Finnigan™ Micro AS Autosampler

Hardware Manual

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Finnigan Micro AS Serial # _____ **Date Purchased** _____

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- ❑ Government lab
- ❑ Hospital / Clinic
- ❑ Research Institute
- ❑ University / College
- ❑ Veterinary
- ❑ Other _____

Job Function: (Check one only)

- ❑ Administration
- ❑ Lab Management
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- ❑ Other _____

My Primary Application Is: (Check one only)

- ❑ Analytical
- ❑ Biomedical
- ❑ Clinical / Toxicology
- ❑ Energy
- ❑ Food / Agriculture
- ❑ Forensic / Toxicology
- ❑ Pharmaceutical
- ❑ Research / Education
- ❑ Other _____

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Finnigan Micro AS Autosampler Hardware Manual — *Revision A 97255-97001*

	Strongly Agree	Agree	Disagree	Strongly Disagree
The manual is well organized.	1	2	3	4
The manual is clearly written.	1	2	3	4
The manual contains all of the information I need.	1	2	3	4
The instructions are easy to follow.	1	2	3	4
The instructions are complete.	1	2	3	4
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I was able to operate the system by using this manual. (If not, please comment below.)	1	2	3	4

Additional Comments: (Attach additional sheets if necessary.)

_____
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Tear this sheet from the manual, fold it closed, stamp it, and drop it in the mail.

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Regulatory Compliance

Thermo Electron San Jose performs complete testing and evaluation of its products to ensure full compliance with applicable domestic and international regulations. When your system is delivered to you, it meets all pertinent electromagnetic compatibility (EMC) and safety standards as follows:

CE Declaration of Conformity

Declaration is in conformity with the following documents:
EEC Directives 89/336, 92/31, and 93/68 EMC Requirements, applied with the following standards:
EN 61326-1 (1997) and A1 (1998) EMC Requirements for electrical equipment for measurement, control, and laboratory use, as follows.

EN55011:1998	Conducted emission - Class B
EN55011:1998	Radiated emission - Class B
EN61000-3-2:1995	Harmonic current emissions
EN61000-3-3:1995	Limitation of voltage fluctuations

EMC issues have been evaluated by KEMA - The Netherlands.

Safety Compliance
EEC Directives 89/392, 91/368, 93/44: Machine Safety
EEC Directives 72/23, 93/68: Low Voltage Directive, applied with standard EN61010-1- Safety Requirements for Laboratory Equipment

Safety issues have been evaluated by KEMA - The Netherlands.

In addition to CE compliance (as per above), the Finnigan Micro AS autosampler has been evaluated by UL International (The Netherlands) to Safety Standard UL61010A-1; hence, the product is hereby authorized to carry the UL and cUL Marks.

Please be aware that any changes that you make to your system may void compliance with one or more of these EMC and/or safety standards.
Making changes to your system includes replacing a part. Thus, to ensure continued compliance with EMC and safety standards, replacement parts should be ordered from Thermo Electron or one of its authorized representatives.

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FCC Compliance Statement

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy. If it is not installed and used in accordance with the instruction manual, it may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference. In this case, the user will be required to correct the interference at his/her own expense.

Notice on Lifting and Handling of Thermo Electron San Jose Instruments

For your safety, and in compliance with international regulations, the physical handling of this Thermo Electron San Jose instrument ***requires a team effort*** for lifting and/or moving the instrument. This instrument is too heavy and/or bulky for one person alone to handle safely.

Notice on the Proper Use of Thermo Electron San Jose Instruments

In compliance with international regulations: If this instrument is used in a manner not specified by Thermo Electron San Jose, the protection provided by the instrument could be impaired.

Contents

Read This First

Welcome to the Thermo Electron Finnigan™ Micro AS autosampler! The MicroAS is a member of the Finnigan family of LC instruments.

This **Finnigan Micro AS Autosampler Hardware Manual** provides you with information on how to install, operate, maintain, and troubleshoot your autosampler.

The **Finnigan Micro AS Autosampler Hardware Manual** includes the following chapters:

Chapter 1: Introduction describes the principal components of the Finnigan Micro AS autosampler and their functions.

Chapter 2: Installation describes how to install the Finnigan Micro AS autosampler.

Chapter 3: Preparing for Use provides information on how to connect tubing, install syringes and needles, and perform other procedures needed to prepare the Finnigan Micro AS for an experimental run.

Chapter 4: I/O Connections describes the output and input connectors that allow the Finnigan Micro AS autosampler to communicate with the datasystem computer, trigger external devices, or be triggered by external devices.

Chapter 5: Test Procedures contains procedures for testing the performance of the Finnigan Micro AS autosampler.

Chapter 6: Maintenance includes procedures for routine maintenance.

Chapter 7: Troubleshooting lists error codes displayed by the autosampler. It also contains procedures for diagnosing and fixing common problems.

Chapter 8: Parts and Accessories lists consumable and replaceable parts that you can order for the Finnigan Micro AS autosampler.

Appendix A: Introduction to Keypad Operation introduces the operation of the autosampler from the front keypad, and provides several programming examples.

Appendix B: Keypad Menu Reference describes the functions of the menus and options accessible from the front keypad of the autosampler.

Appendix C: Programming Reference Chart provides a quick reference chart of all the menus and options accessible from the front keypad.

Appendix D: Specifications details the instrument specifications.

Appendix E: Logbooks contains sample logbook pages that you can photocopy and use for keeping records of your methods, templates, and programs.

Changes to the Manual and Online Help

To suggest changes to this manual or the online Help, please send your comments to:

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You are encouraged to report errors or omissions in the text or index. Thank you.

Abbreviations

The following abbreviations are used in this and other manuals and in the online Help.

A	ampere
ac	alternating current
ADC	analog-to-digital converter
AP	acquisition processor
APCI	atmospheric pressure chemical ionization
API	atmospheric pressure ionization
ASCII	American Standard Code for Information Interchange
b	bit
B	byte (8 b)
baud rate	data transmission speed in events per second
°C	degrees Celsius
CD	compact disc
CD-ROM	compact disc read-only memory
cfm	cubic feet per minute
CI	chemical ionization
CIP	carriage and insurance paid to
cm	centimeter
cm^3	cubic centimeter
CPU	central processing unit (of a computer)
CRC	cyclic redundancy check
CRM	consecutive reaction monitoring
<Ctrl>	control key on the terminal keyboard
d	depth
Da	dalton
DAC	digital-to-analog converter
dc	direct current
DDS	direct digital synthesizer
DEP™	direct exposure probe
DS	data system
DSP	digital signal processor

EI	electron ionization
EMBL	European Molecular Biology Laboratory
<Enter>	enter key on the terminal keyboard
ESD	electrostatic discharge
ESI	electrospray ionization
eV	electron volt
f	femto (10^{-15})
°F	degrees Fahrenheit
.fasta file	extension of a SEQUEST search database file
FOB	free on board
ft	foot
FTP	file transfer protocol
g	gram
G	giga (10^{9})
GC	gas chromatograph; gas chromatography
GC/MS	gas chromatograph / mass spectrometer
GND	electrical ground
GPIB	general-purpose interface bus
GUI	graphical user interface
h	hour
h	height
HPLC	high-performance liquid chromatograph
HV	high voltage
Hz	hertz (cycles per second)
ICIS™	Interactive Chemical Information System
ICL™	Instrument Control Language™
ID	inside diameter
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
in.	inch
I/O	input/output
k	kilo (10^{3}, 1000)
K	kilo (2^{10}, 1024)
KEGG	Kyoto Encyclopedia of Genes and Genomes
kg	kilogram

l	length
L	liter
LAN	local area network
lb	pound
LC	liquid chromatograph; liquid chromatography
LC/MS	liquid chromatograph / mass spectrometer
LED	light-emitting diode
µ	micro (10^{-6})
m	meter
m	milli (10^{-3})
M	mega (10^{6})
M+	molecular ion
MB	Megabyte (1 048 576 bytes)
MH+	protonated molecular ion
min	minute
mL	milliliter
mm	millimeter
MS	mass spectrometer; mass spectrometry
MS	MS^n power: where n = 1
MS/MS	MS^n power: where n = 2
MS^n	MS^n power: where n = 1 through 10
m/z	mass-to-charge ratio
n	nano (10^{-9})
NCBI	National Center for Biotechnology Information (USA)
NIST	National Institute of Standards and Technology (USA)
OD	outside diameter
Ω	ohm
p	pico (10^{-12})
P	poise (unit of dynamic viscosity)
Pa	pascal
PCB	printed circuit board
PID	proportional / integral / differential
P/N	part number

P/P	peak-to-peak voltage
ppm	parts per million
psig	pounds per square inch, gauge
RAM	random access memory
RF	radio frequency
RMS	root mean square
ROM	read-only memory
RS-232	industry standard for serial communications
s	second
SIM	selected ion monitoring
solids probe	direct insertion probe
SRM	selected reaction monitoring
SSQ®	single stage quadrupole
TCP/IP	transmission control protocol / Internet protocol
TIC	total ion current
Torr	torr
TSQ®	triple stage quadrupole
u	atomic mass unit
URL	uniform resource locator
V	volt
V ac	volts alternating current
V dc	volts direct current
vol	volume
w	width
W	watt
WWW	World Wide Web

Note. Exponents are written as superscripts. In the corresponding online Help, exponents are sometimes written with a caret (^) or with *e* notation because of design constraints in the online Help. For example:

MS^n (in this manual) MS^n (in the online Help)

10^5 (in this manual) 10^5 (in the online Help)

Typographical Conventions

Typographical conventions have been established for Thermo Electron San Jose manuals for the following:

- Data input
- Boxed information
- Topic headings

Data Input

Throughout this manual, the following conventions indicate data input and output via the computer:

- Messages displayed on the screen are represented by capitalizing the initial letter of each word and by italicizing each word.
- Input that you enter by keyboard is represented in **bold face letters**. (Titles of topics, chapters, and manuals also appear in bold face letters.)
- For brevity, expressions such as "choose **File > Directories**" are used rather than "pull down the File menu and choose Directories."
- Any command enclosed in angle brackets < > represents a single keystroke. For example, "press **<F1>**" means press the key labeled *F1*.
- Any command that requires pressing two or more keys simultaneously is shown with a plus sign connecting the keys. For example, "press **<Shift> + <F1>**" means press and hold the <Shift> key and then press the <F1> key.
- Any button that you click on the screen is represented in bold face letters and a different font. For example, "click on **Close**".

The following conventions are used to indicate data input using the keypad of the autosampler:

- Names of menus are indicated in initial capital letters. For example, "Ready Menu".
- Names of soft function keys are written in capital letters and enclosed in angle brackets < >. For example, "press <METHODS>" means press the soft function key with the label "METHODS" appearing above it on the display.
- Names of fixed keys in the keypad are represented in **bold face letters**. (Titles of topics, chapters, and manuals also appear in bold face letters.)
- Values that you enter using the numerical keypad are enclosed in square brackets [ ].
- The arrow keys on the front keypad of the autosampler are represented by the following characters: →←↑↓.

Boxed Information

Information that is important, but not part of the main flow of text, is displayed in a box such as the one below.

> **Note**. Boxes such as this are used to display information.

Boxed information can be of the following types:

- **Note** – information that can affect the quality of your data. In addition, notes often contain information that you might need if you are having trouble.
- **Tip** – helpful information that can make a task easier.
- **Important** – critical information that can affect the quality of your data.
- **Caution** – information necessary to protect your instrument from damage.
- **CAUTION** – hazards to human beings. Each CAUTION is accompanied by a CAUTION symbol. Each hardware manual has a blue CAUTION sheet that lists the CAUTION symbols and their meanings.
- **DANGER** – laser-related hazards to human beings. It includes information specific to the class of laser involved. Each DANGER is accompanied by the international laser radiation symbol.

Topic Headings

The following headings are used to show the organization of topics within a chapter:

Chapter 1
Chapter Name

1.2 Second Level Topics

Third Level Topics

Fourth Level Topics

Fifth Level Topics

Safety Precautions

Observe the following safety precautions when you operate or perform service on the autosampler.

Do Not Perform Any Servicing Other Than That Contained in the Finnigan Micro AS Hardware Manual.

To avoid personal injury or damage to the instrument, do not perform any servicing other than that contained in the **Finnigan Micro AS Hardware Manual** or related manuals unless you are qualified to do so.

Shut Off the Autosampler and Disconnect It From Line Power Before You Service It.

Disconnect the Finnigan Micro AS autosampler from all power sources before removing protective panels. Do not operate the instrument with panels removed.

Take Precautions Against Electric Shock.

Check that the actual power voltage is the same as the voltage for which the Finnigan Micro AS is wired. Make sure power cords are connected to correct voltage sources. Replace or repair power cords with faulty insulation.

Always replace blown fuses with fuses of the size and rating indicated on the fuse panel and holder.

The Finnigan Micro AS must be used only with appliances and power sources with proper protective grounding.

Handle Solvents Safely.

Do not allow flammable and/or toxic solvents to accumulate. Follow a regulated, approved waste disposal program. Never dispose of flammable and/or toxic solvents through the municipal sewage system.

Check solvent lines periodically for leaks.

Service Philosophy

Servicing the Finnigan Micro AS system consists of performing procedures required to maintain system performance standards, to prevent system failure, and/or to restore the system to an operating condition. Routine and preventive maintenance procedures are documented in this manual.

Routine and preventive maintenance are the responsibility of the user during and after the warranty period. Regular maintenance will increase the life of the system, maximize the up-time of your system, and allow you to achieve optimum system performance.

Service not described in this manual should be performed only by a Thermo Electron Customer Support Engineer or similarly trained and qualified technical personnel.

Level of Repair

Thermo Electron's service philosophy for the Finnigan Micro AS system calls for troubleshooting to the lowest part, assembly, PCB, or module listed in the **Replaceable Parts** chapter of this manual.

For mechanical failures: A mechanical assembly typically is to be repaired to the level of the smallest item listed in the **Replaceable Parts** chapter of this manual.

For electronic failures: PCBs are not repaired to the component level except in certain cases of fuses, relays, etc. When these exceptions occur, the components can be found in the **Replaceable Parts** chapter.

Reply Cards

Thermo Electron San Jose manuals contain one or two reply cards. All manuals contain a Customer Registration / Reader Survey card and some contain a Change of Location card. These cards are located at the front of each manual.

The Customer Registration / Reader Survey card has two functions. First, when you return the card, you are placed on the Thermo Electron San Jose mailing list. As a member of this list, you receive application reports and technical reports in your area of interest, and you are notified of events of interest, such as user meetings. Second, it allows you to tell us what you like and do not like about the manual.

The Change of Location card allows us to track the whereabouts of the instrument. Fill out and return the card if you move the instrument to another site within your company or if you sell the instrument. Occasionally, we need to notify owners of our products about safety or other issues.

Chapter 1
Introduction

Welcome to the Thermo Electron, Finnigan™ Micro AS autosampler! The Micro AS autosampler is a member of the Finnigan family of LC devices.

