** Use this checklist to ensure that all preparations have been made for installation. A service representative will contact you to verify that everything is checked off before the installation date.

**Checklist** Check off and enter date to ensure that all preparations have been made.

### ABI 3948 DNA Synthesizer Preinstallation Checklist

√ if ready	Date Confirmed	Components
		<b>General</b>
		Received instrument(s) and verified that cartons are intact.
		Read this <i>Site Preparation and Safety Manual</i> , including MSDSs.
		Verified that instrument(s), serial number(s), and system configuration, as shown on the packing list, are the same as ordered.
		Set aside two uninterrupted days for in-lab training during installation.
		Unpacked and stored contents of Installation Chemical Kit.
		<b>Electrical</b>
		A dedicated 2.0 kVA power line and ground, or a 2.0 kVA power line with a line conditioner or UPS, is in place.
		A standard power outlet is within 2.5 m (8 ft.) of the instrument location.
		Instrument voltage, if specified on the packing list, matches the voltage available in the laboratory.
		<b>Laboratory</b>
		Instrument is situated so that it is accessible to the installer on all four sides. (Instrument is free-standing and does not require a laboratory bench or table.)
		Laboratory safety requirements, as specified in this manual, have been met.
		Laboratory environmental requirements, as specified in this manual, have been met.
		Room ventilation accommodates instrument heat output.
		Deionized water is on site. (type 1, ~18 M ohm)
		Proper waste disposal method for hazardous chemical waste has been established.
		Fume hood or ventilation duct system is located within 3 m (10 ft.) of the instrument.
		<b>Equipment</b>
		Waste Bottle with secondary containment
		Macintosh-compatible printer, if not ordered with instrument
		Top-loading balance, 1–500 g with 0.1 g accuracy

**ABI 3948 DNA Synthesizer Preinstallation Checklist** *(continued)*

√ if ready	Date Confirmed	Components
		A two-stage pressure regulator with dual gauges (output range: 0–80 psi, high pressure range: 0–3000 psi), and a Compressed Gas Association (CGA) 580 cylinder adapter for each gas cylinder
		Approved strap or clamp to safely secure gas cylinders to the wall or bench/table
		Sample concentrator
		Vacuum apparatus
		<b>Consumable Supplies</b>
		Additional Applied Biosystems reagent kits
		Additional computer supplies (paper, disks, etc.)
		Chemically resistant disposable gloves
		Two Argon gas cylinders of 99.998% purity or greater
		Eppendorf tubes
		Ammonium hydroxide (concentrated, analytical-grade)
		Absorbent tissue or paper
		Single edge razor blades

## Items Shipped with this Instrument

**Summary** The ABI 3948 DNA Synthesizer is shipped with the following:

- ◆ user's and reference manuals
- ◆ Installation Chemical Kit (P/N 401852 in the U.S., P/N 401853 elsewhere)
- ◆ setup kit (P/N 603890)
- ◆ accessories
- ◆ Apple Macintosh PowerPC computer system

Do not unpack any cartons related to the instrument itself. This will protect you from liability if any damage occurred during shipping.

**IMPORTANT** You must unpack the Installation Chemical Kit and store the components as specified in Table 1-1.

### Hazardous Chemicals Warning

**! WARNING !** Some chemicals used with Applied Biosystems instruments are hazardous and can cause injury, illness, or death. Always read the appropriate Waste Profiles and MSDSs before interacting with the instrument and chemicals in any way. Hazardous Chemical Warnings are prominently displayed on the labels of all hazardous materials.

Before unpacking the Installation Chemical Kit, storing chemicals, or interacting with the chemicals and instrument, read Chapter 3, "Chemical Safety," of this manual. Chapter 3 contains the Waste Profiles and Material Safety Data Sheets (MSDSs) that pertain to this instrument.

### Installation Chemical Kit

Unpack the Installation Chemical Kit upon receipt. The Installation Chemical Kit is intended to be used during installation to verify instrument performance.

Store the chemicals and reagents as indicated in the table below.

**Table 1-1** Installation Chemical Kit Components(P/N 401852)

P/N	Description	Storage Conditions
400501	Bottle Seals, 450 mL	Room temp
400790	Bottle Seals, 200 mL	Room temp
401159	$\beta$ -Cyanoethyl Phosphoramidites dA <sup>bz</sup>	Room temp
401165	Fastphoramidite™ dG <sup>dmf</sup>	Room temp
401160	$\beta$ -Cyanoethyl Phosphoramidites dC <sup>bz</sup>	Room temp
401162	$\beta$ -Cyanoethyl Phosphoramidites T	Room temp
400443	Acetonitrile, 4 L, Burdick & Jackson	Room temp
	-or-	
400262	Acetonitrile, DNA Syn, 400 mL	Room temp
401061	3% Trifluoroacetic Acid/water, 450 mL	Room temp
400613	Triethylammonium acetate, 2 M, 200 mL	Room temp
401272	Trichloroacetic Acid/Dichloromethane	Room temp
401173	Tetrazole/Acetonitrile	Room temp <sup>a</sup>

**Table 1-1** Installation Chemical Kit Components(P/N 401852) *(continued)*

<b>P/N</b>	<b>Description</b>	<b>Storage Conditions</b>
401174	Acetic Anhydride/Lutidine/Tetrahydrofuran	Room temp
401632	0.02M Iodine/Water/Pyridine/Tetrahydrofuran	4 °C
401175	1-methylimidazole (NMI), 450 mL	Room temp
400314	20% Acetonitrile in water	Room temp
401851	20% Acetic acid/Water	Room temp
401056	OneStep Synthesis and Purification Columns dAbz	Room temp
401056	OneStep Synthesis and Purification Columns dGdmf	Room temp
401058	OneStep Synthesis and Purification Columns dCbz	Room temp
401059	OneStep Synthesis and Purification Columns T	Room temp
401602	OligoRack Collection Tubes	Room temp

a. Temperatures below 16 °C (60 °F) cause tetrazole to precipitate from solution.



## Items Needed but Not Supplied

---

**Resupply** The Installation Chemical Kit components are completely consumed during the installation and initial testing of the instrument. To ensure an uninterrupted supply of reagents and eliminate the higher transportation costs of rush shipments, you should order additional chemicals and supplies in advance.

---

**Water** Although the Installation Chemical Kit contains all the reagents necessary for operating the instrument, each laboratory must provide its own source of high-quality deionized water.

---

**Equipment and Supplies** In addition to the Installation Chemical Kit, the following equipment and supplies are needed for operation of the ABI 3948 DNA Synthesizer:

- ◆ Waste bottle with secondary containment
  - ◆ Macintosh-compatible printer, if not ordered with instrument
  - ◆ Top-loading balance, 1–500 g with 0.1 g accuracy
  - ◆ A two-stage pressure regulator with dual gauges (output range: 0–80 psi, high pressure range: 0–3000 psi), and a Compressed Gas Association (CGA) 580 cylinder adapter for each gas cylinder
  - ◆ Approved strap or clamp to safely secure gas cylinders to the wall, bench, table, or cart
  - ◆ Sample concentrator
  - ◆ Vacuum apparatus
  - ◆ Additional Applied Biosystems reagent kits
  - ◆ Additional computer supplies (paper, disks, etc.)
  - ◆ Chemically resistant disposable gloves, lab coats, and safety glasses or goggles
  - ◆ Two Argon gas cylinders of 99.998% purity or greater
  - ◆ Eppendorf tubes
  - ◆ Ammonium hydroxide (concentrated, analytical-grade)
  - ◆ Absorbent tissue or paper
  - ◆ Single edge razor blades
-

## Laboratory Safety

---

**Onsite Representative** We request that a representative from your laboratory be in the vicinity and available to the Applied Biosystems engineer at all times while he or she is on-site.

---

**Required Safety Equipment** Your laboratory has specific safety practices and policies designed to protect laboratory personnel from potential hazards, both obvious and hidden, that are present. We expect that all applicable, safety-related procedures will be followed at all times.

