

DNA/RNA Synthesizers

Models 392 and 394

User's Manual

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This revision of the manual supports Model 392/393 Version 2.01 software.

1 Introduction

This section provides information on:

- How to use this manual
- How to get help
- How the instrument works

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About This Manual

The first part of this manual, Sections 1 through 4, gives you the information that you will need to get started. Step-by-step operating procedures are provided in Section 2, the software is described in detail in Section 3, and then a complete listing of functions, cycles, and procedures is presented in Section 4.

Section 5 and 6 provide more detailed principles of operation (system description for hardware) and a detailed description of the chemistry required for automated DNA/ RNA synthesis. More specialized information is included in the appendices, such as instrument schematics and plumbing diagrams; a list of functions, cycles, and procedures; detailed descriptions of flow and pressure tests; an illustrated instrument parts list; a pre-installation manual; procedures for manual preparation, cleavage, and deprotection of phosphoramidites; and relevant user bulletins. A safety section containing material safety data sheets (MSDSs) and an instrument waste profile is also included in this manual.

For an overview and a general understanding of the synthesizer, read the General Description in this section and the introductions to Sections 3 through 6. Be sure to read the rest of this first section for other important information such as how to get help if you have questions or problems.

This manual is designed to allow for the addition of new User Bulletins. New User Bulletins will be sent to you as they become available.

Note *This manual is intended for use with both Model 392 and 394 instruments. Displays show information needed for Model 394 instruments (which have 8 base positions and are equipped with AutoAnalysis) and may show information not needed for Model 392 instruments (which have 2 columns and may not be equipped with AutoAnalysis).*

User Bulletins

User Bulletins (UBs) contain technical information that is essential to the Model 392/394 operation and related laboratory techniques. UBs are the quickest way to ensure that you have current information. They are produced periodically and will be mailed to you as they become available. Please read the UBs before operating your Model 392/394. Current User Bulletins are found under their own tab at the end of the manual.

Special Text Usage

Attention Users

Four *User Attention* words appear in the text of this manual. They are designed to draw your attention to safety issues or to issues relevant to proper operation of the instrument. Each one requires a certain level of observation or action as follows:

<i>Note</i>	<i>Used to call attention to information.</i>
-------------	---

IMPORTANT	<i>Indicates information that is necessary for proper instrument operation.</i>
------------------	---

Caution	<i>Damage to the instrument could result if you do not comply with this information.</i>
----------------	---

WARNING	<i>CHEMICAL HAZARD. Physical injury to you or other people could result if these required precautions are not taken.</i>
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Commands

In this manual, execute a command by pressing the key indicated in standard text or italics. Plain text is used to indicate that a particular labeled keyboard key is to be pressed. Bold is used to indicate that a particular “soft” key is to be pressed. (Soft keys are discussed after Figure 1-2).

An example of the standard text convention is the “Main Menu” key, which is pressed when the initial instrument display is present to proceed to Page 1 of the Main Menu. A related convention, which is presented on the initial display (shown in Figure 1-1), is the use of single apostrophe marks around ‘Main Menu’.

```
Applied Biosystems, Inc.
394 DNA/RNA Synthesizer (version 2.01)
4 Columns, 8 Bases, Trityl Analysis
Press 'Main Menu' to begin.
```

Figure 1-1. Initial Instrument Display

Pressing **Main Menu** as prompted displays page 1 of the Main Menu, which like many other system menus uses “soft keys”.

```
-Main Menu-           Edit Sequence>
                       Start Sequence>
                       Monitor Sequence>
page 1 of 5           Next Page>
```

Figure 1-2. Main Menu, page 1

Soft keys are the row of four unlabeled keys to the right of the display. These keys are called “soft keys” because their purpose changes with the menu or display presented. For example, to execute the **Edit Sequence** command, press the key to the right of this prompt on the display shown in Figure 1-2. In a procedure or detailed task description, whenever you find **Edit Sequence** or another command name in italics, press the corresponding soft key to execute the command.

Safety Information/Material Safety Data Sheets

Safety warnings are presented in the format shown below. This type of warning addresses chemical safety and is supplemented by the Material Safety Data Sheets (MSDS) and the 392/394 Waste Profile under the “Safety Data” tab in the front of the manual. Each time you see a message labeled **WARNING**, be aware that information relevant to your personal safety is presented.

WARNING ***CHEMICAL HAZARD. Some chemicals used with this instrument are considered hazardous. Hazard warnings are prominently displayed on the bottle labels of all hazardous chemicals. In addition, Material Safety Data Sheets (MSDSs) provide information about physical characteristics, hazards, precautions, first aid, spill cleanup, and disposal procedures. The MSDSs are included in the Safety Summary manual, placed at the front of this manual. Please be sure to familiarize yourself with the information in these documents before attempting to operate the instrument or use the reagents. Additional copies of the MSDS are available from Applied Biosystems at no extra cost.***

Technical Support

Contacting Technical Support

You can contact Applied Biosystems for technical support by telephone or fax, by e-mail, or through the Internet. You can order Applied Biosystems user documents, MSDSs, certificates of analysis, and other related documents 24 hours a day. In addition, you can download documents in PDF format from the Applied Biosystems Web site (please see the section “To Obtain Documents on Demand” following the telephone information below).