The Finnigan Micro AS autosampler offers a wide variety of capabilities for HPLC. It is designed for routine analysis and method development, and is fully compatible with a variety of plate types and with other laboratory equipment. The Finnigan Micro AS features four injection methods: full loop injection, partial loopfill injection, and two types of µL pickup injections. (Refer to **Injection Methods** on page 1-9 for more information.)

This chapter describes the parts of the Finnigan Micro AS autosampler and their functions. This chapter contains the following sections:

- Autosampler Components
- Injection Methods

1.1 Autosampler Components

Figure 1-1 illustrates the components visible from the front view of the Finnigan Micro AS autosampler.

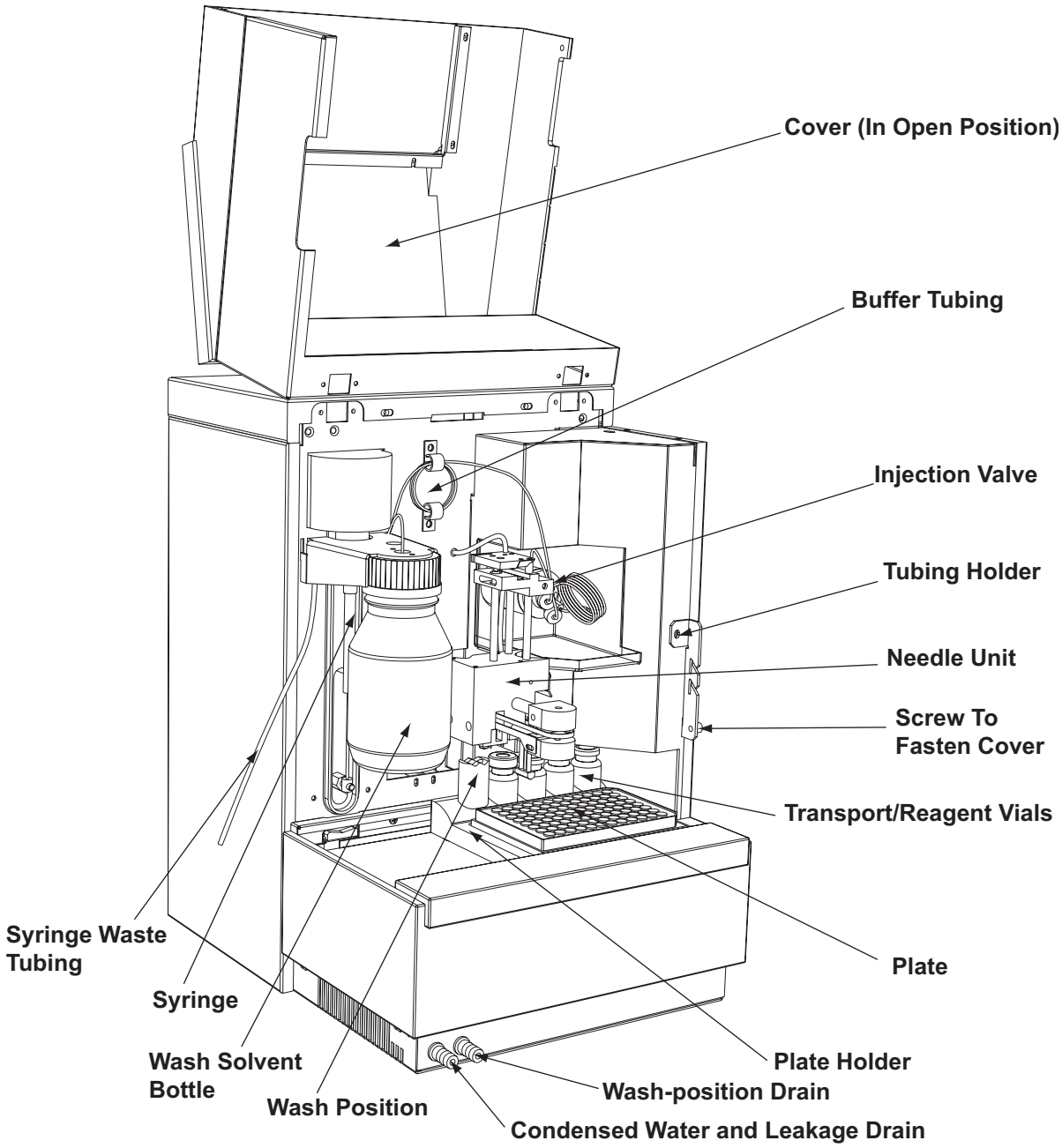


Figure 1-1. Front view of the Finnigan Micro AS autosampler

The major components of the autosampler are as follows:

- Injection System
- Plate holder
- Back panel
- Keypad and Display

Injection System

The major components of the injection system are as follows:

- Syringe
- Needle unit
- Buffer tubing
- Injection valve
- Sample loop
- Wash position

Syringe

The Finnigan Micro AS autosampler is equipped with a 25 µL syringe.

Needle Unit

The needle used for sampling consists of two parts:

- A prepuncturing needle, which is a hollow needle used for puncturing of the septum, capmat or sealer covering the sample vials or wells. The prepuncturing needle can also be used to apply headspace pressure of approximately 0.5 bar (7.25 psi) to the sample.
- A sample needle, which is placed inside the hollow prepuncturing needle and used for the actual transport of sample.

> **Note**. Most commercially available sealers or capmats cannot be used in combination with headspace pressure. Switch off headspace pressure (in the General Menu) when using non-compatible sealers or capmats.

A sensor on the end of the needle assembly detects the presence or absence of plates or vials and automatically determines plate height.

Buffer Tubing

The buffer tubing connects the syringe to port 3 of the injection valve. The buffer tubing prevents contamination of the syringe by sample. (For more information on the role of the buffer tubing during injections, refer to **Injection Methods** on page 1-9.)

The standard buffer tubing supplied with the Finnigan Micro AS autosampler has a volume of 50 µL.

Injection Valve

The Finnigan Micro AS is equipped with a Valco C2-1346 injection valve. The valve controls the loading of sample onto the column through the sample loop. The valve supports four injection modes: full loop injection, partial loopfill injection, µL pick-up injection, and µL pick-up (qualitative analysis) injection. For more information on these injection methods and the operation of the valve, refer to **Injection Methods** on page 1-9.

Sample Loop

The sample loop is a length of PEEK™ tubing connected between port 2 and port 5 of the injection valve. During an injection, the sample is drawn into the sample loop when the injection valve is in the Load position, and pushed onto the column when the injection valve is in the Inject position.

The Finnigan Micro AS is equipped with a 20 µL sample loop. Depending on the volume of sample you wish to inject, you might need to use a smaller sample loop. Refer to **Choosing the Sample Loop** on page 3-6 for information on choosing the correct size of sample loop for your application.

Wash Position

The wash position is the home position of the needle assembly. The needle returns to this position between runs or when a wash step is programmed. During a wash, the white plastic receptacle collects the wash liquid and channels it to the waste outlet.

Plate Holder

The Finnigan Micro AS accommodates the following types of plates:

- 96 low wells
- 96 high wells
- 384 low wells
- 48 vials

The back of the plate holder contains four slots that can hold 10 mL (22 mm x 47 mm) vials. These vials can be used to hold either reagents to be mixed with samples prior to injection, or transport liquid used to transport the sample into the sample loop during µL pick-up injections.

Back Panel

Figure 1-2 illustrates the back panel of the Finnigan Micro AS autosampler.

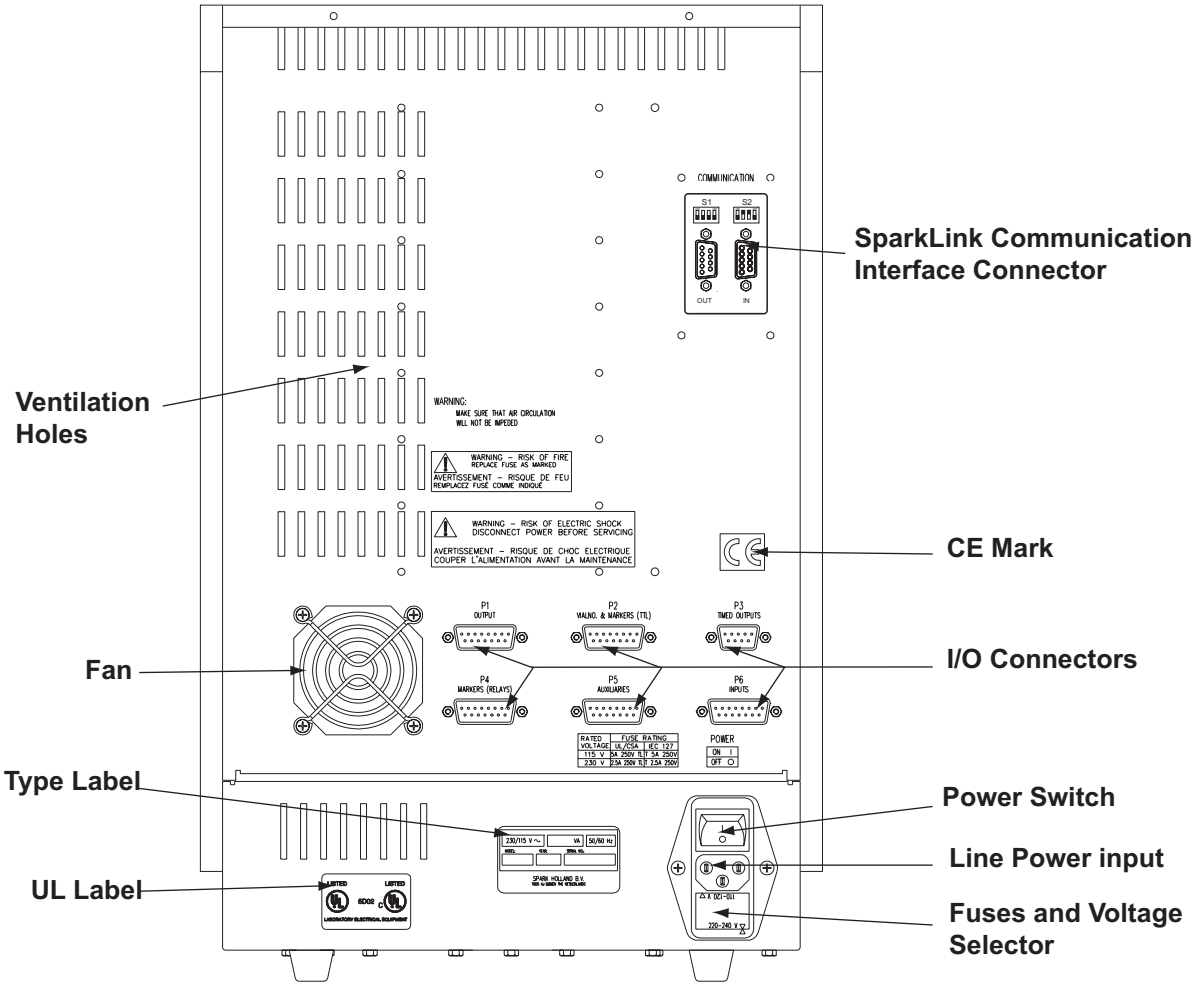


Figure 1-2. Back of the Finnigan Micro AS autosampler

The back panel of the autosampler contains the following major components:

- Communications and I/O Connectors
- Power Switch and Line Power Input
- Fuses and voltage selector

Communications and I/O Connectors

The Finnigan Micro AS autosampler has two nine-pin connectors located in the upper right area of the back panel. See Figure 1-2. The right-hand connector (marked 'IN') is used to connect the Finnigan Micro AS to the data system computer. The left-hand connector (marked 'OUT') is not used with Xcalibur 1.4 and ProteomeX 2.0.

Six I/O connectors (5 output connectors and one input connector) are located on the back panel of the Finnigan Micro AS. See Figure 1-2. The output connectors can be used to trigger external devices from the Finnigan Micro AS. The input connector allows signals from an external device to trigger actions by the Finnigan Micro AS autosampler.

For more information on the configuration of the I/O connectors, refer to **Chapter 4: I/O Connections**.

Power Switch and Line Power Input

The power switch is used to turn power to the autosampler on and off. The autosampler power cord plugs into the line power input. The Finnigan Micro AS autosampler can operate using either 115 V ac ± 10% or 230 V ac ± 10%. Make sure that the voltage selector is set correctly and the correct fuses are installed for the voltage at which you intend to operate the autosampler. For more information on the voltage selector and fuses, refer to **Fuses and Voltage Selector** on page 1-6.

Fuses and Voltage Selector

Two fuses are located behind a covering plate beneath the line power input. These fuses protect the autosampler circuitry from current overloads. The type of fuse required depends on your operating voltage. The correct fuses for your operating voltage are installed in the autosampler before it is shipped to you. The required fuse types are:

115 V ac: Two 5.0 AT-fuses (0.25 in. × 1.25 in., UL/CSA)

230 V ac: Two 2.5 AT-fuses (5 mm × 20 mm, IEC 127)

The fuse cover plate also indicates the current operating voltage. The current operating voltage is the one displayed right-side up at the bottom of the plate. (The voltage not currently in use is printed upside down at the top of the plate.) If you want to change the operating voltage, you need to remove the plate, change the fuses to the appropriate ones for the new voltage, and reinstall the plate in the opposite orientation. For more information on changing fuses, refer to **Replacing Fuses** on page 6-5.

Keypad and Display of the Finnigan Micro AS

Under most circumstances, you control the Finnigan Micro AS autosampler using the ProteomeX and Xcalibur software installed on your data system computer. Refer to the **Finnigan ProteomeX Operator's Manual** for more information on this software. You can also operate and program the Finnigan Micro AS using the front keypad and display. Figure 1-3 illustrates the keypad and display of the Finnigan Micro AS.

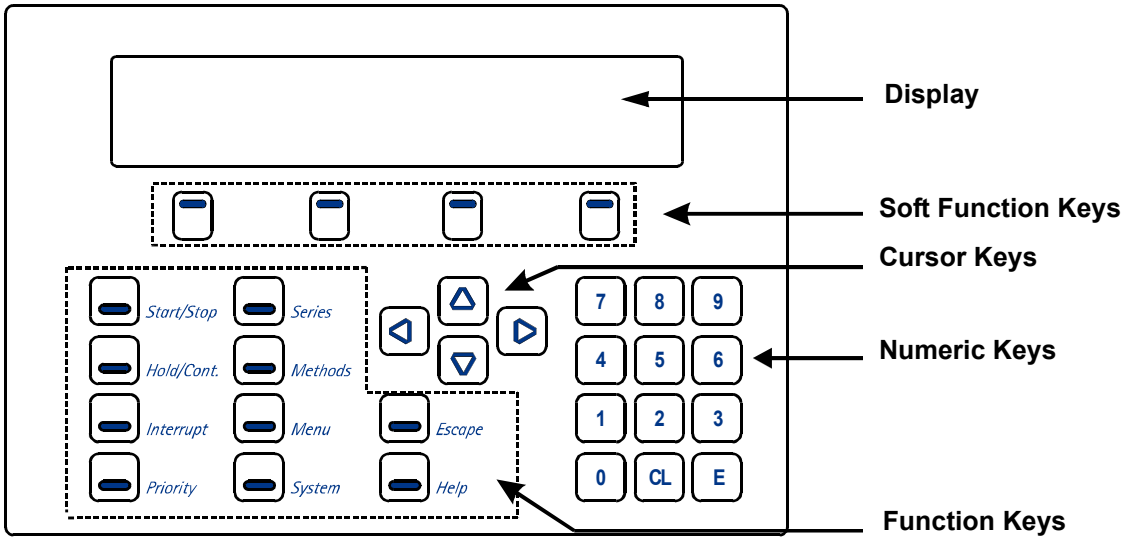


Figure 1-3. Keypad and display of Finnigan Micro AS Autosampler

The functions of the keys are as follows:

Soft function keys: the label assigned to these keys depends on the menu that is active. The label of each key is shown in the bottom line of the display.