The following safety equipment should be available:

- ◆ fire extinguisher (Halon)
  - ◆ eye wash
  - ◆ safety shower
  - ◆ eye and hand protection
  - ◆ adequate ventilation
  - ◆ first aid equipment
  - ◆ spill clean-up equipment
  - ◆ protection from any sources of radiation (lasers, radioisotopes, contaminated equipment, radioactive wastes, etc.) that may be present in the area where our engineer will be working
-

## Laboratory Space Required

---

**Dimensions and Weight** The ABI 3948 DNA Synthesizer and the Macintosh computer have the following dimensions:

Component	Width	Depth	Height	Weight
Instrument	88 cm (35 in.)	60 cm (24 in.)	133 cm (52.5 in.)	159 kg (350 lb.)
Computer	35.5 cm (14 in.)	43.0 cm (17 in.)	45.5 cm (18 in.)	–

---

**Location of Instrument** The ABI 3948 DNA Synthesizer must be located within 3 m (10 ft.) of a fume hood or ventilation duct system. The ABI 3948 DNA Synthesizer is free-standing and does not require a laboratory bench or table. It occupies 0.67 m<sup>2</sup> (6 ft.<sup>2</sup>) of floor space.

The Apple Macintosh computer and printer do require a suitable table or workstation and must be located within 2 m (6 ft.) of the instrument.

**IMPORTANT** The operator should be able to reach the instrument while viewing the computer screen.

---

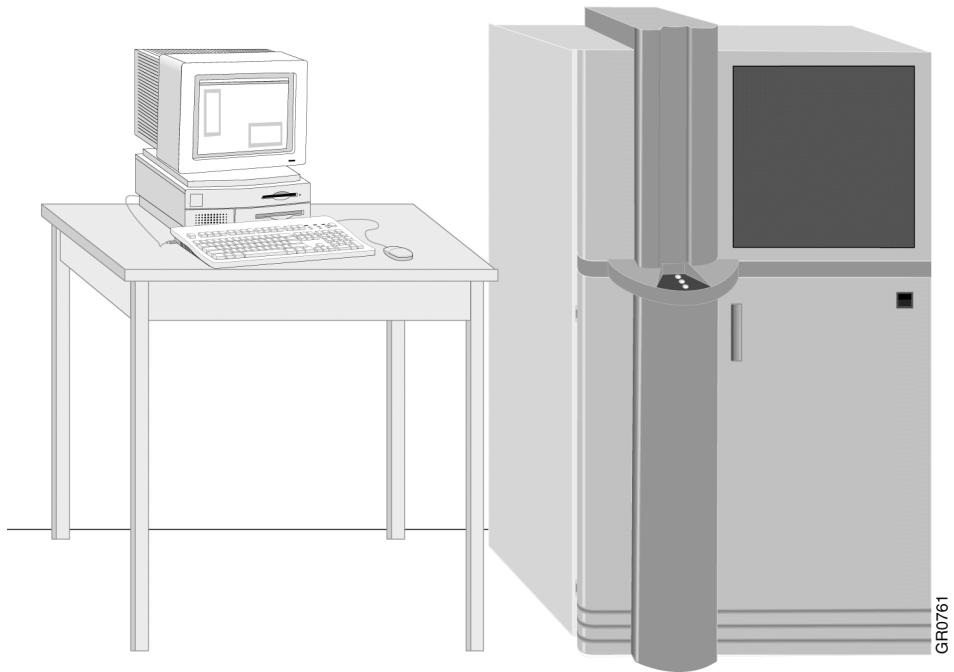
**Clearance** A clearance of 1.3 m<sup>2</sup> (12 ft.<sup>2</sup>) is needed at the rear or the front of the instrument for servicing. Do not block access to the rear of the instrument.

Sufficient space within approximately 1.5 m (5 ft.) of the instrument is needed to safely secure at least one size 1A Argon gas cylinder.

**Note** Additional information pertaining to the safe securing and connection of the gas cylinders is provided in this guide in the section entitled "Instrument Safety".

---

**Typical Laboratory Layout** A typical laboratory layout for the ABI 3948 DNA Synthesizer is shown in Figure 1-1.



**Figure 1-1** Typical laboratory layout for the ABI 3948 DNA Synthesizer.

**IMPORTANT** Allow 3 ft. (1 m) clearance in front of the machine.

---

## Electrical Requirements

---

**Power** The electrical receptacle should have a dedicated 2.0 kVA power line and ground or a 2.0 kVA power line with a line conditioner or uninterruptible power supply (UPS). The electrical receptacle must be located within 2.5 m (8 ft.) of the instrument rear panel. The following table specifies the electrical operating range for various parts of the world.

Location	Volts (AC)	Frequency
Japan	100 ± 10%	50/60 Hz ± 1%
USA/Canada	120 ± 10%	50/60 Hz ± 1%
Europe (pre-1992)	220 ± 10%	50/60 Hz ± 1%
EC	230 ± 10%	50/60 Hz ± 1%
UK (pre-1992)	240 + 6%/–10%	50/60 Hz ± 1%
Australia	240 + 6%/–10%	50/60 Hz ± 1%

---

**Grounding** Certain types of electrical noise are greatly exaggerated by poor or improper electrical ground connections. To prevent these problems, it is very important to have a dedicated line and ground between the instrument and building main electrical service.

---

**Power Cords** In the USA, Canada, and Japan, the instrument is supplied with a detachable cord equipped with a standard three-prong plug.

In Europe and Australia, the instrument is supplied with an detachable electrical cord equipped with a standard EC plug.

The Macintosh computer can be plugged into any standard electrical receptacle after it has been configured for the proper voltage.

---

**Voltage Quality** Line voltage must be within ±10% of the nominal value. High or low voltages may have adverse effects on the electronic components of this instrument. In areas where the supplied power is subject to fluctuations exceeding these limits, a power line regulator may be required.

---

**Voltage Spikes** Short-duration, high-voltage spikes often cause random failures in microprocessor controlled instrumentation. These spikes can be caused by other devices using the same power source (refrigerators, air conditioners, and centrifuges) or by outside influences such as lightning. A dedicated line and ground between the instrument and building main electrical service are necessary to prevent such problems.

If your environment contains devices that are electrically noisy or you are in an area with frequent electrical storms, a line conditioner with a recommended capacity of 2.0 kVA will enhance the reliability of your system. This may be lower depending on the conditioner or power supply design.

---

*continued on next page*

---

**Power Outages** The instrument has been designed to recover from short periods of power outage (loss) and continue operation, provided that the line voltage does not become excessively noisy before the outage. If increased protection during a power outage is desired, you may want to install an uninterruptible power supply (UPS). We recommend a capacity of 2.0 kVA. The UPS will involve a higher cost than a line conditioner.

---

## Laboratory Environmental Requirements

---

**Altitude** This instrument is for indoor use only and for altitudes not exceeding 2,000 meters (6,500 ft.) above sea level.

---

**Temperature and Humidity** The laboratory temperature should be maintained between 15–30 °C (59–85 °F). The instrument can tolerate up to 80% relative humidity. Avoid placing the instrument adjacent to heaters or cooling ducts.

---

**Pollution** The installation category (overvoltage category) for this instrument is II, and it is classified as portable equipment. The instrument has a pollution degree rating of 2, and may be installed in an environment that has non-conductive pollutants only.

---

**Heat** The thermal output of the instrument is 8800 Btu/h (~2,600 W). Consult your facilities department regarding ventilation requirements for this level of heat output.

---

**Emission/ Immunity Statement** For our European customers, any product marked with the CE label meets the European requirements for emission and immunity as defined in the EMC Directive 89/336/EEC. This product has been evaluated to the Standard for Emissions for Industrial Scientific Equipment (EN 55011 – Class A), and to the Standard for Generic Immunity (EN50082-1).

---



## Laboratory Ventilation

---

**Venting** This instrument produces toxic gaseous waste that must be ventilated either through a fume hood to a duct or directly to the duct. The fume hood or duct must be located within 25.4 cm (10 ft.) of the instrument. The information presented here reflects U.S. regulations and practices for venting waste from Applied Biosystems instruments to a fume hood or to a duct.

**! WARNING !** Some Applied Biosystems instruments use chemicals that are hazardous. Always mix and prepare hazardous materials under an operating fume hood.