To Contact Technical Support by E-Mail

Contact technical support by e-mail for help in the following product areas:

Product Area	E-mail address
Genetic Analysis (DNA Sequencing)	galab@appliedbiosystems.com
Sequence Detection Systems and PCR	pclab@appliedbiosystems.com
Protein Sequencing, Peptide and DNA Synthesis	corelab@appliedbiosystems.com
Biochromatography, PerSeptive DNA, PNA and Peptide Synthesis systems, CytoFluor®, FMAT™, Voyager™, and Mariner™ Mass Spectrometers	tsupport@appliedbiosystems.com
LC/MS (Applied Biosystems/MDS Sciex)	apisupport@sciex.com or api3-support@sciex.com
Chemiluminescence (Tropix)	tropix@appliedbiosystems.com

Hours for Telephone Technical Support

In the United States and Canada, technical support is available at the following times:

Product	Hours
Chemiluminescence	8:30 a.m. to 5:30 p.m. Eastern Time
Framingham support	8:00 a.m. to 6:00 p.m. Eastern Time
All Other Products	5:30 a.m. to 5:00 p.m. Pacific Time

To Contact Technical Support by Telephone or Fax

In North America

To contact Applied Biosystems Technical Support, use the telephone or fax numbers given below. (To open a service call for other support needs, or in case of an emergency, dial **1-800-831-6844** and press **1**.)

Product or Product Area	Telephone Dial...	Fax Dial...
ABI PRISM® 3700 DNA Analyzer	1-800-831-6844 , then press 8	1-650-638-5981
DNA Synthesis	1-800-831-6844 , then press 21	1-650-638-5981
Fluorescent DNA Sequencing	1-800-831-6844 , then press 22	1-650-638-5981
Fluorescent Fragment Analysis (includes GeneScan® applications)	1-800-831-6844 , then press 23	1-650-638-5981
Integrated Thermal Cyclers (ABI PRISM®877 and Catalyst 800 instruments)	1-800-831-6844 , then press 24	1-650-638-5981
ABI PRISM® 3100 Genetic Analyzer	1-800-831-6844 , then press 26	1-650-638-5981
BioInformatics (includes BioLIMS®, BioMerge™, and SQL GT™ applications)	1-800-831-6844 , then press 25	1-505-982-7690
Peptide Synthesis (433 and 43X Systems)	1-800-831-6844 , then press 31	1-650-638-5981
Protein Sequencing (Procise® Protein Sequencing Systems)	1-800-831-6844 , then press 32	1-650-638-5981
PCR and Sequence Detection	1-800-762-4001 , then press 1 for PCR, 2 for the 7700 or 5700, 6 for the 6700 or dial 1-800-831-6844 , then press 5	1-240-453-4613
Voyager™ MALDI-TOF Biospectrometry and Mariner™ ESI-TOF Mass Spectrometry Workstations	1-800-899-5858 , then press 13	1-508-383-7855
Biochromatography (BioCAD® Workstations and Poros® Perfusion Chromatography Products)	1-800-899-5858 , then press 14	1-508-383-7855
Expedite™ Nucleic acid Synthesis Systems	1-800-899-5858 , then press 15	1-508-383-7855
Peptide Synthesis (Pioneer™ and 9050 Plus Peptide Synthesizers)	1-800-899-5858 , then press 15	1-508-383-7855
PNA Custom and Synthesis	1-800-899-5858 , then press 15	1-508-383-7855

Product or Product Area	Telephone Dial...	Fax Dial...
FMAT™ 8100 HTS System and Cytofluor® 4000 Fluorescence Plate Reader	1-800-899-5858 , then press 16	1-508-383-7855
Chemiluminescence (Tropix)	1-800-542-2369 (U.S. only), or 1-781-271-0045	1-781-275-8581
Applied Biosystems/MDS Sciex	1-800-952-4716	1-650-638-6223