Cursor keys: can be used to move to a different field in the display, to move to a different field in a menu, or to make a displayed value higher or lower.

Numeric keys:

- **0** to **9**: to enter numerals in the various programming fields.
- **CL**: to clear a value in a field or replace it by NONE or AUTO.
- **E** stands for Enter; to go through menu lines or to confirm a choice made in a menu or a value entered. The entered value is checked for validity and then saved.

Function keys:

Run control keys:

- **Start/Stop**: to start or stop automatic processing, or to reset the system after an error has occurred.
- **Hold/Cont**.: to hold or continue the analysis time. The analysis time is extended by the period that Hold is active.
- **Interrupt**: not used
- **Priority**: to stop a run to process a priority sample before analyzing the rest of the programmed sample series. Before the run is interrupted processing of the present sample will be finished. As soon as the priority sample has been analyzed, the analytical run is resumed. A priority sample is a series of one well with an injection method, a wash method and a time base method defined in a template. Priority samples may only be run if the correct settings have been entered in the System Menu.

Programming keys (Refer to **Appendix A: Introduction to Keypad Operation** and **Appendix B: Keypad Menu Reference** for more information.):

- **Series**: to enter the Series Menu in which series can be defined for an analytical run.
- **Methods**: to enter the Methods Menu in which methods can be programmed for use in an analytical run.
- **Menu**: this key can only be used if [MENU] or [MN] is shown in the top right hand corner of the display. Press this key to display additional menu choices.
- **System**: to enter the System Menu in which system settings can be entered.

General keys:

- **Escape**: allows the user to leave the programming mode or go to a previous level in the menu. Entered values are checked for validity and then saved.
- **Help**: to display help information. Help is available only for a limited number of functions.

1.2 Injection Methods

This section describes the injection methods offered by the Finnigan Micro AS autosampler. The autosampler offers four injection methods:

- Full loop injection
- Partial loopfill injection
- µL pick-up injection
- µL pick-up (qualitative analysis) injection

> **Note**. The µL pick-up (qualitative analysis) injection mode is available only when you control the Finnigan Micro AS from your data system computer using the instrument control software. This injection mode cannot be programmed from the autosampler front keypad.

Table 1-1 summarizes the features of the four injection methods.

Table 1-1. Finnigan Micro AS autosampler injection methods

	Full loop	**Partial loopfill**	**µL pick-up**	**µL pick-up (qualitative analysis)**
Description	The sample loop is completely filled.	The sample loop is partially filled.	A small volume of sample is transported into the sample loop by aspiration of transport liquid (mobile phase)	A small volume of sample is transported into the sample loop by aspiration of transport liquid (mobile phase)
Permitted injection volume	Sample loop volume	0.01 µL up to 50% of sample loop volume	0.01 µL up to (sample loop volume - 3 × needle tubing volume)/2	Sample loop volume
Sample Loss	Sample loss = 2 × loop volume + flush volume	Sample loss = flush volume	No sample loss	No sample loss
Reproducibility	Maximum reproducibility. Relative Standard Deviation (RSD) < 0.3%	RSD < 0.5%	RSD < 1%	Not determined
Accuracy	±10% (accuracy of sample loop volume)	Maximum accuracy. Accurancy depends on syringe accuracy.	Maximum accuracy. Accuracy depends on syringe accuracy.	Maximum accuracy. Accuracy depends on syringe accuracy.

The Finnigan Micro AS uses a syringe to aspirate sample from a well into the sample loop. To prevent contamination of the syringe the Finnigan Micro AS is equipped with a buffer tubing between the syringe and the injection valve. Wash solvent is used to remove sample from the buffer tubing and sample needle, and to rinse the buffer tubing and sample needle.

For an overview of the fluid connections of the Finnigan Micro AS, see Figure 1-4.

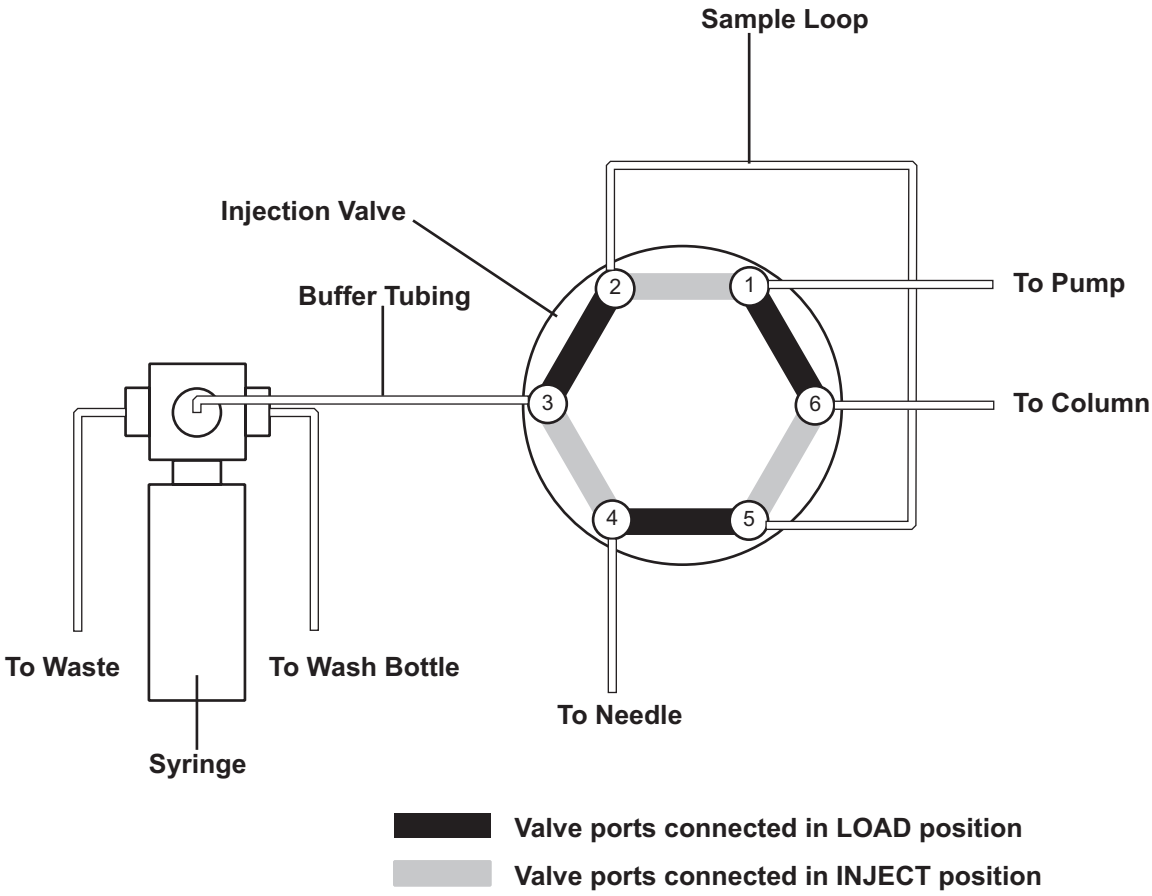


Figure 1-4. Fluid connections of the Finnigan Micro AS autosampler

Full Loop Injection

In a full loop injection, the syringe aspirates sufficient sample to overfill the sample loop. The overfilling of the sample loop ensures that it is completely filled with pure sample. The full contents of the loop are expelled onto the column when the sample is injected.

Because the sample loop volume determines the injection volume, full loop injections are highly reproducible. However, because the volume of the sample loop is only specified to within 10%, they are less accurate than injections made by other methods. The injection volume cannot be varied over the course of a run. Full loop injections also require relatively large sample losses: the sample lost is equal to the loop overfill volume plus the flush volume. (Refer to Table 1-1 for more details.)

Use the full loop injection method if:

- You have relatively large amounts of sample.
- You need maximum reproducibility.
- You do not need to vary injection volume over the course of a run.

The switching sequence for a full loop injection is as follows:

1. The injector starts in the INJECT position. The sample needle enters the well after the air needle prepunctures the septum. Headspace pressure is applied through the outer air needle to ensure that no air or vapor bubbles are formed during sample aspiration.

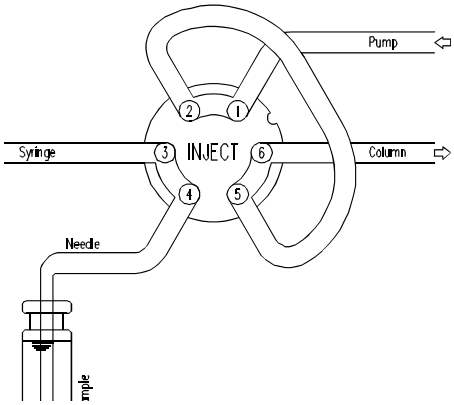


Figure 1-5. Full loop injection: injection valve in the initial state

2. The syringe dispenser aspirates the programmed flush volume from the sample well to fill the sample line with sample and remove wash solvents.

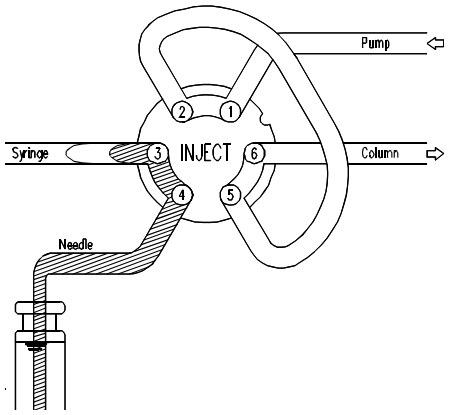


Figure 1-6. Full loop injection: injection valve after aspiration of flush volume

3. The injection valve switches to the LOAD position, placing a "sharp" sample front at the inlet of the sample loop.

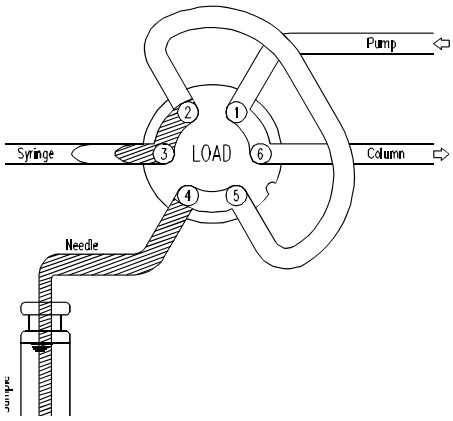


Figure 1-7. Full loop injection: injection valve in the LOAD position and ready to draw sample from the vial

4. For full loop injections the sample loop is quantitatively filled by transporting three times the loop volume through the loop.

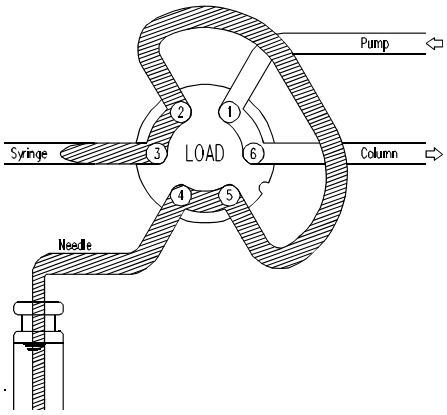


Figure 1-8. Full loop injection: injection valve after the sample loop has been filled

5. The injection valve switches to the INJECT position. The sample loop is now part of the HPLC mobile phase flow path; sample is transported to the column. The analysis time starts.

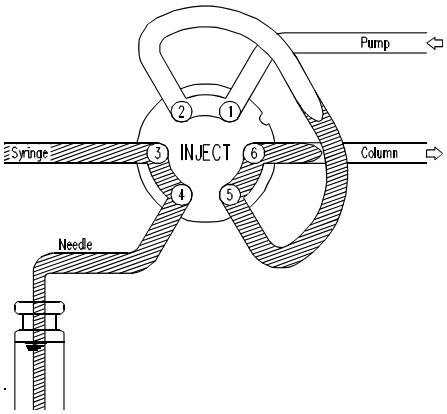


Figure 1-9. Full loop injection: injection valve as sample is injected onto the column

If only one injection is to be done from each well, or if a wash routine has been programmed to execute after every injection, the needle withdraws from the well immediately after the injection. If a wash is programmed, the autosampler immediately performs a wash. After the analysis time has passed, a new sequence is started.

If more than one injection is done from the same well without a wash between injections, the Finnigan Micro AS withdraws a flush volume after the analysis time is complete to compensate for diffusion of mobile phase from the rotor

groove into the first part of the sample line during the analysis time. The flush volume between injections is always 50% of the programmed flush volume. If the total amount of sample withdrawn with the next injection from the well will exceed the total volume of the buffer tubing, the buffer tubing is emptied into the wash position before the next injection. The next fill sequence then starts with a full flush volume.

An air segment can be used to reduce the amount of flush volume (see Figure 1-10). During a full loop injection, the air segment is aspirated in front of the flush volume. The air segment is not injected onto the column and does not influence the injection. Use of an air segment can be enabled in the General Menu.

With the default 2.4 µL needle, the minimum programmable flush volume is 0 µL for injections. You might experience decreased performance if you use a flush volume of less than twice the needle tubing volume. If your samples are highly viscous, you might need to program larger flush volumes and reduce the syringe speed for better performance.

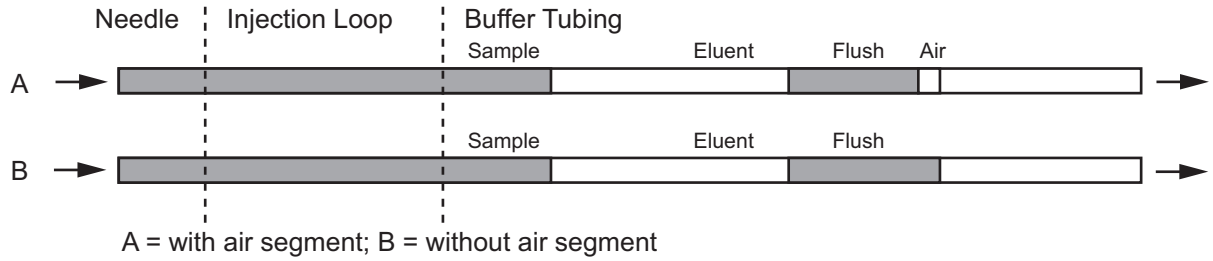


Figure 1-10. Sample path for full loop injection, with and without air segment

Partial Loopfill Injection

In a partial loopfill injection, the sample loop is not filled completely. Only the desired injection volume of sample, which must be equal to or less than 50% of the sample loop volume, is drawn into the loop.