**CAUTION** Dispose of all waste in accordance with all applicable local, state, and federal environmental health and safety regulations and laws.

---

**Fume Hood** Following are important points about the fume hood:

- ◆ The fume hood should operate continuously, including nights and weekends, because vented waste bottle contents can escape to surroundings.
  - ◆ The fume hood must be constructed of materials that are compatible with the waste materials/chemicals being generated or exhausted.
  - ◆ The fume hood should be located away from air currents generated by air conditioning ducts, fans, windows, doors, and moving equipment and persons.
  - ◆ The fume hood exhaust vent should be located where gaseous waste cannot be drawn back in the building.
  - ◆ A sign or label should be present that shows where to locate the fume hood sash so as to give an average flow of 100 ft./min. (linear) face velocity. The minimum velocity flow at any point in the hood must be 80 ft./min. (linear). The maximum flow must not exceed 125 ft./min. (linear).
  - ◆ The fume hood must meet local, state, and federal health and safety requirements. Refer to current fume hood standards established by the American Society of Heating, Refrigeration, Air conditioning engineers (ASHRAE), American Conference of Governmental Industrial Hygienists (ACGIH), and Occupational Safety and Health Agency (OSHA).
  - ◆ Check and record face velocity at least yearly.
  - ◆ Inspect and maintain exhaust system, including fans and motors at least yearly.
- 

**Duct System** It is important that the duct system:

- ◆ operate continuously, including nights and weekends, because vented waste bottle contents can escape to surroundings.
- ◆ be constructed of PVDF tubing or other materials compatible with the waste materials being generated.
- ◆ not come in contact with strong oxidizers, bases, or other chemicals that are incompatible with gaseous waste.
- ◆ allow vapor or gas movement of 1000–2000 ft./min. (5.5–11 m/s).

**! WARNING !** Do not connect the waste vent to a ductless hood or to a system that purifies, filters air, and returns it to the room.

---







# *Instrument Safety*

---

# 2

## **Instrument Safety**

---

**Safe Operation** Before operating the instrument, read the information in this section concerning hazards and potential hazards. Ensure that anyone involved with the operation of the instrument is instructed in both general safety practices for laboratories and specific safety practices for the instrument.

---

**User Attention Words** Four user attention words appear in the text of all documentation for Applied Biosystems products. Each word implies a particular level of observation or action that is significant to user safety or proper instrument operation.

**Note** Calls attention to useful information.

**IMPORTANT** Indicates information that is necessary for proper instrument operation.

**CAUTION** Cautions the user that a potentially hazardous situation could occur, causing injury to the user or damage to the instrument, if this information is ignored.

**! WARNING !** Warns the user that serious physical injury or death to the user or other persons could result if these precautions are not taken.

---

## **Instrument Labeling**

---

**Safety Labels** Safety labels are located on the instrument. Each label consists of a Signal Word panel and a Message Panel. A Safety Alert Symbol indicates a potential personal safety hazard. If multiple hazards exist, the signal word corresponding to the greatest hazard is used.

---

**Signal Words**

- ◆ **CAUTION** indicates a potentially hazardous situation that could result in minor or moderate injury to the user or damage to the instrument.
- ◆ **WARNING** indicates a potentially hazardous situation that could result in death or serious injury.
- ◆ **DANGER** indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury (most extreme).

---










**Labels That May Be Found On Your Instrument**

The following Danger, Caution, and Warning labels, listed in English and French below, may be found on your instrument.



English	French
CAUTION: Hazardous chemicals. Read the Material Safety Data Sheets before handling.	Attention: Produits chimiques dangereux. Lire les fiches techniques de sûreté de matériels avant la manipulation des produits.
CAUTION: Hazardous waste. Read the Waste Profile before handling or disposal.	Attention: Déchets dangereux. Lire les renseignements sur les déchets avant de manipuler ou d'éliminer.
WARNING: Risk of electric shock. Disconnect power cord from supply before replacing fuses or removing power supply module from instrument.	Avertissement: Risque de choc électrique. D'électrique. D'ébrancher le cordon d'alimentation avant de remplacer les fusibles ou de retirer le block d'alimentation de l'instrument.
WARNING: For continued protection against risk of fire, replace only with Listed and Certified fuse of the specified type and ratings.	Avertissement: Pour assurer une protection continue contre les risques d'incendie, remplacer les fusibles uniquement par des fusibles énumérés et certifiés du type de courant nominal spécifiés.
WARNING: HOT LAMP.	Avertissement: LAMPE CHAUDE.
WARNING: HOT. Replace lamp with an Applied Biosystems lamp.	Composants chauds. Remplacer la lampe par une lampe Applied Biosystems.
WARNING: Disconnect supply cord before opening. Grounding circuit continuity is vital for safe operation of equipment. Never operate equipment with grounding conductor disconnected.	Avertissement: Débrancher la corde d'approvisionnement avant l'ouverture. La continuité de circuit au sol est essentiel pour l'exploitation sûre du matériel. N'actionnez jamais le matériel avec le conducteur débranché.
WARNING: For protection against fire hazard, replace only same type and rating of fuse.	Avertissement: Afin d'assurer la protection contre les risques d'incendie, remplacer uniquement par un fusible de même type et de même courant nominal.
CAUTION: HOT.	Attention: Surface chaude.
DANGER: High voltage.	Danger: Haut Voltage.
WARNING: To reduce the chance of electrical shock, do not remove covers that require tool access. No user serviceable parts are inside. Refer servicing to Applied Biosystems qualified service personnel.	Avertissement: Pour réduire la chance du choc électrique ne retirez pas les couvertures qui exigent l'accès d'outil. Aucune pièce utile d'utilisateur n'est intérieur. Référez l'entretien au personnel de service de Applied Biosystems.
DANGER: Laser radiation when open and interlock defeated. Avoid direct exposure to beam.	Danger: Rayonnement de Laser si ouvert et couplage a défaut. Evitez l'exposition directe au faisceau.
CAUTION: Moving parts.	Attention: Pièces mobiles.

## Safety Alert Symbols

**Electrical Symbols** The following chart is an illustrated glossary of all electrical symbols that are used on Applied Biosystems instruments. Whenever such symbols appear on instruments, please observe appropriate safety procedures.