Outside North America

Region	Telephone Dial...	Fax Dial...
Africa and the Middle East		
Africa (English Speaking) and West Asia (Fairlands, South Africa)	27 11 478 0411	27 11 478 0349
South Africa (Johannesburg)	27 11 478 0411	27 11 478 0349
Middle Eastern Countries and North Africa (Monza, Italia)	39 (0)39 8389 481	39 (0)39 8389 493
Eastern Asia, China, Oceania		
Australia (Scoresby, Victoria)	61 3 9730 8600	61 3 9730 8799
China (Beijing)	86 10 64106608	86 10 64106617
Hong Kong	852 2756 6928	852 2756 6968
Korea (Seoul)	82 2 593 6470/6471	82 2 593 6472
Malaysia (Petaling Jaya)	60 3 758 8268	60 3 754 9043
Singapore	65 896 2168	65 896 2147
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Belgium	32 (0)2 712 5555	32 (0)2 712 5516
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Denmark (Naerum)	45 45 58 60 00	45 45 58 60 01
Finland (Espoo)	358 (0)9 251 24 250	358 (0)9 251 24 243
France (Paris)	33 (0)1 69 59 85 85	33 (0)1 69 59 85 00
Germany (Weiterstadt)	49 (0) 6150 101 0	49 (0) 6150 101 101
Hungary (Budapest)	36 (0)1 270 8398	36 (0)1 270 8288
Italy (Milano)	39 (0)39 83891	39 (0)39 838 9492
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Poland, Lithuania, Latvia, and Estonia (Warszawa)	48 (22) 866 40 10	48 (22) 866 40 20
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South East Europe (Zagreb, Croatia)	385 1 34 91 927	385 1 34 91 840
Spain (Tres Cantos)	34 (0)91 806 1210	34 (0)91 806 1206
Sweden (Stockholm)	46 (0)8 619 4400	46 (0)8 619 4401
Switzerland (Rotkreuz)	41 (0)41 799 7777	41 (0)41 790 0676
The Netherlands (Nieuwerkerk a/d IJssel)	31 (0)180 331400	31 (0)180 331409
United Kingdom (Warrington, Cheshire)	44 (0)1925 825650	44 (0)1925 282502
All other countries not listed (Warrington, UK)	44 (0)1925 282481	44 (0)1925 282509

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Japan		
Japan (Hacchobori, Chuo-Ku, Tokyo)	81 3 5566 6230	81 3 5566 6507
Latin America		
Del.A. Obregon, Mexico	305-670-4350	305-670-4349

To Reach Technical Support Through the Internet

We strongly encourage you to visit our Web site for answers to frequently asked questions and for more information about our products. You can also order technical documents or an index of available documents and have them faxed or e-mailed to you through our site. The Applied Biosystems Web site address is

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

To submit technical questions from North America or Europe:

Step	Action
1	Access the Applied Biosystems Technical Support Web site.
2	Under the Troubleshooting heading, click Support Request Forms , then select the relevant support region for the product area of interest.
3	Enter the requested information and your question in the displayed form, then click Ask Us RIGHT NOW (blue button with yellow text).
4	Enter the required information in the next form (if you have not already done so), then click Ask Us RIGHT NOW . You will receive an e-mail reply to your question from one of our technical experts within 24 to 48 hours.

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General Description of the Model 392/394

The Applied Biosystems Model 392 and 394 DNA Synthesizers automate all steps of single stranded oligonucleotide synthesis. When used as a system including Applied Biosystems reagents and columns, these instruments produce the highest quality synthetic DNA currently attainable while minimizing synthesis time and cost.

The Model 392 and 394 use the phosphoramidite method of oligonucleotide synthesis because of its inherently high coupling efficiency and the stability of the starting materials. The synthesis begins with the 3' terminal nucleoside attached to a solid support, which is contained within a disposable column (the reaction chamber). Nucleotide bases are added one at a time to the support-bound DNA chain until the sequence is fully synthesized. Solid support synthesis allows excess reagents to be removed by filtration and eliminates the need for purification between base additions.

Applied Biosystems synthesizers use a pressure driven chemical delivery system to deliver reagents and solvents to the reaction column chamber. Reagent and solvent deliveries also rely on our patented *zero-dead volume* valves which increase reliability, eliminate cross-contamination and reduce reagent costs.

The Model 392 and 394 are controlled via menu-driven software. A four-line screen displays various options and necessary information about the syntheses or the status of the instrument. The synthesizers are fully programmable. Users can run pre-programmed protocols or can create custom cycles.

The Model 394 has an AutoAnalysis feature, optional on the Model 392, which allows on-line monitoring of trityls using the built-in conductivity detector provided with the feature. AutoAnalysis allows you to specify a threshold value below which the synthesis is interrupted. The interrupt feature will detect major coupling failures and execute a column interrupt. The AutoAnalysis interrupt threshold is not intended to be used as a detector of coupling efficiency, but rather as a way to prevent reagent consumption following a failed coupling.

Applied Biosystems has been perfecting the science of nucleic acid synthesis on automated instruments since 1982. The Model 392 and 394 are our most advanced instruments to date. The company's philosophy, however, is to provide researchers with complete systems, not just instruments. Our DNA synthesis "system" includes instruments, chemicals, service and technical support.

All of our chemicals are purified and rigorously analyzed to ensure high yield synthesis. Each phosphoramidite, column reagent, and solvent manufactured at Applied Biosystems is unconditionally guaranteed. If you are not completely satisfied by the product (and it is used prior to any applicable expiration date and under the correct operating conditions), it will be replaced at no charge.

Applied Biosystems also maintains a large staff of fully trained service engineers strategically located around the world. In addition, technical experts are available to answer any questions about DNA synthesis, analysis, and purification.

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