Partial loopfill injections allow the injection volume to be varied over the course of a run. They also require less sample loss than full loop injections: sample loss is equal to the flush volume. Partial loopfill injections offer greater accuracy than full loop injections, but decreased reproducibility.

Use the partial loopfill injection method if:

- You need to vary injection volumes over the course of a run.
- You need maximum accuracy.

The switching sequence for a partial loopfill injection is as follows:

1. The injector starts in the INJECT position. The sample needle enters the well after the air needle prepunctures the septum. Headspace pressure is

applied through the outer air needle to ensure that no air or vapor bubbles are formed during sample aspiration.

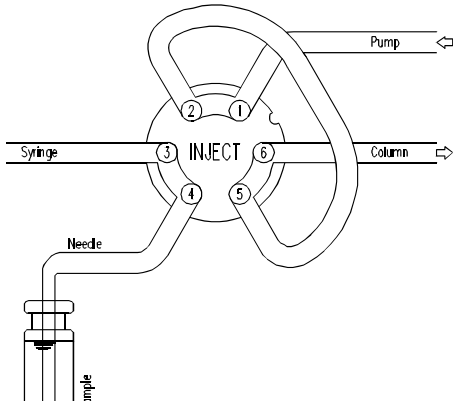


Figure 1-11. Partial loopfill injection: injection valve in the initial state

2. The syringe dispenser aspirates the programmed flush volume from the sample well to fill the sample line with sample and remove wash solvents.

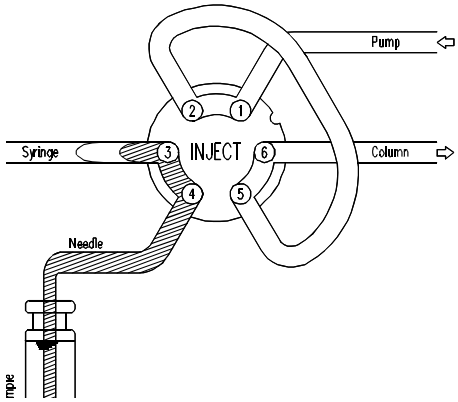


Figure 1-12. Partial loopfill injection: injection valve after aspiration of flush volume

3. The injection valve switches to the LOAD position, placing a "sharp" sample front at the inlet of the sample loop.

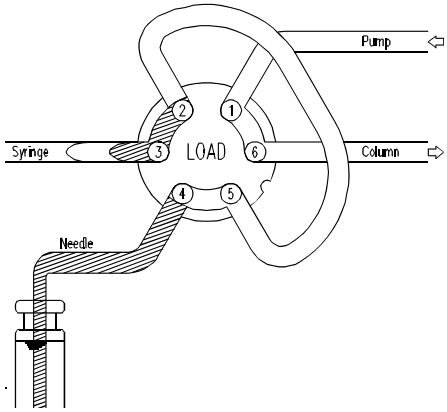


Figure 1-13. Partial loopfill injection: injection valve in the LOAD position and ready to draw sample from the vial

4. For partial loopfill injections the sample loop is filled by transporting the programmed injection volume into the sample loop.

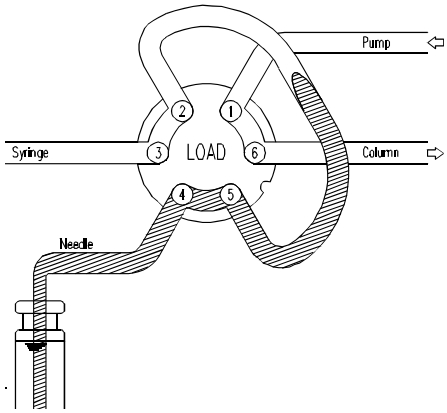


Figure 1-14. Partial loopfill injection: injection valve as sample is drawn into the loop

5. The injection valve switches into the INJECT position. The sample loop is now part of the HPLC mobile phase flow path; the sample is transported to the column. The analysis time starts.

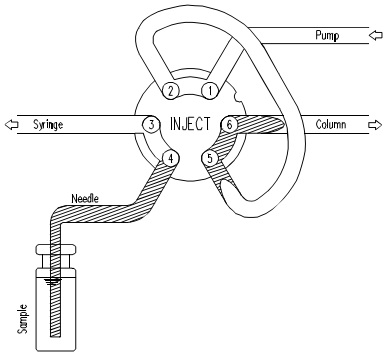


Figure 1-15. Partial loopfill injection: injection valve as sample is injected onto the column

If the next injection is to be performed from the same well, and no wash step is programmed, the next injection sequence begins with a flush of half the programmed flush volume. Otherwise, the next injection sequence begins with a flush of the programmed flush volume.

> **Note**. Use of a flush volume of less than twice the volume of needle tubing might result in decreased performance.

An air segment can be used to reduce the amount of flush volume (see Figure 1-16). This air segment is at the front of the flush volume and is not injected. Use of an air segment can be enabled in the General Menu.

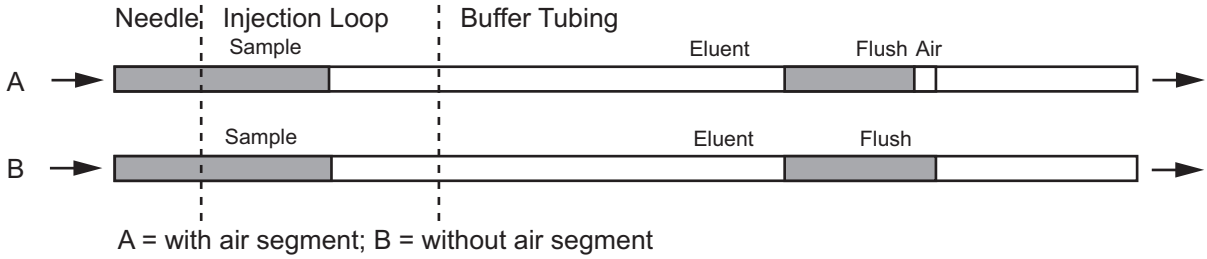


Figure 1-16. Sample path for partial loopfill injection, with and without air segment

µL Pick-up

In a µL pick-up injection, the syringe aspirates a very small amount of sample and transports it into the sample loop by aspirating an appropriate volume of transport liquid. The transport liquid should be the same as the mobile phase, to avoid disturbing the chromatogram with extra solvent peaks.

µL pick-up injections allow injections of very small volumes with no sample loss. They offer accuracy equal to that of partial loopfill injections, but have the lowest reproducibility of the three available injection methods.

Use the µL pick-up injection method if:

- You have a relatively small amount of sample and need to minimize sample loss.
- You need to inject very small volumes.

The switching sequence for a µL pick-up injection is as follows:

1. The injection valve starts in the INJECT position. The sample needle enters the vial of transport liquid (mobile phase, to avoid disturbance of the chromatogram with an additional peak of the transport solvent) after the air needle prepunctures the septum. The headspace pressure is applied through the outer air needle to ensure that no air or vapor bubbles are formed during solvent aspiration.

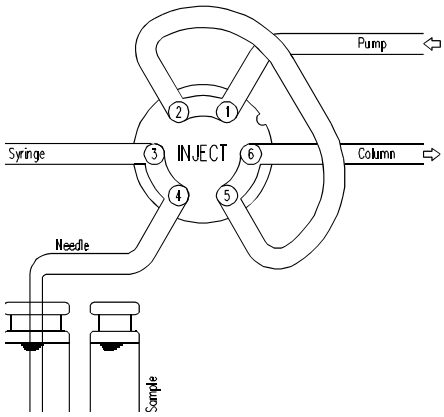


Figure 1-17. µL pick-up: injection valve in initial state

2. For the first injection after a wash or after emptying of the buffer tubing, the syringe dispenser aspirates transport liquid from the transport vial to fill the sample line with transport liquid and remove wash solvent.

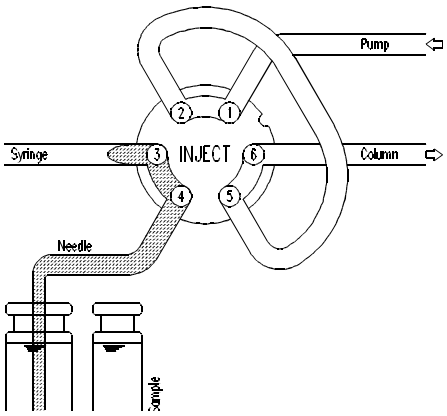


Figure 1-18. µL pick-up: injection valve after initial aspiration of transport liquid

3. The needle moves from the transport vial to the sample well. The injection valve is switched to the LOAD position.

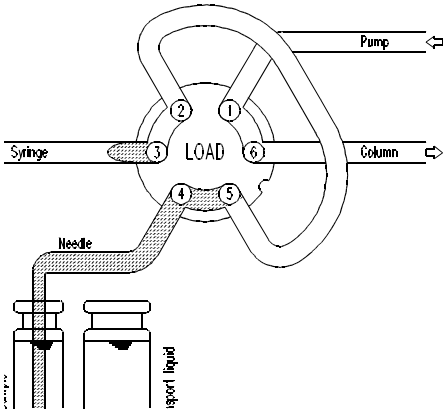


Figure 1-19. µL pick-up: injection valve ready to aspirate sample

4. The programmed injection volume is aspirated from the sample well.

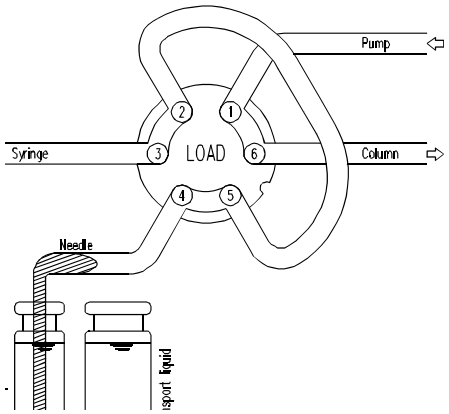


Figure 1-20. µL pick-up: injection valve after sample has been aspirated

5. The sample needle moves back to the transport vial. The sample is quantitatively transported into the loop, with transport liquid (mobile phase) from the transport vial.

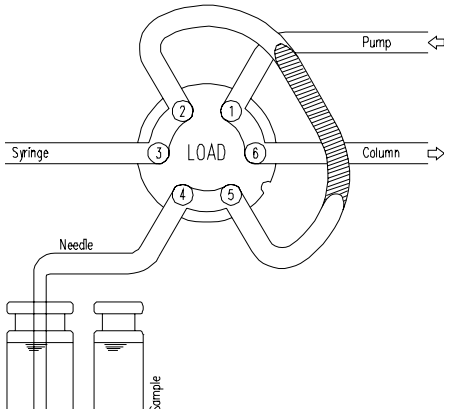


Figure 1-21. µL pick-up: injection valve after sample has been transported into loop

6. The injection valve is switched to INJECT. The sample loop is now part of the HPLC mobile phase flow path: sample is transported to the column. The analysis time starts to run.

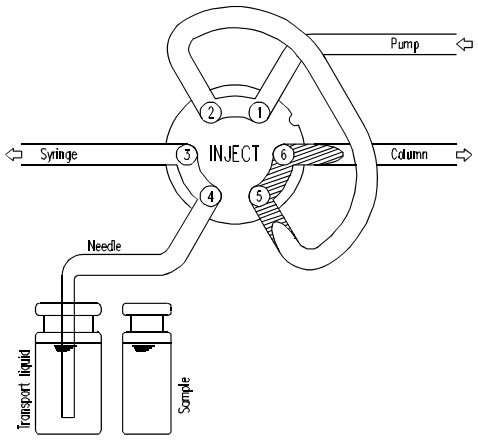


Figure 1-22. µL pick-up: injection valve as sample is injected

The next sequence skips the first withdrawal of transport solvent (step 2), unless a wash routine is performed or the Finnigan Micro AS has emptied the buffer tubing to waste. In those cases the sequence is completely repeated.

If an air segment (see Figure 1-23) has been programmed, it is aspirated at the front of the first plug of transport liquid and at the front of every sample plug. Use of an air segment can be enabled in the General Menu.

> **Note.** If the air segment is enabled during a µL pick-up injection, the air segment at the front of the sample plug is injected into the HPLC system. It is recommended that you switch off the air segment option when using the µL pick-up injection method.

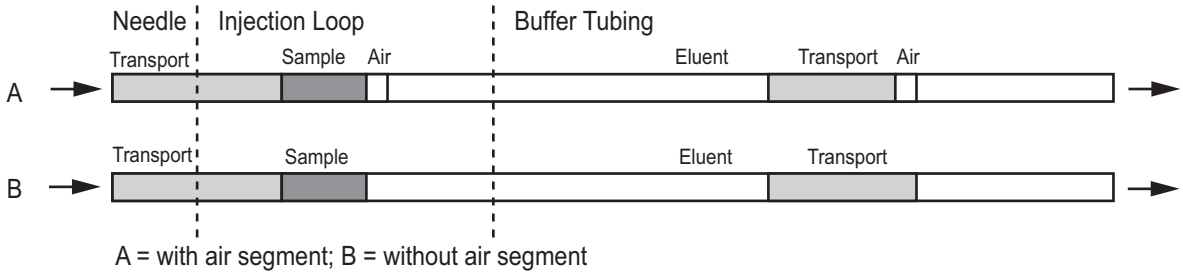


Figure 1-23. Sample path for µL pick-up injection, with and without air segment

Note. During µL pick-up injections, headspace pressure is not applied to sample wells to prevent errors due to air expansion when switching from the sample well to the transport vial.

µL Pick-up (Qualitative Analysis)

The µL pick-up (qualitative analysis) injection mode is available only when you control the Finnigan Micro AS from your data system computer using the instrument control software. This injection mode cannot be programmed from the autosampler front keypad.

The operation of the autosampler valve during the µL pick-up (qualitative analysis) injection mode is exactly the same as during the ordinary µL pick-up injection. (Refer to **µL Pick-up** on page 1-19.) However, the µL pick-up (qualitative analysis) injection mode has less stringent injection volume limits. You can inject up to the full volume of the sample loop in this mode. Injections of volumes greater than [(sample loop volume - 3 × needle tubing volume)/2] will have reduced reproducibility. Because of the reduced reproducibility, it is recommended that you use this injection method only for qualitative analysis, and not for applications in which precise quantitation is critical.