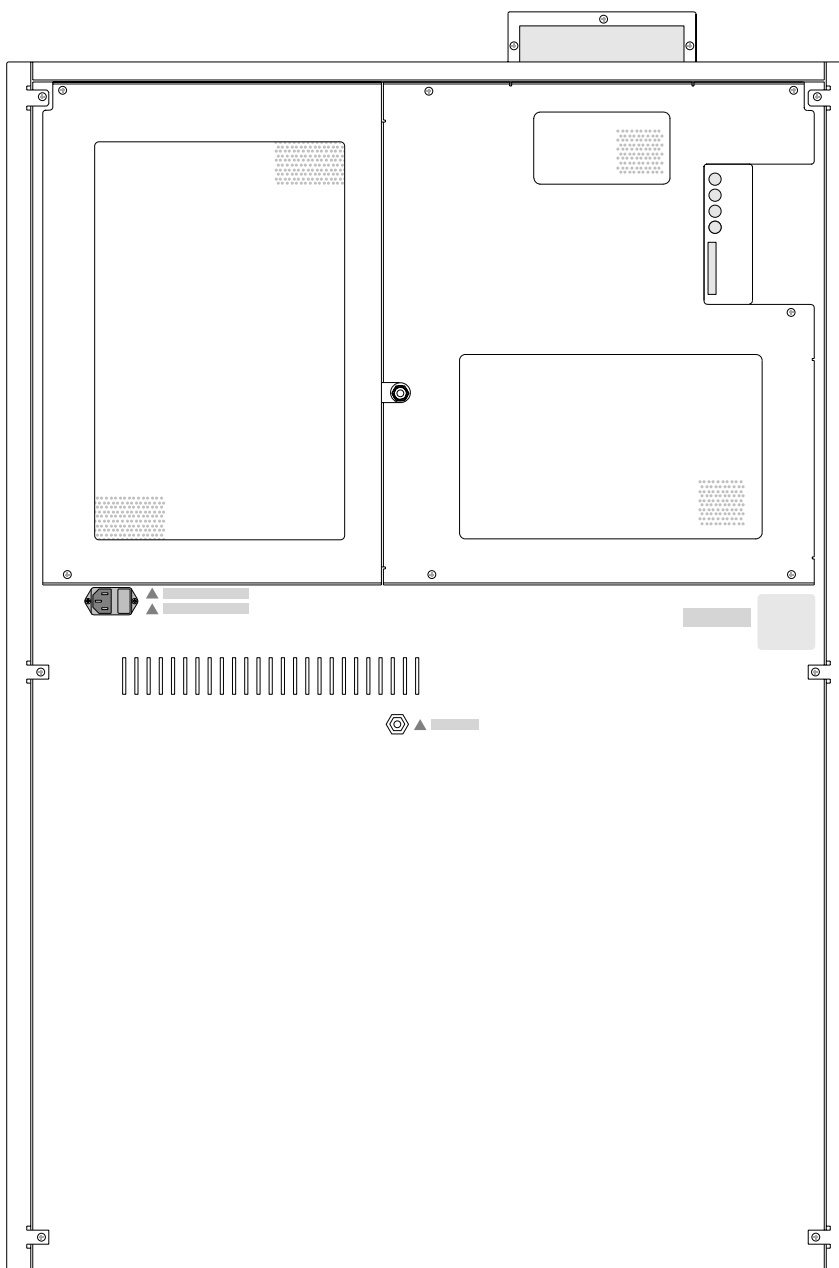
	This symbol indicates the <b>on</b> position of the main power switch.
	This symbol indicates the <b>off</b> position of the main power switch.
	This symbol indicates the <b>on/off</b> position of a push-push main power switch.
	This symbol indicates that a terminal may be connected to another instrument's signal ground reference. This is not a protected ground terminal.
	This symbol indicates that this is a protective grounding terminal that must be connected to earth ground before any other electrical connections are made to the instrument.
	A terminal marked with this symbol either receives or delivers alternating current or voltage.
	A terminal marked with this symbol can receive or supply an alternating and a direct current or voltage.
	<b>CAUTION</b> This symbol indicates the presence of high voltage and warns the user to proceed with caution.
	<b>CAUTION</b> This symbol alerts you to consult the manual for further information and to proceed with caution.

**Non-electrical Symbols** The following is an illustrated glossary of all non-electrical safety alert symbols found on Applied Biosystems instruments.

	<b>CAUTION</b> This symbol illustrates a heater hazard. Proceed with caution when working around these areas to avoid being burned by hot components.
	This symbol indicates that a laser is present inside the instrument.

## Input/Output Connections

**Location** The exact locations of the input/output connections on the 392/394 DNA/RNA Synthesizer are shown in Figure 2-1. The input/output connections are labeled on the instrument.



**Figure 2-1** Input/Output connections on the ABI 3948 DNA Synthesizer.

## Gas Safety

---

**Pressurized Gas Safety** **! WARNING !** Pressurized gas cylinders are potentially explosive if not handled properly, and can cause great damage and severe injuries.

This instrument uses a pressurized gas cylinder for operation. Some kinds of rapidly leaking gas can displace normal atmosphere and cause suffocation. If knocked over, a pressurized gas cylinder can explode. Keep in mind the following when working with gas cylinders:

- ◆ Screw the gas cap on tightly when not in use and when transporting.
- ◆ Attach the cylinder firmly to a wall or gas cylinder cart by means of an approved strap or clamp.

---

**Gaseous Waste Safety** **! WARNING !** Handle all liquid, solid, and gaseous waste as potentially hazardous. Gaseous waste can cause injury, illness, or death.

Instruments that use gas cylinders for operation emit gaseous waste. Follow carefully the instructions provided in this chapter in the section entitled, "Disposing of Gaseous Waste and Exhaust," and read the MSDSs and Waste Profiles in Chapter 3, "Chemical Safety."

Keep in mind the following when working with instruments that use gas cylinders:

- ◆ Some gaseous waste is toxic.
  - ◆ Vent according to instructions in the guide and all appropriate laws and regulations.
-

## Disposing of Gaseous Waste

---

### Instrument Waste and Exhaust System

The waste and exhaust system of the instrument is composed of a 3/8 in.-o.d. (0.95 cm) waste line from the instrument's waste port to a 2.5-gal. (9.5 L) polyethylene bottle supplied by Applied Biosystems, which must be placed in a secondary container (not supplied). The bottle's cap incorporates a separate exhaust line to conduct the waste fumes and gasses that enter the bottle to a fume hood or duct system for disposal.

**CAUTION** Be sure to place the waste bottle in a secondary container to minimize the possibility of leaks.

The fume hood or duct system must be operating whenever the instrument power is on or when there is waste in the waste container.

---

### Exhaust Line Tubing

- ◆ Exhaust line tubing should be polypropylene tubing of the shortest possible length run as straight as possible. Tubing length should not exceed 15 ft. (4.5 m).
  - ◆ The exhaust line tubing should not have low points that can trap residue or condensation.
  - ◆ The exhaust line tubing should be fastened securely. Use fasteners of polypropylene or Teflon. Do not use brass as it corrodes. Be careful not to puncture tubing.
  - ◆ The tubing should be located away from sources of potential damage such as contact, heat, or flame.
  - ◆ The tubing end should be placed as far as possible into the duct, canopy, or hood.
  - ◆ The open end of the tubing should not face into oncoming air movement through the duct or canopy.
- 

### Connecting the Exhaust line

Connect the waste line from the instrument to the waste bottle so that it drops vertically without bends or kinks. This prevents liquid and waste from accumulating and blocking the flow.

Make sure that the exhaust line leads to the fume hood or duct in a continuously upward direction. The line must not create low points by dipping in a downward direction because condensation may collect and prevent proper flow through the instrument. Accordingly, the bottle and its secondary container are usually placed on a shelf below the work surface or on the floor.

---



## Pressurized Gas and Accessories Needed but Not Supplied

---

**Gas Cylinder** Each laboratory must supply the required gas cylinder and accessories for installation. This instrument requires one size 1-A argon gas cylinder that holds approximately (7.2 m<sup>3</sup>) 257 ft.<sup>3</sup> of gas when full.

Use only prepurified argon of 99.998% or greater purity. An additional argon cylinder should be ordered in advance for the ongoing operation of the instrument.

**CAUTION** Damage to the instrument and its products can result from using impure argon, gasses other than argon, or an inadequate amount of argon.

---

**Pressure Regulator** A two-stage pressure regulator with dual gauges (output range: 0–80 psi, high pressure range: 0–3000 psi), and a Compressed Gas Association (CGA) 580 cylinder adapter with a needle-type shutoff valve on the exit side is required. The needle valves should have Swagelok- type end-fittings ready for connection to .25-in. (6.35 mm) o.d. tubing.

**CAUTION** Do not allow the cylinder pressure to drop below 300 psi. Chemical vapors and/or liquids can backflow into the pressure regulator resulting in serious damage to the instrument.

The second stage output of the regulator should be set at approximately 15 psi (103.5 kPa).

---

**Attaching the Cylinder** Attach the pressurized gas cylinder firmly to a wall or gas cylinder cart by means of approved straps or clamps.

**! WARNING !** Pressurized gas cylinders are explosive. Attach the pressurized gas cylinder firmly to a wall or bench by means of approved straps or clamps. Always cap the gas cylinder when not in use.

---



# *Chemical Safety*

---

# 3

## **Introduction**

---

**Please read...** This chapter contains detailed information for this instrument about:

- ◆ hazardous chemicals used (if any)
- ◆ hazardous waste produced and how to handle

Where appropriate, detailed Waste Profiles and Material Safety Data Sheets (MSDSs) are provided to ensure correct and safe operation of the instrument.

Applied Biosystems assumes that all operations in your laboratory will be conducted in accordance with safety practices detailed in Waste Profiles and MSDSs and with any applicable laws and regulations.

---

## Hazardous Chemicals

---

**Overview** This instrument uses chemicals that are hazardous, chlorinated, organic liquids.

**! WARNING ! Hazardous chemicals can cause injury, illness, or death. Handle all chemicals as potentially hazardous.**

Chemicals are classified as hazardous when they are physically hazardous or if they may cause health hazards upon acute or chronic exposure.

- ◆ Physically hazardous chemicals are materials that are flammable, combustible, compressed gasses, explosives, oxidizers, organic peroxides, pyrophoric, reactive or unstable, or water reactive.
- ◆ Chemicals that may cause health hazards are materials that are carcinogens, toxic or highly toxic, reproductive toxins, irritants, corrosives, sensitizers, hepatogens, nephrotoxins, agents which act on the hematopoietic systems, and agents which damage the lungs, skin eyes, or mucous membranes.

---

**Handling Hazardous Chemicals** Important requirements for handling hazardous chemicals include:

- ◆ Read all applicable MSDSs before handling hazardous chemicals.
  - ◆ When replacing reagents, always install the new bottle on the instrument. Do not top off old bottles. Some chemicals reduce the integrity of glass bottles and repeated use beyond six weeks may result in the bottle fracturing when it is pressurized during operation.
  - ◆ Provide secondary containment for all reagent bottles.
  - ◆ Do not store chemicals in direct sunlight or heat (on or off the instrument).
-

## Hazardous Waste

---

**Overview** The ABI 3948 DNA Synthesizer generates hazardous, chlorinated, organic liquid and gaseous waste.

**! WARNING ! CHEMICAL WASTE HAZARD.** Waste produced by this instrument is potentially hazardous and can cause physical injury, illness, or death. Dispose of the contents of the waste tray and waste bottle in accordance with all applicable health and environmental laws and regulations.

---

### Handling Hazardous Waste

The following are important requirements for handling hazardous waste:

- ◆ Ensure that the waste container is correctly installed.
  - ◆ Always handle hazardous materials beneath a fume hood that is connected in accordance with all installation requirements.
  - ◆ During transporting, ensure that waste containers are tightly sealed with the cap provided.
  - ◆ Read the Instrument Waste Profiles in this chapter before handling or disposing of hazardous waste.
  - ◆ Read all applicable Material Safety Data Sheets before handling or disposing of hazardous waste.
  - ◆ Dispose of hazardous waste in accordance with all applicable laws and regulations.
- 

### Storing Hazardous Waste

**! WARNING ! Never collect or store waste in a glass container because of the risk of breaking or shattering.**

The following are guidelines for storing hazardous waste:

- ◆ Do not store waste for long periods of time.
  - ◆ Do not store large amounts of waste in the lab.
  - ◆ Do not store waste in direct sunlight or heat (on or off instrument).
-

## Instrument Waste Profile Overview

---

**General Information** The Instrument Waste Profile provides essential information about hazardous waste. Read the Instrument Waste Profile and all applicable MSDSs before handling or disposing of waste. The Instrument Waste Profile is NOT a substitute for MSDS information. See specific MSDS sheets in this chapter for chemical constituent, health, toxicological, and hazard information. For a complete list of acronyms and abbreviations used in Waste Profiles, see Appendix A.

---

**Waste Profile Sections** Information in the Instrument Waste Profiles is divided into ten sections. The names of the ten sections are listed below.

Topic	Section
Identification	1
Approximate Composition	2
Physical Data	3
Fire and Explosion Hazard Data	4
Health Hazard Data	5
Reactivity Data	6
Spill or Leak Procedures	7
Special Protective Equipment	8
Special Precautions	9
Additional Information	10

---

*continued on next page*

## ABI MODEL 3948 INSTRUMENT WASTE PROFILE

EMERGENCY PHONE NUMBERS (USA) 415-570-6667 Ext. 999 (UK) 0925-825650

### SECTION 1 - IDENTIFICATION

The flammable liquid waste from the Model 3948 is collected in a 10-L bottle located below the instrument. The halogenated liquid waste is collected in a 4-L bottle located below the instrument. The sample collector liquid waste from the is collected in 2 15 mL bottles located to the rear of the sample collector platform. The Model 3948 generates about 90 mL of flammable waste, and about 15 mL of halogenated waste per 20-mer oligo. This waste is a complex mixture of reagents which may have properties of greater hazard than the individual waste components by themselves.

**HANDLE THIS MATERIAL WITH EXTREME CAUTION! DO NOT DISPOSE OF THIS WASTE IN SINKS OR DRAINS! THIS MATERIAL SHOULD BE DISPOSED OF AS A REGULATED HAZARDOUS WASTE!**

### SECTION 2 - APPROXIMATE COMPOSITION

Material	%	TLV	PEL*	CAS#
<b>Flammable Waste-20 L Container</b>				
1-methylimidazole	<1	N/A	N/A	616-47-7
Acetonitrile	63	40 ppm	40 ppm	75-05-8
Water	24	N/A	N/A	N/A
Tetrahydrofuran	8	200 ppm	200 ppm	109-99-9
Phosphoramidites	<1	N/A	N/A	N/A
Acetic anhydride	<1	N/A	N/A	N/A
Iodine	<1	0.1 ppm	0.1 ppm	7553-56-2
2,6-lutidine	<1	N/A	N/A	108-48-5
TEAA	<1	N/A	N/A	5204-74-0
Pyridine	<1	5 ppm	5 ppm	110-86-1
Trifluoroacetic acid	<1	N/A	N/A	76-05-01
Ammonium Hydroxide	9.6	10ppm	10ppm	68-12-2
<b>Flammable Waste-Sample Container</b>				
Water	98	N/A	N/A	N/A
Acetonitrile	2	40 ppm	40 ppm	75-05-8

N/A = Not Available

\* OSHA's PEL limits are subject to the decision of the 11th Circuit Court of Appeals or higher Federal Court decision.

### SECTION 3 - PHYSICAL DATA

BOILING POINT	760 mm: N/A
SPECIFIC GRAVITY	(H <sub>2</sub> O = 1): 0.94

VOLATILITY	(vol%): 96-98%
APPEARANCE AND ODOR:	Yellow to reddish-brown liquid with an acrid, unpleasant odor
FREEZING POINT	N/A
pH RANGE	4-6
SOLUBILITY IN H <sub>2</sub> O	Soluble

**SECTION 4 - fire and explosion hazard data (Acetonitrile data only!)**

FLASH POINT (Closed Cup):	5.6 °C (42 °F)
FLAMMABLE LIMITS:	4.4% LEL 16% UEL
FIRE EXTINGUISHING MEDIA:	Dry chemical, alcohol foam, carbon dioxide or Halon
SPECIAL FIRE FIGHTING PROCEDURES:	Use self-contained breathing apparatus and protective clothing to prevent skin and eye contact.

**SECTION 5 - HEALTH HAZARD DATA**

EXPOSURE LIMITS:	See Section 3.
	For acetonitrile, the STEL is 60 ppm and the IDLH level is 4,000. For Dichloromethane, the STEL is 1000 ppm and the IDLH level is 5,000 ppm.
EFFECTS OF ACUTE OVEREXPOSURE	
SWALLOWING	Harmful if swallowed! Causes severe irritation of eyes, nose, and throat, Higher concentrations may cause liver and kidney damage, unconsciousness, and death.
SKIN	May cause severe irritation or burns. Allergic skin sensitization may also occur.
EMERGENCY AND FIRST-AID PROCEDURES	
SWALLOWING:	If conscious, give large quantities of water immediately and induce vomiting. Get medical attention immediately. Do not induce vomiting if unconscious.
SKIN:	Remove contaminated clothing. Flush the contaminated area with water and wash with mild soap or detergent. Get medical attention.
INHALATION:	Provide fresh air and rest. If breathing is difficult, provide oxygen and get medical attention immediately.



EXPOSURE LIMITS:	See Section 3.
EYES:	Flush eyes immediately with large amounts of water for at least 15 minutes. Get medical attention.
SWALLOWING:	If conscious, give large quantities of water immediately and induce vomiting. Get medical attention immediately. Do not induce vomiting if unconscious.