Use the µL pick-up (qualitative analysis) injection mode if:

- You want to minimize sample loss.
- You need to inject larger volumes than those allowed for by the µL pick-up injection mode.

When you use the Xcalibur Instrument Setup page to create and save an instrument method for the Finnigan Micro AS using the µL pick-up (qualitative analysis) injection mode, you will see the warning message shown in Figure 1-24. Click on **OK** to dismiss the warning message and save the method.

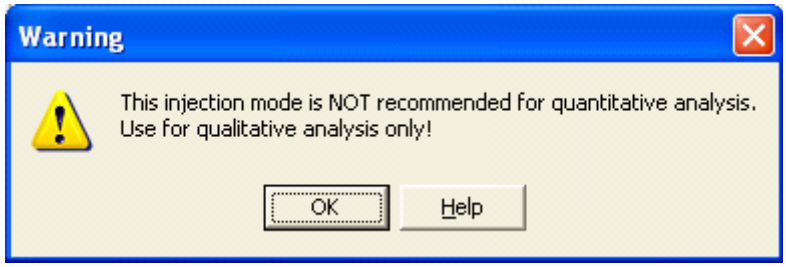


Figure 1-24. Warning message for µL pick-up (qualitative analysis) injection mode

Chapter 2
Installation

This chapter describes how to install your Finnigan Micro AS autosampler. The Finnigan Micro AS shipping container contains a packing list. Please check that all items mentioned in the list are included in the package before you start the installation procedure for the Finnigan Micro AS.

> **Caution**. Do not install the Finnigan Micro AS in areas subject to shock, dust, or in direct sunlight. Do not place it near a source of heat, as this will disturb tray cooling.

> **CAUTION**. The Finnigan Micro AS autosampler must only be connected to power sources and apparatus with protective grounding.

This chapter contains the following sections:

- Installation Procedure
- Factory Installed Items

2.1 Installation Procedure

To install the Finnigan Micro AS, do the following:

1. Lift the Finnigan Micro AS from the shipping container. Make sure that you keep the autosampler upright by placing your hands under it.
2. Place the Finnigan Micro AS in its operating location, preferably on the left hand side of the mass spectrometer. Make sure that the ventilation holes are not obstructed. Allow the instrument to acclimatize for 1 h.
3. Install the plate holder (see Figure 1-1 on page 1-2) in the Finnigan Micro AS. Place the plate holder on the flat surface underneath the wash solvent bottle, as far to the left and to the back as possible.
4. Check that the local line voltage matches the voltage indicated on the back panel of the Finnigan Micro AS.
5. Connect the power cord to the Finnigan Micro AS. (See Figure 1-2 on page 1-5.) Plug the power cord into line voltage.
6. Switch on the Finnigan Micro AS using the switch at the back of the apparatus. (See Figure 1-2, number 4.)
7. Using a Phillips screwdriver, remove the cover-fastening screw from the right side of the cover. (See Figure 1-1 on page 1-2.)

The Finnigan Micro AS starts up. The display indicates that a self-test and initialization procedure is being executed. After completion of this procedure, the following appears on the display:

```
                    SERIAL MODE              --°C

                <PANIC>                  <EXIT>
```

The autosampler starts up in serial mode, ready for control by the computer data system. If you want to operate the autosampler from the front panel instead of controlling it from the data system, press <EXIT> on the front panel. You should then see the following appear on the display:

```
            10:26 TUESDAY MAY 30-98 [MENU]

                     READY (x.xx)

        <EXCHANGE>  <WASH>  <SYR END>  <UTILS>
```

Note. The autosampler must be placed into serial mode before you attempt to operate the autosampler using the data system control software. The data system computer will not be able to establish communication with the autosampler unless the autosampler is in serial mode.

Place the autosampler in serial mode by pressing the <SERIAL> soft-function key in the Ready Menu.

2.2 Factory Installed Items

The Finnigan Micro AS is factory installed with the following:

- Fuses (All fuses are UL-listed and CSA-certified):
  - 115 V ac ± 10%: two 5 AT fuses (slow, ¼ in. × 1¼ in., UL/CSA) **or**
  - 230 V ac ± 10%: two 2.5 AT fuses (slow, 5 × 20 mm, IEC127).
- 20 µL sample loop
- 25 µL syringe
- 50 µL buffer tubing
- Fused silica 2.4 µL sample needle

Table 2-1 gives the specifications for the standard tubings installed on the Finnigan Micro AS autosampler.

For installation of HPLC connections, waste tubing, wash solvent, syringe, sample needle, plates, and so on, refer to **Chapter 3: Preparing for Use**.

Table 2-1. Tubing specifications

Tubing	Material and dimensions
Standard sample needle and tubing	Fused silica tubing; 300 mm x 0.375 mm OD x 0.100 mm ID (total volume 2.4 µL)
Buffer tubing from high pressure valve to syringe valve	PEEK tubing; 260 mm × 1/16 in. OD x 0.50 mm ID (volume 50 µL)
Tubing syringe valve to wash solvent bottle	PTFE tubing; 260 mm × 1/16 in. OD x 0.50 mm ID
Tubing syringe valve to waste	PTFE tubing; 350 mm × 1/8 in. OD x 1/16 in. ID

Chapter 3
Preparing for Use

A number of items required for use of the Finnigan Micro AS are factory-installed (refer to **Chapter 2: Installation** for more information). This chapter describes procedures for the installation of additional parts necessary for autosampler operation.

This chapter contains the following sections:

- HPLC Connections
- Waste Tubing
- Wash Solvent
- Choosing the Sample Loop
- Syringe
- Needle Assembly
- Plates and Sample Handling
- Placing Reagent Vials/Transport Vials.

> **Note.** Ensure that the power is switched on before performing any of the procedures described in this chapter.

3.1 HPLC Connections

Make the following connections:

- HPLC pump to port 1 of the injection valve
- HPLC column to port 6 of the injection valve

Refer to the **Finnigan ProteomeX Operator's Manual** for more information on connecting the Finnigan Micro AS to your ProteomeX system.

The instrument was flushed with isopropanol before it was shipped from the factory. Make sure that the mobile phase of your HPLC system is miscible with isopropanol, or start up with an intermediate solvent as mobile phase (disconnect the HPLC column).

> **Caution**. To ensure optimum injection performance, do not exchange column and pump connections at the injection valve.

3.2 Waste Tubing

To connect the waste drainage tubing, do the following:

1. Connect the syringe waste tubing by putting the end of the syringe waste tube (see Figure 1-1 on page 1-2) into a bottle placed next to the Finnigan Micro AS.
2. Connect the wash-position drainage tubing:
   a. Connect a length of the silicone tubing (7 mm ID, 10 mm OD) from the parts and accessories kit (P/N 00960-01-00010) to the drain wash connector of the Finnigan Micro AS (see Figure 1-1, number 10).
   b. Place the other end of the tubing in a waste container on the floor. All liquid dispensed to waste at the back of the plate is drained through this tubing.
3. Connect the condensed water and solvent drainage tubing:
   a. Connect another length of silicone tubing to the drain port of the Finnigan Micro AS (see Figure 1-1, number 11).
   b. Place the other end of the tubing in a waste container on the floor. All leaked solvents and condensed water are drained through this hose.

When operating the autosampler, make sure that the flow path of the waste tubing is not obstructed in any way.

3.3 Wash Solvent

The Finnigan Micro AS has a 250 mL wash solvent bottle. Install the 250 mL wash solvent bottle:

1. Fill the wash solvent bottle with the appropriate wash solvent. Use either methanol (organic solvent, no buffers) or a mixture of water and isopropanol (80/20). Before using the wash solvent, degas it with helium or an ultrasonic bath.
2. Screw the bottle to the cap in the holder.
3. Place the holder in the Finnigan Micro AS as indicated in Figure 3-1.
4. Put the wash solvent tube in the wash solvent.
5. Lower the cover of the Finnigan Micro AS.
6. On the front keypad of the autosampler, press <EXIT> to exit serial mode and enter the Ready Menu.
7. Press soft function key <SYR END> in the Ready Menu to fill the syringe.
8. Press <SYR HOME> to return the syringe to the home position.
9. Repeat **step 7** and **step 8** until the wash solvent tube and the syringe are completely filled.
10. Press soft function key <WASH> to perform a standard wash routine.
11. If any air remains in the syringe, press <SYR END> again to fill the syringe with wash solvent. Then press <SYR HOME> again to move contents to waste. Repeat if there is still air in the syringe and gently tap the syringe as wash solvent is dispensed to waste. (If there is air in the syringe that cannot be dislodged by this method, refer to **Removing an Air Bubble From the Syringe** on page 7-9.)
12. Press **Menu**, then press <SERIAL> to place the autosampler back into serial mode.

> **Note**. The autosampler must be placed into serial mode before you attempt to operate the autosampler using the data system control software. The data system computer will not be able to establish communication with the autosampler unless the autosampler is in serial mode.
>
> Place the autosampler in serial mode by pressing the <SERIAL> soft-function key in the Ready Menu.

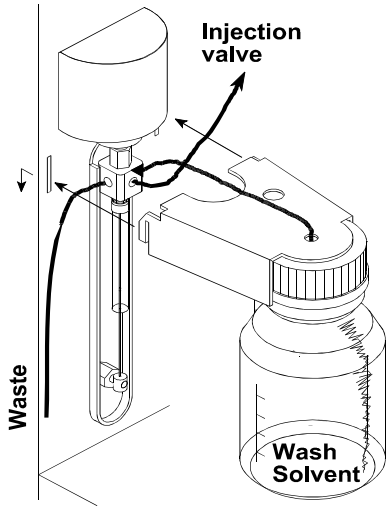


Figure 3-1. Installation of wash solvent bottle

If your experiment requires more than 250 mL of wash solvent for a complete run, install a longer tube (with a flanged end for the valve fitting) and place a larger bottle next to the Finnigan Micro AS. To fill the larger wash solvent tube, you might have to repeat **step 7** and **step 8** of the wash solvent bottle installation procedure several times.

3.4 Choosing the Sample Loop

When the standard 25 µL syringe is used with the standard 50 µL buffer tubing and the standard 20 µL sample loop, the injection volume ranges shown in Table 3-1 are available for the various injection modes.

Table 3-1. Injection volumes with the 20 µL sample loop

Injection Method	Injection Volume
Full loop	20 µL
Partial loopfill	0.01 to 10 µL
µL pick-up	0.01 to 6.4 µL
µL pick-up (qualitative analysis)	0.01 to 20 µL

An optional 10 µL sample loop is also available for the Finnigan Micro AS. Using the smaller sample loop can improve the accuracy of partial loopfill injections by minimizing the expansion of loop contents that occurs when the injection valve switches from INJECT to LOAD. Table 3-2 shows the available injection volumes for the autosampler fitted with the 10 µL sample loop.

Table 3-2. Injection volumes with the 10 µL sample loop

Injetion Method	Injection Volume
Full loop	10 µL
Partial loopfill	0.01 to 5 µL
µL pick-up	0.01 to 1.4 µL
µL pick-up (qualitative analysis)	0.01 to 10 µL

The maximum injection volumes are calculated using the following formulas:

- Full loop: injection volume = loop volume
- Partial loopfill: max. injection volume = 50% of loop volume
- µL pick-up: max. injection volume = (loop volume - 3 × needle tubing volume)/2

3.5 Syringe

The Finnigan Micro AS is equipped with a 25 µL syringe. To replace the syringe, do the following:

1. On the front keypad of the autosampler, press <EXIT> to exit serial mode and enter the Ready Menu.
2. Press soft function key <SYR END> in the Ready Menu to move the syringe to end position.
3. Lift the cover.
4. Unscrew the top of the syringe by turning it clockwise.
5. Pull the bottom of the syringe towards you. You can now remove the syringe (see Figure 3-2).
6. Fill the new syringe with wash solvent and make sure that all air bubbles are removed from the syringe.
7. Connect the bottom of the filled syringe to the Finnigan Micro AS autosampler by fitting the hole in the end of the syringe handle over the peg on the autosampler.
8. Screw the top of the filled syringe to the Finnigan Micro AS by turning counter clockwise.
9. Lower the cover.
10. Press soft function key <SYR HOME> to remove air from the syringe. The syringe moves to home position and its contents are dispensed to waste.
11. If any air remains in the syringe, press <SYR END> again to fill the syringe with wash solvent. Then, press <SYR HOME> again to move content to waste. Repeat if there is still air in the syringe and gently tap the syringe as wash solvent is dispensed to waste. (If there is air in the syringe that cannot be dislodged by this method, refer to **Removing an Air Bubble From the Syringe** on page 7-9.)
12. Press the soft function key <WASH> in the Ready Menu to execute a standard wash routine. All tubing connected to the syringe valve will be filled and rinsed.
13. Press **Menu**, then press <SERIAL> to place the autosampler back into serial mode.

> **Note**. The autosampler must be placed into serial mode before you attempt to operate the autosampler using the data system control software. The data system computer will not be able to establish communication with the autosampler unless the autosampler is in serial mode.
>
> Place the autosampler in serial mode by pressing the <SERIAL> soft-function key in the Ready Menu.

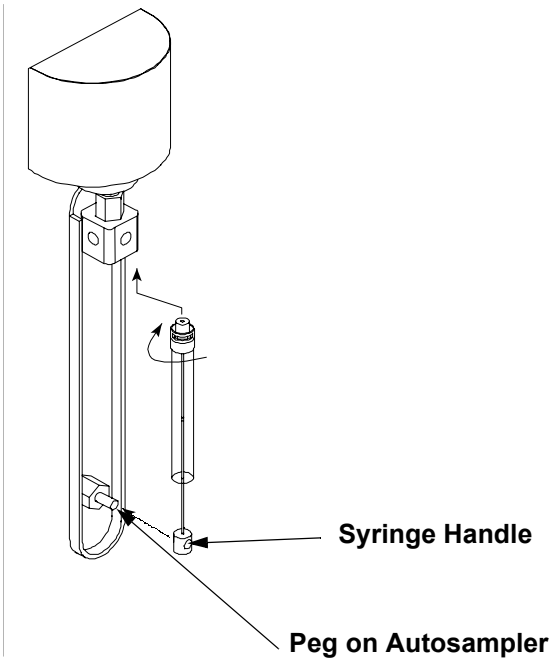


Figure 3-2. Installation of the syringe

3.6 Needle Assembly

The needle used for sampling consists of two parts:

- A prepuncturing needle, which is a hollow needle used for puncturing of the septum, capmat or sealer. The prepuncturing needle can also used to apply headspace pressure of approximately 0.5 bar (7.25 psi) to the sample.
- sample needle, which is placed inside the hollow prepuncturing needle and used for the actual transport of sample.

> **Note**. Most commercially available sealers or capmats cannot be used in combination with headspace pressure. Switch off headspace pressure (in the General Menu) when using non-compatible sealers or capmats.

Figure 3-3 illustrates the components of the needle assembly. Parts 1, 2, 3, 4, and 6 constitute the sample needle.