#### SECTION 6 - REACTIVITY DATA

STABILITY:	Stable
INCOMPATIBILITY:	Contact with strong oxidizing agents or concentrated acids or bases may cause fire or explosion.
HAZARDOUS COMBUSTION OR DECOMPOSITION PRODUCTS:	Burning may release toxic vapors and gases including phosgene, hydrogen chloride, hydrogen fluoride, carbon monoxide, and oxides of nitrogen.
HAZARDOUS POLYMERIZATION:	Will not occur.

#### SECTION 7 - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN:	<p>Avoid inhalation and skin contact.  Wear protective clothing.  Ventilate area of spill or leak.  Remove all ignition sources.  Small quantities may be collected with absorbent towels or pads and removed to a well-ventilated area away from ignition sources. Larger amounts (1 liter or more) may be collected with an inert absorbent (kitty litter or similar material) or commercially available spill pillows designed for solvent collection.  This waste material must not be allowed to enter confined spaces (such as a sewer) because of the possibility of an explosion.</p>
WASTE DISPOSAL:	<p>This instrument waste solution should be disposed of as a regulated hazardous waste by a properly-permitted hazardous waste management facility in accordance with federal, state and local regulations. Recommend disposal methods include high temperature incineration and solidification for secure chemical landfill disposal.</p>

**SECTION 8 - SPECIAL PROTECTIVE EQUIPMENT**

RESPIRATORY PROTECTION:	An MSHA- or NIOSH-approved respirator for organic vapors is recommended. A supplied-air or SCBA respirator is recommended for high vapor concentration and emergency situations.
VENTILATION:	Handle within a well-ventilated area. Minimize open exposure to air.
PROTECTIVE GLOVES: .	Neoprene or latex rubber gloves are recommended
EYE PROTECTION:	Safety glasses with side shields, monogoggles, or face shield.
OTHER PROTECTIVE EQUIPMENT:	As necessary to prevent skin contact.

**SECTION 9 - SPECIAL PRECAUTIONS**

PRECAUTIONS TO BE TAKEN:	Handle as a flammable, poisonous liquid. Maintain adequate ventilation at all times. Do not breathe vapor. Do not get in eyes, on skin, or on clothing. Accidental contact should be washed immediately. Keep away from heat, sparks, and flame. Spill collection materials, eye wash, and safety shower should be in area of use.
OTHER:	This waste solution has strong solvent properties and will attack many forms of rubber, plastics, coating, and finishes.

**SECTION 10 - ADDITIONAL INFORMATION**

When not directly attached to the instrument, this waste material should be stored in a secure, well-ventilated location suitable for flammable materials. Store away from light, heat, or potential ignition sources. Contact the appropriate state hazardous waste regulatory agency for proper disposal procedures and lists of registered service companies. THIS WASTE MATERIAL IS HAZARDOUS AND SHOULD ONLY BE HANDLED BY PERSONS THOROUGHLY TRAINED IN HAZARDOUS MATERIALS HANDLING PROCEDURES!  
Halogenated Waste

Material	%	TLV	PEL*	CAS#
Trichloroacetic acid	3	1 ppm	1 ppm	76-03-9
Dichloromethane	97	100 ppm	75-09-2	75-05-8

N/A = Not Available

\* OSHA's PEL limits are subject to the decision of the 11th Circuit Court of Appeals or higher Federal Court decision.

Physical Data

BOILING POINT	760 mm: 40 C
SPECIFIC GRAVITY	(H <sub>2</sub> O = 1): 1.56
VOLATILITY	(vol%): 96-99%

APPEARANCE AND ODOR:	Clear to orange liquid with a pleasant aromatic odor
FREEZING POINT	N/A
pH RANGE	0-1
SOLUBILITY IN H <sub>2</sub> O	3%

## Material Safety Data Sheets Overview

---

**General Information** Material Safety Data Sheets provide information about physical characteristics, health hazards, safety precautions, first aid, spill cleanup and disposal procedures. Read the MSDSs before handling reagents or interacting with the instrument.

---

**MSDS Sections** Each MSDS is divided into 16 sections, although not all sections apply to every chemical. The names of the 16 sections are listed below.

- ◆ Section 1 – Chemical Product and Company Identification
- ◆ Section 2 – Composition, Information on Ingredients
- ◆ Section 3 – Hazards Identification
- ◆ Section 4 – First Aid Measures
- ◆ Section 5 – Fire Fighting Measures
- ◆ Section 6 – Accidental Release Measures
- ◆ Section 7 – Handling and Storage
- ◆ Section 8 – Exposure Controls, Personal Protection
- ◆ Section 9 – Physical and Chemical Properties
- ◆ Section 10 – Stability and Reactivity
- ◆ Section 11 – Toxicological Information
- ◆ Section 12 – Ecological Information
- ◆ Section 13 – Disposal Considerations
- ◆ Section 14 – Transport Information
- ◆ Section 15 – Regulatory Information
- ◆ Section 16 – Other Information

Additional copies of MSDSs for chemicals manufactured by Applied Biosystems are available at no extra cost. They can also be viewed on the Applied Biosystems World Wide Web site.

The web address is [www.appliedbiosystems.com/techsupport](http://www.appliedbiosystems.com/techsupport)

---

## MSDSs for the ABI 3948 DNA Synthesizer

---

### MSDSs for Applied Biosystems Chemicals

The MSDSs for chemicals manufactured by Applied Biosystems and used with the ABI 3948 DNA Synthesizer are included in this section of the manual.

- ◆ Trichloroacetic acid/dichloromethane (P/N 901815)
  - ◆ Anhydrous Acetonitrile (P/N 901817)
  - ◆ Tetrazole/Acetonitrile (P/N 901826)
  - ◆ Acetonitrile in water (P/N 901829)
  - ◆ 1-methylimidazole/tetrahydrofuran (P/N 901846)
  - ◆ Deoxyadenosine Benzoyl Cyanoethyl Phosphoramidite (P/N 902068)
  - ◆ Deoxycytidine Benzoyl Cyanoethyl Phosphoramidite (P/N 902069)
  - ◆ Thymidine Cyanoethyl Phosphoramidite (P/N 902071)
  - ◆ Triethylamine/Acetate Buffer (P/N 902544)
  - ◆ dG<sup>dmf</sup> Fastphoramidite (P/N 902753)
  - ◆ 3% Trifluoroacetic acid (P/N 902769)
  - ◆ 0.02 M Iodine/Water/Pyridine/Tetrahydrofuran (P/N 902910)
  - ◆ 20% Acetic acid in water (P/N 903379)
  - ◆ Acetic anhydride/lutidine/tetrahydrofuran (P/N 904101)
- 

### MSDSs for Chemicals Not Supplied by Applied Biosystems

For chemicals required for this instrument but not manufactured or sold by Applied Biosystems, obtain the MSDSs from their manufacturers. Brief warnings for these chemicals are listed below.

**! WARNING ! CHEMICAL HAZARD. Ammonium Hydroxide is a corrosive chemical that could burn or cause serious skin or eye damage and must be handled with great caution. Wear protective eyewear, gloves, and safety clothing when working with ammonium hydroxide. Use only in a well-ventilated area.**

---



# Acronyms and Abbreviations



## Acronyms and Abbreviations Used in Waste Profiles and MSDSs

**Introduction** Waste Profiles and MSDSs use acronyms and abbreviations for certain organizations, government regulations, common scientific terminology, units of measurement, and chemicals.

The following tables contain lists of acronyms and abbreviations commonly used in Waste Profiles and MSDSs.

### Organizations, Regulations, and Scientific Terminology

Acronyms and abbreviations for organizations, government regulations, and scientific terminology.