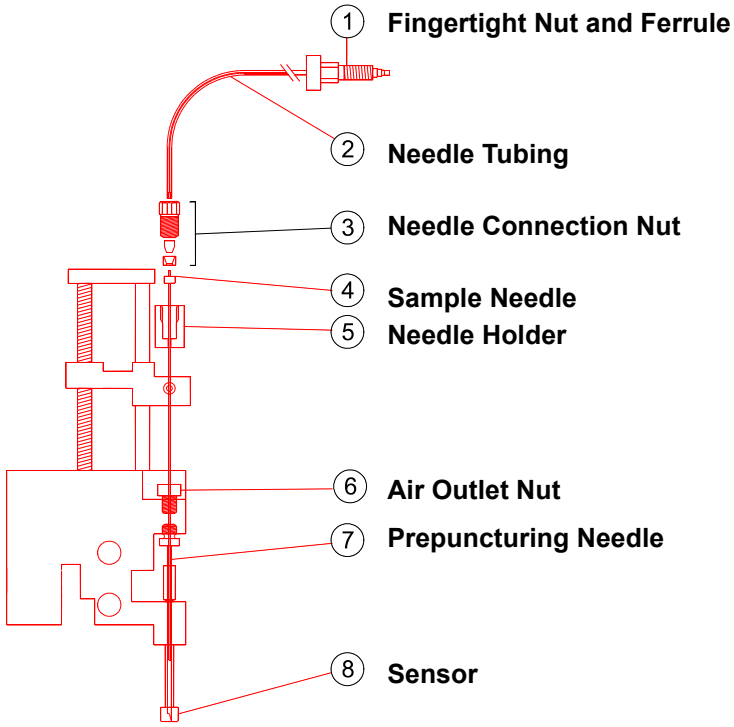


Figure 3-3. Needle assembly

Replace a needle as follows. See Figure 3-3 for the location of the parts in the needle assembly.

1. Loosen the needle connection nut (3).
2. Loosen the fingertight nut and ferrule (1).
3. Carefully pull out sample needle and tubing.
4. Insert a new sample needle and tube through the needle holder (5) and tighten the nut (4).
5. Connect the other end of the tube to port 4 of the injection valve using a fingertight nut and ferrule. Do not overtighten the nut, or the tubing may become blocked.
6. Lower the cover of the Finnigan Micro AS.
7. On the front keypad of the autosampler, press <EXIT> to exit serial mode and enter the Ready Menu.
8. Check the sample needle height. (The default height is 5 mm from the plate.) If necessary, adjust the value in the System Menu (General Menu).
9. Press soft function key <WASH> in the Ready Menu to clean the new sample needle.
10. Press **Menu**, then press <SERIAL> to place the autosampler back into serial mode.

> **Note**. The autosampler must be placed into serial mode before you attempt to operate the autosampler using the data system control software. The data system computer will not be able to establish communication with the autosampler unless the autosampler is in serial mode.
>
> Place the autosampler in serial mode by pressing the <SERIAL> soft-function key in the Ready Menu.

3.7 Plates and Sample Handling

The Finnigan Micro AS allows the use of the following types of plates:

- 96 low wells
- 96 high wells
- 384 low wells
- 48 vials

A sensor (see Figure 3-3, number 8) detects the presence of the plate or vials, and provides information on plate height.

Because the Finnigan Micro AS uses headspace pressure during sample injections, it is very important that samples be properly handled. Note the following:

- Standard wells are best filled using a narrow-end pipette to allow air to escape when filling the well.
- Do not fill wells to the rim. The sample might be forced into the prepuncturing needle and cause cross-contamination of samples and contamination of the sample needle.
- Make sure that the vial seals are airtight to prevent air bubbles in the sample and evaporation of volatile samples. Check the seals after crimping. If the cap can be turned easily, the seal is not airtight, and the handcrimper should be adjusted.

> **Note**. If wells are used that are not airtight, switch off headspace pressure in the General Menu.

To replace a plate in the Finnigan Micro AS, do the following:

1. On the front keypad of the autosampler, press <EXIT> to exit serial mode and enter the Ready Menu.
2. Press soft function key <EXCHANGE> in the Ready Menu. The plate moves to the left.
3. Take out the plate and replace it with another one.
4. Press soft function key <PLATE HOME>. The plate moves to operating position again.
   - If you have replaced the plate with a plate of the same type, go to **step 6**.
   - If you have installed a new type of plate, go on to **step 5**.
5. Set the plate parameters:
   a. Press **System**.
   b. Press soft function key <PLATES> and press **E**.

c. Press soft function key for your plate type.

d. Press **E**. Press <ROWS> to process the plate by rows, or press <COLUMNS> to process the plate by columns.

e. Press **Escape** to return to the System Menu.

f. Press <GENERAL> to enter the General Menu.

g. Scroll down to the Needle Height parameter, and enter an appropriate needle height for your plate.

h. Press **Escape** twice to return to the Ready Menu.

A message appears to indicate that all programmed series will be reset. If you have programmed series using the front keypad, you will need to reprogram them.

6. Press **Menu**, then press <SERIAL> to place the autosampler back into serial mode.

> **Note**. The autosampler must be placed into serial mode before you attempt to operate the autosampler using the data system control software. The data system computer will not be able to establish communication with the autosampler unless the autosampler is in serial mode.
>
> Place the autosampler in serial mode by pressing the <SERIAL> soft-function key in the Ready Menu.

3.8 Placing Reagent Vials/Transport Vials

To replace reagent/transport vials, do the following:

1. On the front keypad of the autosampler, press <EXIT> to exit serial mode and enter the Ready Menu.
2. Press soft function key <EXCHANGE> in the Ready Menu. The plate holder moves to the left.
3. Take out the reagent vials/transport vials and replace them with other reagent vials/transport vials.
4. Press soft function key <PLATE HOME>. The plate moves to the operating position again.
5. Press **Menu**, then press <SERIAL> to place the autosampler back into serial mode.

> **Note**. The autosampler must be placed into serial mode before you attempt to operate the autosampler using the data system control software. The data system computer will not be able to establish communication with the autosampler unless the autosampler is in serial mode.
>
> Place the autosampler in serial mode by pressing the <SERIAL> soft-function key in the Ready Menu.

> **Note**. Reagent and transport vials can be placed in any of the four positions. Transport vials must be placed in a continuous row.
>
> In the System Menu, go to the Plates Menu to define the position for first and last Transport vial.

Chapter 4
I/O Connections

The Finnigan Micro AS has six standard I/O connectors on the rear panel that can be used to allow the autosampler to control external devices or be controlled by an external device. There are five OUTPUT connectors and one INPUT connector. In addition, the autosampler has two 9-pin communications connectors, one of which is used to connect the autosampler to the data system computer. See Figure 1-2 for the location of the connectors.

The types of connectors discussed in this chapter are:

- Contact Closure Outputs
- TTL Outputs
- TTL Inputs
- Communications Connectors

4.1 Contact Closure Outputs

On the back panel of the Finnigan Micro AS, the programmable output connector (labeled P1), marker output connector (labeled P4), and auxiliary output connector (labeled P5) are contact closure outputs (floating NO/NC contact). See Figure 4-1. Table 4-1, Table 4-2, and Table 4-3 give the configurations for these three connectors. The maximum voltage for these connectors is 28 V(dc or ac). The maximum current is 0.25 A.

> **Note**. Maximum current for 24 V_{DC} supply is 0.5 A total.

Table 4-1. Connector P1 OUTPUTS (2 programmable outputs and alarm output)

Output	Description	Output	Description
1	OUT 1 - Normally open	8	Spare
2	OUT 1 - Common	9	Spare
3	OUT 1 - Normally closed	10	Alarm output - Normally open
4	OUT 2 - Normally open	11	Alarm output - Common
5	OUT 2 - Common	12	Alarm output - Normally closed
6	OUT 2 - Normally closed	13	24 V dc
7	Spare	14	Power ground
		15	Power ground

> **Note.** The Alarm output is activated whenever an error occurs. Refer to **Error Codes** on page 7-2 for a description of the error codes of the Finnigan Micro AS.

Table 4-2. Connector P4 MARKERS

Output	Description	Output	Description
1	Inject marker - Normally open	8	Labeled well marker - Common
2	Inject marker - Common	9	Labeled well marker - Normally closed
3	Inject marker - Normally closed	10	STOP I/O - Normally open
4	Well marker - Normally open	11	STOP I/O - Common
5	Well marker - Common	12	STOP I/O - Normally closed
6	Well marker - Normally closed	13	24 V dc
7	Labeled well marker - Normally open	14	Power ground
		15	Power ground

Table 4-3. Connector P5 AUXILIARIES

Output	Description	Output	Description
1	AUX 1 - Normally open	8	AUX 3 - Common
2	AUX 1 - Common	9	AUX 3 - Normally closed
3	AUX 1 - Normally closed	10	AUX 4 - Normally open
4	AUX 2 - Normally open	11	AUX 4 - Common
5	AUX 2 - Common	12	AUX 4 - Normally closed
6	AUX 2 - Normally closed	13	24 V dc
7	AUX 3 - Normally open	14	Power ground
		15	Power ground

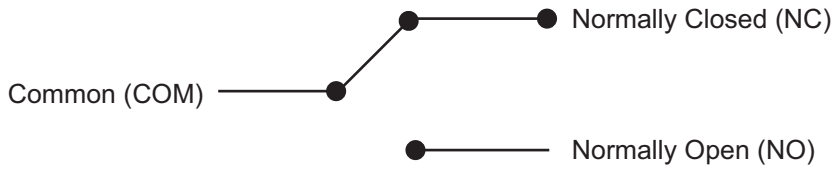


Figure 4-1. Contact closure output

4.2 TTL Outputs

The TTL marker output connector (P2) and the 4 timebase code output connector (P3) are both TTL levels outputs. See Figure 4-2. The timebase code output can be programmed as part of a timebase method, which allows the autosampler to trigger external devices at pre-defined times during a run. Table 4-4 and Table 4-5 give the configurations for connectors P2 and P3.

Maximum voltage for the TTL outputs is 5.5 volts. An output voltage of greater than 3.5 V corresponds to logical 1. An output voltage of less than 1.0 V corresponds to logical 0. The sink current is ± 20 mA. All markers are active low (logical 0).

Table 4-4. Connector P2 TTL MARKER OUTPUTS

Output	Descripton	Output	Description
1	INJECT MARKER	9	not connected
2	VIAL/WELL MARKER	10	not connected
3	LABELED WELL MARKER	11	not connected
4	STOP I/O	12	not connected
5	not connected	13	signal ground
6	not connected	14	signal ground
7	not connected	15	signal ground
8	not connected		

Note. In most modes of operation, a marker output pulse is generated when the injection valve switches from LOAD to INJECT. However, in a user program, markers must be programmed by the user.

Table 4-5. Connector P3 TIMEBASE OUTPUTS

Output	Description	Output	Description
1	TB 0 (HEX) (1)	6	signal ground
2	TB 1 (HEX) (2)	7	signal ground
3	TB 2 (HEX) (4)	8	signal ground
4	TB 3 (HEX) (8)	9	signal ground
5	not used		

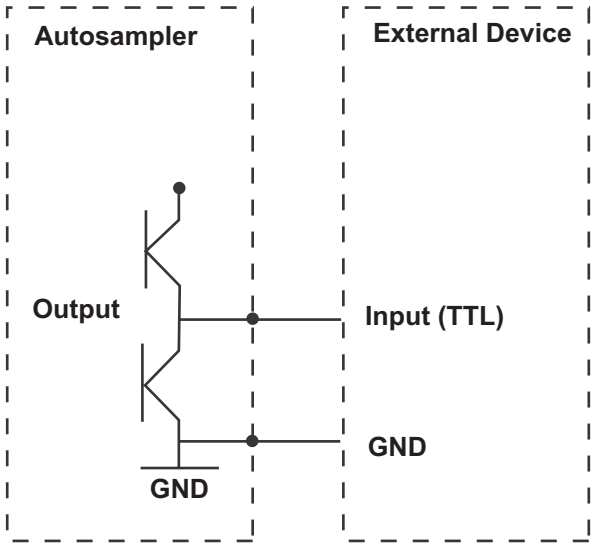


Figure 4-2. TTL output

4.3 TTL Inputs

Connector P6 is an active high or active low TTL input. Its mode of operation can be specified in the System Menu. The NEXT INJECTION INPUT and the NEXT WELL INPUT can be used when the Finnigan Micro AS works in REMOTE CONTROL mode. The FREEZE INPUT and STOP I/O input can be used by other devices to control the Finnigan Micro AS. The four inputs (INPUT 1 to 4) can be used only in the user program, for example to control the sequence of the steps in this method. A connection diagram is shown in Figure 4-3.

Table 4-6. Connector P6 TTL INPUTS

Output	Description	Output	Description
1	NEXT INJECTION INPUT	9	signal ground
2	NEXT WELL INPUT	10	signal ground
3	FREEZE INPUT	11	signal ground
4	STOP I/O	12	signal ground
5	INPUT 1	13	signal ground
6	INPUT 2	14	signal ground
7	INPUT 3	15	signal ground
8	INPUT 4		

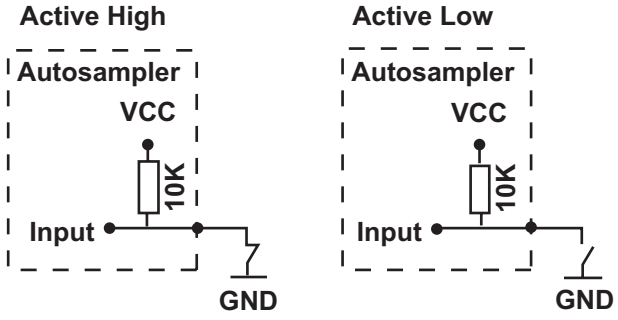


Figure 4-3. TTL Input

The use of the following TTL inputs is discussed further in this section:

- Next Injection Input
- Next Well Input
- Freeze Input
- Stop I/O
- INPUTS 1-4

Next Injection Input

When the Finnigan Micro AS is started in remote control mode, the NEXT INJECTION input starts the next injection sequence. After the injection sequence is finished, the Finnigan Micro AS waits for the next input. When the autosampler is not in remote control mode and the Ready Menu is active, a NEXT INJECTION input starts the last programmed series. In this case, the Finnigan Micro AS executes the complete run as if it had been started with the **Start/Stop** key, and will not wait for another NEXT INJECTION input before beginning subsequent injections.

Next Well Input

A NEXT WELL input causes the Finnigan Micro AS to perform the next injection from the next well, even if not all injections from the current well in the programmed injection method have been executed.

Freeze Input

The FREEZE input causes the Finnigan Micro AS to freeze the analysis time for the time this input is active. If the FREEZE input is activated while the analysis time is not running, the Finnigan Micro AS performs all programmed pre-injection sample handling (the mix method and the loading portion of the injection method), but waits to inject the sample until the FREEZE input is no longer active.