**Table A-1** Acronyms and abbreviations

Term	Explanation
ACGIH	American Conference of Governmental Industrial Hygienists
CAS#	Chemical Abstract Service Reference Number for Specific Pure Chemical
cc	Closed cup testing of flash point
CFR	Code of Federal Regulations. Regulations published by the United States Government
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act (Superfund) is a federal law administered by EPA
DFG MAK	Federal Republic of Germany's Maximum Contamination Value in the workplace (similar to PEL in the USA)
DOT	United States Department of Transportation, regulates transportation of hazardous material (USA)
EPA	United States Environmental Protection Agency, regulates use, disposal, or emission of hazardous material (USA)
IDLH	Immediate Danger to Life and Health
LC <sub>LO</sub>	Lowest published lethal concentration
LC <sub>50</sub>	Lethal concentration in air that kills 50% of a specified population
LD <sub>50</sub>	Lethal dose that kills 50% of a specified population
LEL	Lower Explosion Limit
MSHA	Mine Safety and Health Administration, recommends respirators
NFPA	National Fire Protection Association, publishes recommended regulations for local or state governments in the United States (Hazardous rating system developed by this Association)

**Table A-1** Acronyms and abbreviations *(continued)*

Term	Explanation
NIOSH	National Institute of Occupational Safety and Health (USA) recommends exposure levels and respirators
oc	Open cup testing for flash point
OSHA	Occupational Safety and Health Administration (USA), sets chemical exposure levels.
PEL	Permissible Exposure limit. The federal OSHA limit, usually expressed as TWA for an 8-hour work shift.
PPM	Parts Per Million
Prop 65	A California Law requiring warnings for chemicals that are known to the state to be carcinogenic or cause reproductive harm.
RCRA	Resource Conservation and Recovery Act
RTECS	Registry of Toxic Effects of Chemical Substances
SARA	Superfund Amendments and Reauthorization Act, a federal act administered by EPA.
SCBA	Self-Contained Breathing Apparatus
STCC	Standard Transportation Commodity Code
STEL	Short Term Exposure Level, published by ACGIH
TC <sub>LO</sub>	Lowest published toxic concentration
TLV	Threshold Limit Value. The ACGIH-recommended TWA, usually for an 8-hour work shift
TWA	Time Weighted Average
UEL	Upper Explosive Limit
u or U	Unknown
UN	United Nations. This designation identifies hazardous chemicals in the process of world-wide transportation.

### Units of Measurement

The following are abbreviations for units of measurement.

**Table A-2** Abbreviations for units of measurement

Abbrev.	Unit of Measurement
#	number
°C	degrees Celsius
°F	degrees Fahrenheit
µL	microliter
µm	micron
µmol	micromole
AUFS	absorbency units full-scale
ft.	foot
i.d.	inside diameter
in.	inch
L	liter
m	meter



**Table A-2** Abbreviations for units of measurement

Abbrev.	Unit of Measurement
mg	milligram
mL	milliliter
mm	millimeter
o.d.	outside diameter
P/N	Applied Biosystems part number
psi	pounds per square inch
sec	second
V	volt

**Chemicals** The following are abbreviations for chemicals.

**Table A-3** Abbreviations for chemicals










Abbrev.	Definition
A	adenine
AA	amino acid
1Ac	acetyl
AcI	acetylimidazole
Acm	acetamidomethyl
Ac <sub>2</sub> O	acetic anhydride
ACN	acetonitrile
ACT	activator vessel
BHA resin	benzhydramine resin
t-Boc	tert-butyloxycarbonyl
Bzl	benzyl
Br-Z	2-bromobenzyloxycarbonyl
t-Bu	tert-butyl
C	cytosine
CHO	formyl
CH <sub>3</sub> Bzl	4-methylbenzyl
CH <sub>3</sub> OBzl	4-methoxybenzyl
Cl-Z	2-chlorobenzyloxycarbonyl
CPG	Controlled Pore Glass
DCA	dichloroacetic acid
DCC	dicyclohexylcarbodiimide
DCM	dichloromethane
DCU	dicyclohexylurea
DIEA	diisopropylethylamine
DMAP	4-dimethylaminopyridine
DMF	dimethylformamide
DMSO	dimethylsulfoxide
DNA	deoxyribonucleic acid

**Table A-3** Abbreviations for chemicals (*continued*)



<b>Abbrev.</b>	<b>Definition</b>
Dnp	2,4-dinitrophenyl
Et	ethyl
EtOH	ethanol
Fmoc	9-fluorenylmethyloxycarbonyl
G	guanine
HBTU	2-(1 H-benzotriazol-1-yl)-1,1,3,3-tetramethyl-uronium hexafluorophosphate
HLP	high loaded polystyrene
HMP resin	p-hydroxymethylphenoxymethyl-polystyrene resin
HOAc	acetic acid
mBHA resin	4-methylbenzhydramine resin
MeOH	methanol
Mob	4-methoxybenzyl
Mtr	4-methoxy-2,3,6-trimethyl-benzene sulfonyl
Mts	mesitylene-2-sulfonyl
NMI	1-Methylimidazole
NMP	N-Methylpyrrolidone, N-methyl-2-pyrrolidone
OBt	ethyl ester
OMe	methyl ester
PAM resin	phenylacetamidomethyl resin
PEG	polyethylene glycol
RV	reaction vessel
SSPS	solid-phase peptide synthesis
T	thymine
TETD	tetraethylthiuram disulfide
TFA	trifluoroacetic acid
TFMSA	trifluoromethane sulfonic acid
THF	tetrahydrofuran
Tos	4-toluenesulfonyl (tosyl)
Tri	trityl
U	uracil
Z	benzyloxycarbonyl

## Safety Alert Symbols

**Electrical Symbols** The following are illustrations of all electrical symbols that are used on Applied Biosystems instruments.

	This symbol indicates the <b>on</b> position of the main power switch.
	This symbol indicates the <b>off</b> position of the main power switch.
	This symbol indicates the <b>on/off</b> position of a push-push main power switch.
	This terminal may be connected to another instrument's signal ground reference. This is not a protected ground terminal.
	This protective grounding terminal must be connected to earth ground before any other electrical connections are made to the instrument.
	This terminal either receives or delivers alternating current or voltage.
	This terminal can receive or supply an alternating and a direct current or voltage.
	<b>CAUTION</b> This symbol indicates the presence of high voltage and warns the user to proceed with caution.
	<b>CAUTION</b> This symbol alerts you to consult the manual for further information and to proceed with caution.

**Non-electrical Symbols** The following are illustrations of all non-electrical symbols found on Applied Biosystems instruments.



	<b>CAUTION</b> This symbol illustrates a heater hazard. Proceed with caution when working around these areas to avoid being burned by hot components.
	This symbol indicates that a laser is present inside the instrument.

## Symboles des alertes de sécurité

**Symboles électriques** Le tableau suivant donne la signification de tous les symboles électriques qui figurent sur les appareils Applied Biosystems. En présence de l'un de ces symboles, il est impératif de se conformer aux consignes de sécurité appropriées.










	Position <i>MARCHE</i> de l'interrupteur d'alimentation principal.
	Position <i>ARRÊT</i> de l'interrupteur d'alimentation principal.
	Positions <i>MARCHE-ARRÊT</i> de l'interrupteur d'alimentation principal à bouton poussoir.
	Borne pouvant être reliée à la mise à la terre d'un autre appareil. Ce n'est pas une borne de mise à la terre protégée.
	Borne de mise à la terre de protection devant être reliée à la terre avant d'effectuer tout autre raccordement électrique à l'appareil.
	Borne recevant ou fournissant une tension ou un courant de type alternatif.
	Borne pouvant recevoir ou fournir une tension ou un courant de types alternatif et continu.
	<b>ATTENTION</b> Indique la présence d'une haute tension et avertit l'utilisateur de procéder avec précaution.
	<b>ATTENTION</b> Avertit l'utilisateur de la nécessité de consulter le manuel pour obtenir davantage d'informations et de procéder avec précaution.

**Symboles non électriques** Le tableau suivant donne la signification des symboles d'alertes de sécurité non électriques qui figurent sur les appareils Applied Biosystems.



	<b>ATTENTION</b> Danger associé à la présence d'un appareil de chauffage. Procéder avec précaution pour éviter de se brûler au contact de pièces ou d'éléments chauds.
	Indique que l'appareil renferme un laser.

## Sicherheitswarnsymbole

**Elektrische Symbole** Die folgende Tabelle enthält Beschreibungen aller auf den Instrumenten von Applied Biosystems verwendeten elektrischen Symbole. Wenn diese Symbole auf den Instrumenten erscheinen, beachten Sie bitte die entsprechenden Sicherheitsvorkehrungen.

	Dieses Symbol zeigt die <i>EIN</i> -Position des Hauptnetzschalters an.
	Dieses Symbol zeigt die <i>AUS</i> -Position des Hauptnetzschalters an.
	Dieses Symbol zeigt die <i>EIN/AUS</i> -Position eines Druck-Zug-Hauptnetzschalters an.
	Dieses Symbol zeigt an, daß ein Anschluß an die Betriebserde eines anderen Instruments angeschlossen werden kann. Dies ist kein geschützter Erdanschluß.
	Dieses Symbol zeigt einen geschützten Erdanschluß an, der geerdet werden muß, bevor andere elektrische Anschlüsse zum Instrument hergestellt werden.
	Ein mit diesem Symbol gekennzeichneter Anschluß kann Wechselstrom oder -spannung erhalten oder abgeben.
	Ein mit diesem Symbol gekennzeichneter Anschluß kann Wechselstrom oder -spannung und Gleichstrom oder -spannung erhalten oder abgeben.
	<b>VORSICHT</b> Dieses Symbol zeigt das Vorliegen von Hochspannung an und warnt den Anwender, mit Vorsicht fortzufahren.
	<b>VORSICHT</b> Dieses Symbol fordert Sie auf, das Handbuch zwecks näherer Informationen zu konsultieren und mit Vorsicht fortzufahren.

**Nicht-elektrische Symbole** Die folgende Tabelle enthält Beschreibungen aller auf den Instrumenten von Applied Biosystems verwendeten nicht-elektrischen Symbole.



	<b>VORSICHT</b> Dieses Symbol zeigt eine Gefahr durch die Heizung an. Gehen Sie mit Vorsicht vor, wenn Sie in der Nähe dieser Bereiche arbeiten, damit Sie sich nicht an heißen Komponenten verbrennen.
	Dieses Symbol zeigt das Vorliegen eines Lasers im Innern des Instruments an.

## Símbolos de alerta de seguridad

**Símbolos eléctricos** En la siguiente tabla se muestra un glosario ilustrado de todos los símbolos eléctricos que se utilizan en los instrumentos de Applied Biosystems.

	Este símbolo indica la posición de <i>encendido</i> del interruptor principal.
	Este símbolo indica la posición de <i>apagado</i> del interruptor principal.
	Este símbolo indica la posición de encendido/apagado de un interruptor principal de presión.
	Este símbolo indica que existe la posibilidad de conectar esta terminal a la toma de tierra de referencia de otro instrumento. Esta no es una toma de tierra protegida.
	Este símbolo indica que la toma de tierra protegida debe ser conectada a tierra antes de realizar cualquier otro tipo de conexión eléctrica al instrumento.
	Una terminal marcada con este símbolo recibe o suministra corriente o tensión alterna.
	Una terminal marcada con este símbolo puede recibir o suministrar corriente o tensión alterna y continua.
	<b>PRECAUCIÓN</b> Este símbolo indica la presencia de alta tensión y advierte al usuario que proceda con precaución.
	<b>PRECAUCIÓN</b> Este símbolo indica que consulte el manual para obtener más información y que proceda con precaución.

**Símbolos no eléctricos** A continuación se presenta un glosario ilustrado de todos los símbolos de seguridad y alerta no eléctricos que aparecen en los instrumentos de Applied Biosystems.



	<b>PRECAUCIÓN</b> Este símbolo indica peligro de altas temperaturas. Proceda con cautela cuando trabaje cerca de estas zonas para evitar quemarse con componentes calientes.
	Este símbolo indica que hay un láser dentro del instrumento.

## Simboli degli allarmi di sicurezza

**Simboli elettrici** La tabella seguente è un glossario illustrato di tutti i simboli elettrici utilizzati su strumenti Applied Biosystems. Ogni volta che tali simboli compaiono sugli strumenti, rispettare le procedure di sicurezza appropriate.

	Questo simbolo indica la posizione <i>ON</i> dell'interruttore di alimentazione generale.
	Questo simbolo indica la posizione <i>OFF</i> dell'interruttore di alimentazione generale.
	Questo simbolo indica la posizione <i>ON/OFF</i> di un interruttore di alimentazione generale a pulsante.
	Questo simbolo indica che un terminale può essere collegato al riferimento di terra del segnale di un altro strumento. Non è un terminale di terra protetto.
	Questo simbolo indica un terminale protettivo di messa a terra che deve essere collegato a terra prima di realizzare qualsiasi altro collegamento elettrico allo strumento.
	Un terminale contrassegnato con questo simbolo riceve o fornisce tensione o corrente alternata.
	Un terminale contrassegnato con questo simbolo può ricevere o fornire tensione o corrente alternata e continua.
	<b>ATTENZIONE</b> questo simbolo indica la presenza di alta tensione e invita l'utente a procedere con cautela.
	<b>ATTENZIONE</b> questo simbolo invita l'utente a consultare il manuale per ulteriori informazioni e procedere con cautela.

**Simboli non elettrici** Segue un glossario illustrato dei simboli degli allarmi di sicurezza non elettrici trovati su strumenti Applied Biosystems.



	<b>ATTENZIONE</b> questo simbolo illustra un rischio da alte temperature. Procedere con cautela quando si lavora in queste aree per evitare ustioni causate da componenti a temperature elevate.
	Questo simbolo indica la presenza di laser nello strumento.

## Símbolos de alerta de segurança

**Símbolos elétricos** A tabela a seguir constitui um glossário ilustrado de todos os símbolos elétricos usados nos instrumentos Applied Biosystems. Sempre que um desses símbolos aparecer num instrumento, siga os procedimentos adequados de segurança.

	Este símbolo indica que o interruptor de energia elétrica está na posição <i>ligado</i> .
	Este símbolo indica que o interruptor de energia elétrica está na posição <i>desligado</i> .
	Este símbolo indica a posição ligado/desligado de um interruptor principal de energia elétrica do tipo botão de pressão.
	Este símbolo indica que um terminal pode estar conectado a uma referência de aterramento de sinal de um outro instrumento. Este não é um terminal terra protegido.
	Este símbolo indica que este é um terminal de aterramento de proteção, que deve ser ligado à terra antes de se fazer qualquer outra ligação elétrica ao instrumento.
	Um terminal marcado com este símbolo recebe ou transmite tensão ou corrente alternada.
	Um terminal marcado com este símbolo recebe ou fornece tensão ou corrente alternada ou contínua.
	<b>CUIDADO</b> Este símbolo indica a presença de alta tensão e avisa o usuário para proceder com cuidado.
	<b>CUIDADO</b> Este símbolo serve como alerta, para que se consulte o manual a fim de se obter mais informações e que se proceda com cuidado.

**Símbolos não-elétricos** A seguir, apresentamos um glossário ilustrado de todos os símbolos de alerta de segurança não relacionados à eletricidade encontrados nos instrumentos Applied Biosystems.

	<b>CUIDADO</b> Este símbolo representa um perigo devido a aquecedor no local. Proceda com cuidado ao trabalhar em áreas próximas a aquecedores, para evitar queimaduras devidas ao contato com componentes quentes.
	Este símbolo indica que há um laser dentro do instrumento.





---

**Worldwide Sales Offices**

Applied Biosystems vast distribution and service network, composed of highly trained support and applications personnel, reaches into 150 countries on six continents. For international office locations, please call our local office or refer to our web site at [www.appliedbiosystems.com](http://www.appliedbiosystems.com).

**Headquarters**

850 Lincoln Centre Drive  
Foster City, CA 94404 USA  
Phone: +1 650.638.5800  
Toll Free: +1 800.345.5224  
Fax: +1 650.638.5884

**Technical Support**

For technical support:  
Toll Free: +1 800.831.6844  
[www.appliedbiosystems.com/techsupport](http://www.appliedbiosystems.com/techsupport)

---

**[www.appliedbiosystems.com](http://www.appliedbiosystems.com)**



PE Corporation is committed to providing the world's leading technology and information for life scientists. PE Corporation consists of the Applied Biosystems and Celera Genomics businesses.

Printed in the USA, 08/2000  
Part Number 903704D