Stop I/O

When the STOP I/O input is received, the current run is immediately aborted. If the autosampler is not being operated in remote control mode, it returns to the Ready Menu. If the autosampler is in remote control mode, the run is aborted, and the autosampler remains in remote control mode. In this case, the autosampler cannot be restarted with a NEXT INJECTION input.

INPUTS 1-4

Inputs 1-4 are programmable inputs that can be used in the user program.

4.4 Communications Connectors

Two communications connectors, labelled S1 and S2, are located at the upper right of the autosampler back panel (See Figure 4-4.) The communication connectors are standard RS232 or RS422/485 communication interface connectors. Connector S1 is not used with Xcalibur 1.4 / ProteomeX 2.0. Connector S2 is used to connect the autosampler to the data system computer.

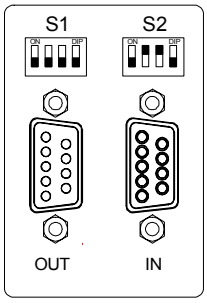


Figure 4-4. Communications connectors

Set the dipswitches S1 and S2 as illustrated in Figure 4-5.

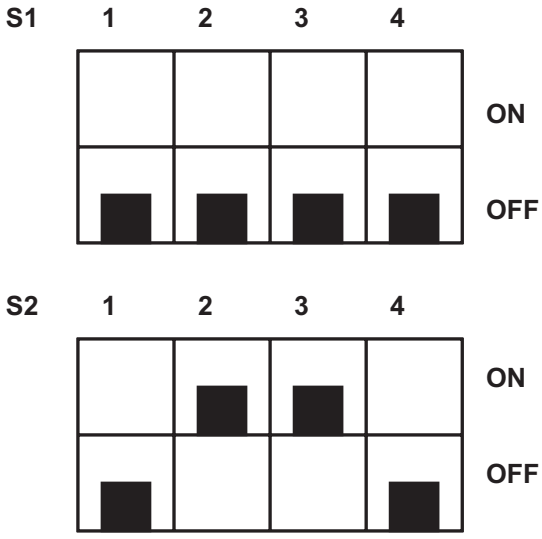


Figure 4-5. Communications dipswitches, showing correct configuration

The connections for the 9-pin connector are as follows:

- Pin 2 (TD): Transmitted data to the computer.
- Pin 3 (RD): Received data from the computer.
- Pin 5 (SG): Signal ground (also indicated as GND in some devices).

Chapter 5
Test Procedures

This chapter describes some tests that you can use to check the performance of your Finnigan Micro AS autosampler. The following tests are described in this chapter:

- Syringe Volume Displacement Test
- Tray Cooling Performance Test
- Loop Performance Test

5.1 Syringe Volume Displacement Test

To check the syringe volume displacement, 20 µL of water is dispensed from a sample vial into a weighed destination vial. To carry out the syringe volume displacement check, complete the following steps:

1. Fill a sample vial with distilled water.
2. Weigh an empty destination vial.
3. Place the sample vial at position A01 and the destination vial at position A02 in the autosampler.
4. Program the autosampler with the mix method shown in Table 5-1 and the series shown in Table 5-2. Execute the series.
5. Weigh the destination vial after the series is complete. The difference in mass divided by the density of water (1 g/mL) is the volume dispensed by the syringe.

Table 5-1. Mix method for syringe volume displacement check

Step	Action	Speed	Height
1	Aspirate 25 µL Sample	2	05
2	Dispense 200 µL to Destination	3	03
3	End of mix method		

Table 5-2. Series for syringe volume displacement check

Series	Parameter	Value
Series 1	Number	1
	Injection method	None
	Wash method	None
	Mix method	1
	First well	A 01
	Last well	A 02
	First destination vial	A 02
	Reagent A vial	1

5.2 Tray Cooling Performance Test

To test the performance of the cooling tray on your autosampler, do the following:

1. Place a thermocouple on the bottom of the tray. Make sure that the contact between the tray and the thermocouple is firm.
2. Switch on the tray cooling and program a setpoint of 10 °C.
3. Wait at least 15 minutes for the Finnigan Micro AS to equilibrate.
4. Read the temperature of the thermocouple.

The value must be within 2 °C of the programmed setpoint.

5.3 Loop Performance Test

To check that the sample loop volume falls within the specified volume range, do the following:

1. Disconnect the loop from the injection valve.
2. Remove all liquids from the loop with air.
3. Weigh the empty loop on an analytical balance.
4. Fill the loop, using a minimum of 2 times its volume of water.
5. Weigh the filled loop again.

The difference in mass between the filled loop and the empty loop is the mass of the capacity of the loop. The mass divided by the density of water (1 g/mL) gives the volume of the loop. The calculated volume should be within ± 10% of nominal volume of the sample loop.

Chapter 6
Maintenance

This chapter contains procedures for routine maintenance of the Finnigan Micro AS autosampler.

This chapter contains the following sections:

- Replacing the Syringe
- Injection Valve Maintenance
- Replacing Fuses

6.1 Replacing the Syringe

Replace the autosampler syringe if it becomes worn or leaks. Follow the procedure described in **Syringe** on page 3-7 to replace the syringe.

6.2 Injection Valve Maintenance

The Finnigan Micro AS autosampler is equipped with a Valco Cheminert® C2-1346 injection valve. The material in this section is adapted from **Valco Technical Note 801**, Valco Instrument Co. Inc.

If you experience problems with your injection valve, first try cleaning the valve by flushing all lines with an appropriate solvent. If you cannot successfully clean the valve by flushing with solvent, follow the instructions below to disassemble the valve and clean or replace the rotor.

> **Note**. Do not disassemble the valve unless you have isolated the cause of your system malfunction to the valve. Refer to **Chapter 7: Troubleshooting** for more information on diagnosing problems with your system.

Valve Disassembly

To disassemble the valve, do the following:

1. Use a 9/64 in. hex driver to remove the socket head screws that secure the cap on the valve. (See Figure 6-1.)
2. To ensure that the sealing surface of the cap is not damaged, either rest the cap on its outer face, or, if it is still connected to tubing, leave it suspended by the tubing.
3. With your fingers or a small tool, gently pry the rotor away from the driver.
4. Examine the rotor sealing surface for scratches. If scratches are visible to the naked eye, replace the rotor with a new one. If no scratches are visible, clean all valve parts with an appropriate solvent, taking care not to scratch any surfaces. You do not need to dry the rotor or other parts.

> **Tip.** The most common valve problem in HPLC is the formation of buffer crystals in the valve, which can usually be removed by flushing with water.

Reassemble the valve as described in the next topic: **Valve Reassembly**.

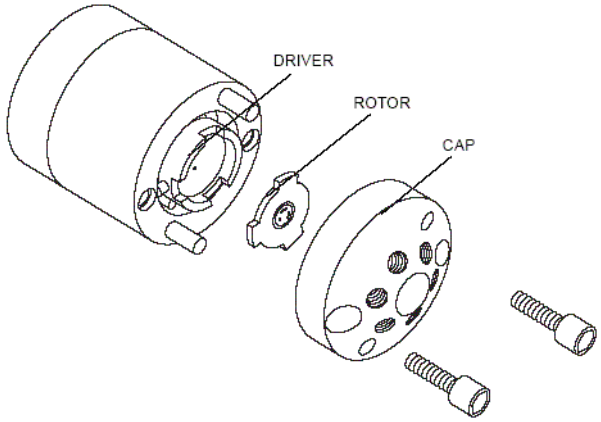


Figure 6-1. Exploded view of injection valve

Valve Reassembly

To reassemble the injection valve, do the following:

1. Replace the rotor in the driver, making sure that the rotor sealing surface with its engraved flow passages is facing out. The pattern is asymmetrical to prevent improper placement.
2. Replace the cap. Insert the two socket-head screws and tighten them gently until both are snug. Do not overtighten the screws. The screws simply hold the assembly together and do not affect the sealing force, which is automatically set as the screws close the cap against the valve body.
3. Test the valve by pressurizing the system. If the valve does not hold pressure, contact your local Thermo Electron service representative.

6.3 Replacing Fuses

Two fuses protect the Finnigan Micro AS autosampler from damage due to current overload. If a power surge or other event causes these fuses to blow, you need to replace the fuses.

Replace the fuses by doing the following:

1. Switch off the Finnigan Micro AS autosampler and unplug the line power cord from the back of the autosampler.

CAUTION. Do not attempt to change the fuses unless the autosampler is switched off and unplugged from power sources.

2. Insert a 3 mm (1/8 in.) or similar size flat-bladed screwdriver into the shallow slot at the top of the fuse cover plate. Pry gently outwards to dislodge the fuse assembly.
3. Remove the old fuses from the slots on either side of the fuse assembly. See Figure 6-2.

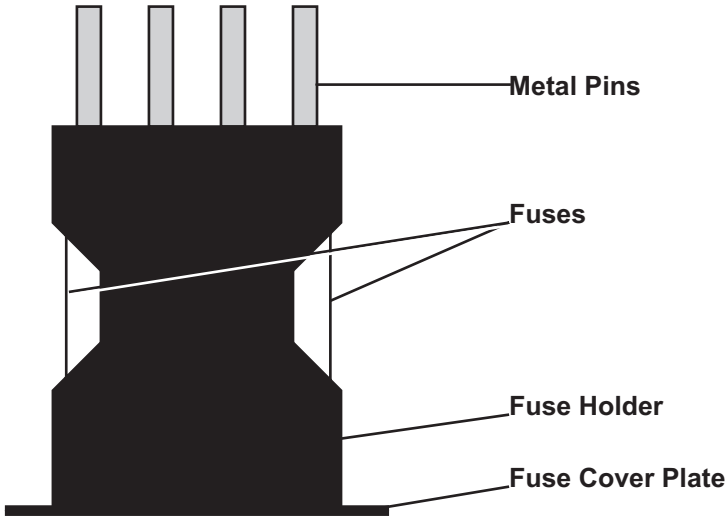


Figure 6-2. Schematic of fuse assembly

4. Insert new fuses into the slots on either side of the fuse assembly. Make sure that the fuses are firmly seated.

CAUTION. Use only the correct fuses for your operating voltage. Refer to **Appendix D: Specifications** for more information on fuses.

5. Slide the fuse assembly into the autosampler until it clicks into place and the fuse cover plate is flush with the back of the autosampler. Ensure that the voltage selector is in the correct orientation for your operating

voltage. Your operating voltage should be printed right side up at the bottom of the fuse cover plate.

Tip. The fuse assembly slides easily into place if it is properly aligned in the socket. If you have difficulty reinserting the fuse assembly, shift it from side to side in the socket to find the correct alignment.

Chapter 7
Troubleshooting

This chapter describes how to diagnose and troubleshoot problems with your Finnigan Micro AS autosampler. In many cases, a physical fault in the autosampler causes a two-digit error code to be displayed on the front panel. If you encounter a problem in operating your autosampler, check the display for an error code and refer to **Error Codes** on page 7-2 to determine the nature of the problem.

If no error code is displayed, refer to **Start-up Problems** on page 7-6 or **Analytical Problems** on page 7-7, as appropriate, for additional troubleshooting information.

If you are unable to solve the problem using the procedures in this chapter, contact your local Thermo Electron service representative.

This chapter contains the following sections:

- Error Codes
- Start-up Problems
- Analytical Problems

7.1 Error Codes

If you attempt to enter invalid programming parameters, the Finnigan Micro AS front panel displays an **error message**, with information on the allowed parameter ranges. If something goes wrong in the physical operation of the Finnigan Micro AS, the front panel displays an **error code**. Press the **Start/Stop** key twice to clear the message, and try to repair the failure condition with the help of the explanation of the code concerned. Call your local Thermo Electron service representative if the problem persists.

The following topics list the error codes:

- Injection Valve and ISS Unit
- Syringe Dispenser Unit
- Injection Needle Unit
- Plate
- Vials
- Electronics
- Plate Holder
- Injection Problems
- Reproducibility Problems

Injection Valve and ISS Unit

Table 7-1 lists the error codes related to the operation of the injection valve and ISS unit.

Table 7-1. Injection valve and ISS unit error codes

Error Code	Description
ERROR 11	Injection valve is not in a valid position.
ERROR 12	The injection valve did not switch within 1.5 s.
ERROR 13	The switching time of the injection valve exceeds 500 ms.
ERROR 14	ISS-A valve is not in a valid position.
ERROR 15	The ISS-A valve did not switch within 1.5 s.
ERROR 17	ISS-B valve is not in a valid position.
ERROR 18	The ISS-B valve did not switch within 1.5 s.

Syringe Dispenser Unit

Table 7-2 lists the error codes for the syringe dispenser unit.

Table 7-2. Syringe dispenser unit error codes

Error Code	Description
ERROR 21	The syringe valve did not switch.
ERROR 22	The syringe did not reach the home position in time.
ERROR 23	The syringe spindle did not make the correct number of rotations.
ERROR 24	The spindle does not rotate.
ERROR 25	The syringe valve did not find a valid position.

Injection Needle Unit

Table 7-3 lists the error codes for the injection needle unit.

Table 7-3. Injection needle unit error codes

Error Code	Description
ERROR 30	The sample needle arm did not reach or leave the home position (vertical).
ERROR 31	The sample needle arm is in an invalid horizontal position while moving down.
ERROR 32	The sample needle arm did not reach or leave destination within a certain time (horizontal).
ERROR 34	Sample needle arm not in vertical the home position while moving horizontally.
ERROR 39	Vial sensor sticks.
ERROR 40	The sample needle spindle does not rotate correctly.
ERROR 41	The sample needle did not reach or leave the home position.
ERROR 42	The sample needle is not at home position.
ERROR 53	The sample needle arm is not in the home position while moving the plate.

Plate

Table 7-4 lists error codes related to plates.

Table 7-4. Plate error codes

Error Code	Description
ERROR 58	Not enough plates in right lift to execute run of series.
ERROR 59	Missing plate.

Vials

Table 7-5 lists error codes for vials.

Table 7-5. Vials error codes

Error Code	Description
ERROR 60	Missing vial. Only displayed when Skip Missing Vial is set to NO in the System Settings and during the execution of the Mix of a sample on 48-vial plate.
ERROR 62	Missing transport vial.
ERROR 64	Missing vial for reagent A.
ERROR 65	Missing vial for reagent B.
ERROR 66	Missing vial for reagent C.
ERROR 67	Missing vial for reagent D.
ERROR 68	Missing destination vial.
ERROR 69	Not enough transport liquid available due to missing transport vials.

Electronics

Table 7-6 lists error codes related to the autosampler electronics.

Table 7-6. Electronics error codes

ERROR 71	Flexprint of the sample needle is not connected.
ERROR 72	Invalid configuration of the Finnigan Micro AS, a PCB is missing.
ERROR 73	Current limit of the external I/O exceeded.
ERROR 75	Error occurred during initialization, the Finnigan Micro AS cannot start.

Plate Holder

Table 7-7 lists error codes related to the plate holder.

Table 7-7. Plate holder error codes

ERROR 90	Plate home time-out, plate did not reach the home position (home error).
ERROR 91	Plate did not reach or leave the home position during run.
ERROR 92	Plate holder missing.
ERROR 93	Dirt on the plate holder.

Recovering From a Missing Vial Error

When you operate the Finnigan Micro AS using the Xcalibur/ProteomeX software, the autosampler pauses and displays error code 60 if it encounters a missing vial during the run. Xcalibur reports that the Micro AS has an error. To recover from this error and resume the run, do the following:

1. Press the second soft-function key from the left under the display. The instrument resets. Xcalibur indicates that the MicroAS is Not Connected.
2. Place a vial in the empty position in the sample tray. This removes the source of the error.
3. Press **Menu**, and then press <SERIAL> to place the autosampler into serial mode. Xcalibur displays ‘Ready to download’.
4. In the Xcalibur toolbar, click on the Pause/Resume button to resume the run.

7.2 Start-up Problems

If your Finnigan Micro AS autosampler does not start up correctly, consult Figure 7-1 for troubleshooting information.

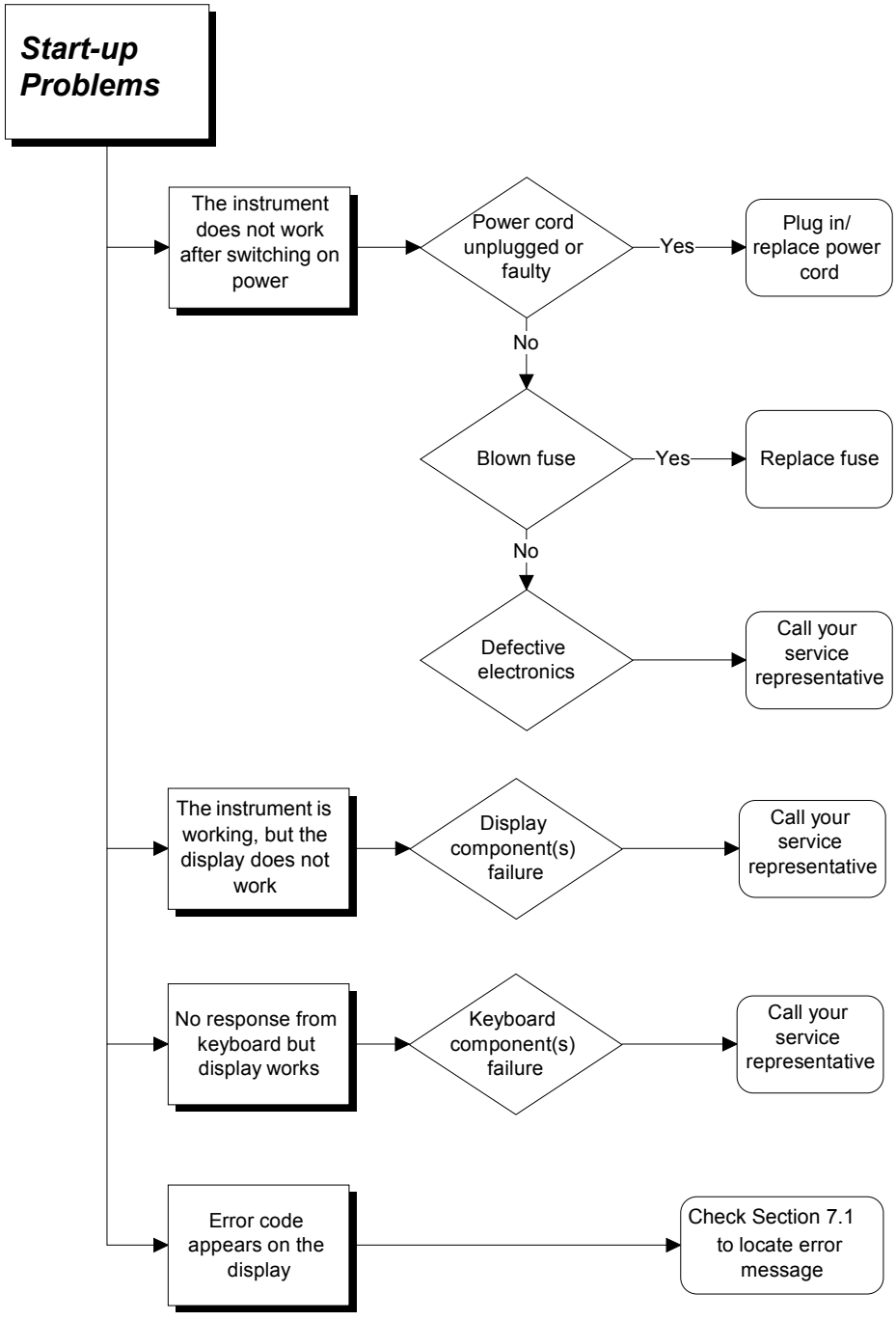


Figure 7-1. Troubleshooting flowchart for start-up problems

7.3 Analytical Problems

If you experience analytical problems, you will have to determine whether they are caused by the autosampler or by the rest of the HPLC system. Replace the autosampler with a manual injection valve, and perform several manual full loop injections. If these produce good results, then the autosampler is faulty. If not, then another component of the HPLC system is at fault.

> **Note**. Analytical problems might be caused by external influences, such as temperature, use of light-sensitive samples, and so on. For this reason, it is important to troubleshoot analytical problems with the autosampler using samples and System Menu settings that are known to give acceptable analytical performance.

Figure 7-2 illustrates the components of the autosampler that should be checked when troubleshooting an analytical problem.

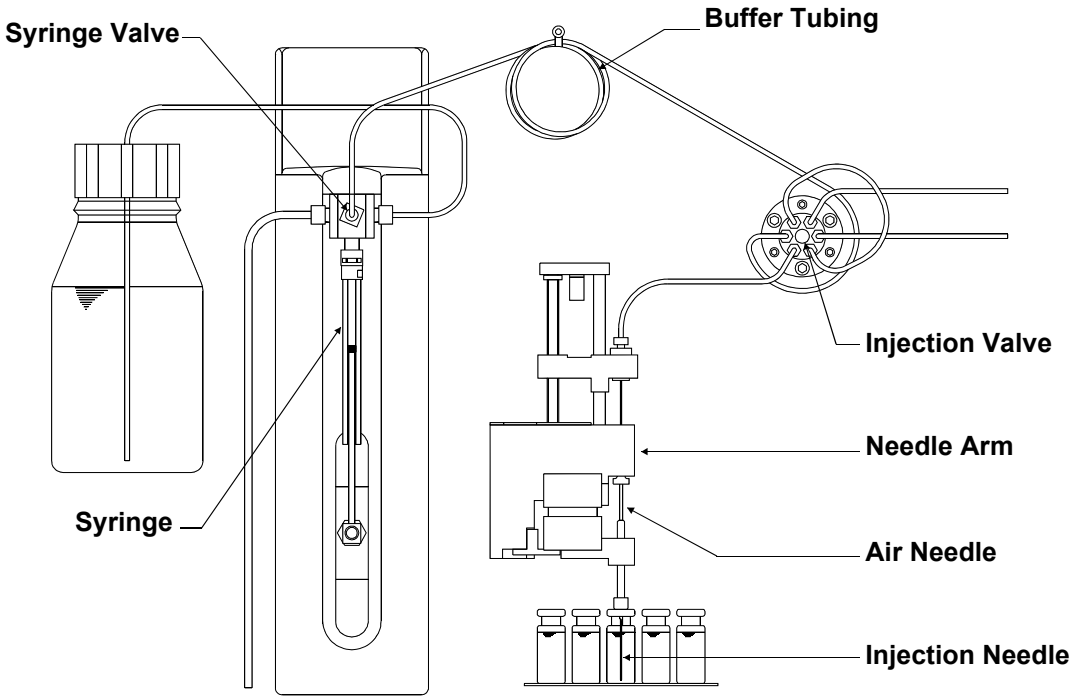


Figure 7-2. Autosampler schematic, showing components to be checked in troubleshooting analytical problems

This section contains topics specifically discussing the troubleshooting of:

- Injection Problems
- Reproducibility Problems

Injection Problems

Figure 7-3 illustrates a flowchart for troubleshooting injection problems.

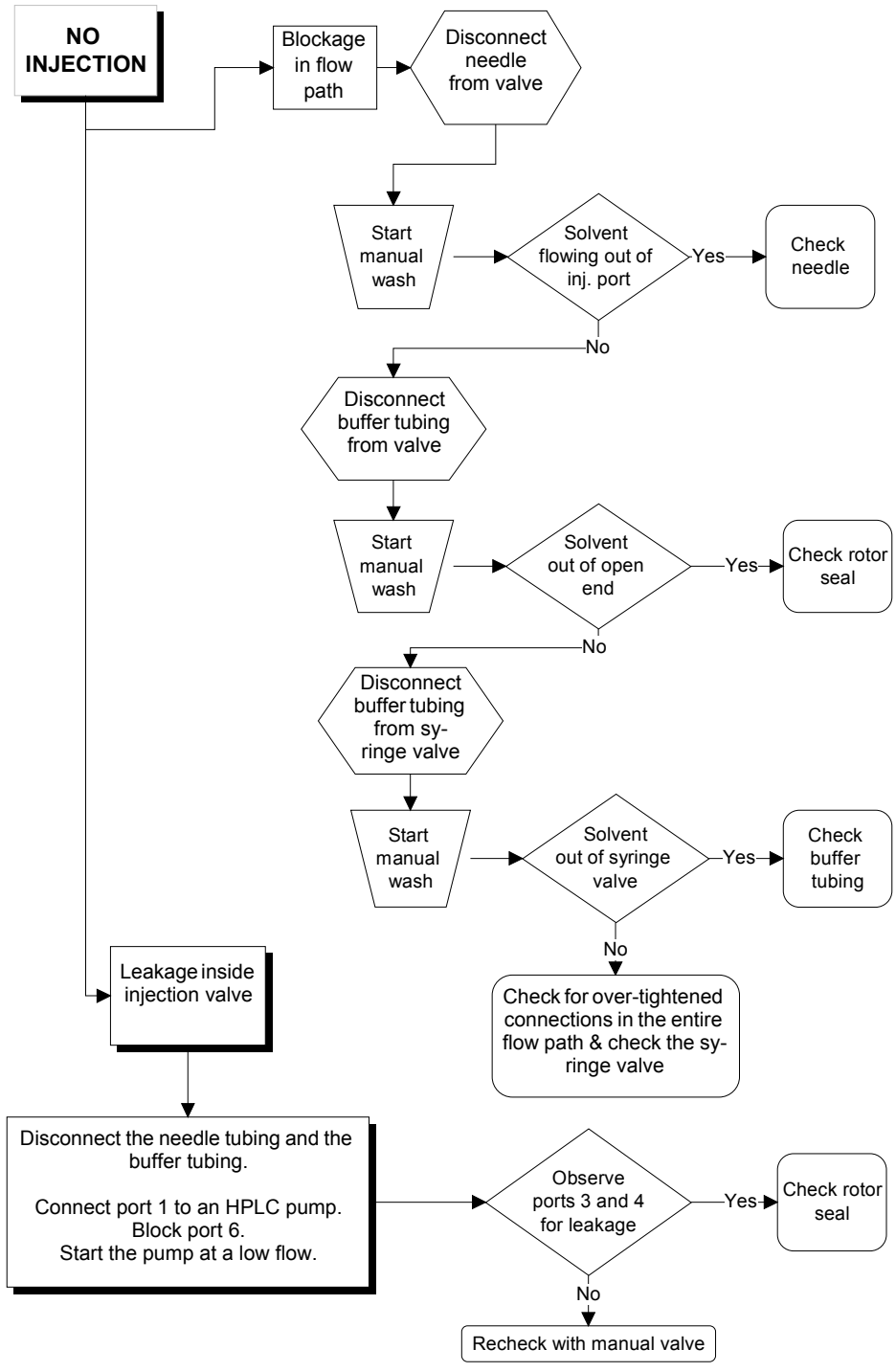


Figure 7-3. Flowchart for troubleshooting injection problems

Reproducibility Problems

This topic describes what to do if you have reproducibility problems with your Finnigan Micro AS autosampler. It contains the following subtopics:

- Removing an Air Bubble From the Syringe
- Reproducibility Troubleshooting Chart

Removing an Air Bubble From the Syringe

The most common cause of reproducibility problems with the Finnigan Micro AS autosampler is a trapped air bubble in the syringe. To diagnose and fix this problem, do the following:

1. On the front keypad of the autosampler, press <EXIT> to exit serial mode and enter the Ready Menu.
2. Press <SYR END>. The syringe will move to its end position.

   If there is an air bubble trapped in the syringe, it should be clearly visible when the syringe is in the end position.
3. First, try to expel the air bubble by running a wash:
   a. Press <SYR HOME> to return the syringe to the home position.
   b. Press <WASH> to activate the wash procedure.
   c. Let the wash procedure run until the syringe has been filled and emptied several times. Press **Start/Stop** to stop the wash.
   d. Check the syringe again for air bubbles. If there is still air in the syringe, go to **step 4**. If the air bubble has been expelled, go to **step 11**.
4. Remove the syringe from the autosampler:
   a. Press <SYR END>. The syringe will move to its end position.
   b. Lift the cover.
   c. If necessary, remove the wash solvent bottle and holder to allow easier access to the syringe. To do this, pull on the wash solvent bottle holder to slide the tabs on the holder out of the slots in the autosampler.
   d. Unscrew the syringe from the autosampler by turning clockwise.
   e. Pull the bottom of the syringe towards you and slide the bottom of the syringe handle off of the peg on the autosampler.
5. Hold the syringe upright (with the syringe opening pointing upwards). Gently tap or flick the syringe with a finger to dislodge air bubbles and allow them to escape from the syringe.

If you cannot dislodge the air bubble using this method, go to **step 6**. If the air bubble has been expelled, go to **step 8**.

6. Fill a small (~50 mL) beaker with wash solvent.
7. Submerge the syringe opening in the wash solvent in the beaker. Rapidly push down and draw up the syringe plunger. Repeat until the air bubble is expelled from the syringe.
8. Reinstall the syringe on the autosampler:
   a. Fit the hole in the end of the syringe handle over the peg on the autosampler.
   b. Screw the top of the syringe to the autosampler by turning counterclockwise.
   c. Close the autosampler cover.
   d. Press <SYR HOME> to return the syringe to the home position.
9. If you removed the wash solvent bottle earlier, reinstall it. Refer to **Wash Solvent** on page 3-4 for more information on installing the wash solvent bottle.
10. Execute a wash:
    a. Press <WASH> to start the wash procedure.
    b. Let the wash procedure run until the syringe has been filled and emptied several times. Press **Start/Stop** to stop the wash.
11. Press **Menu**, then press <SERIAL> to put the autosampler back into serial mode.

> **Note**. The autosampler must be placed into serial mode before you attempt to operate the autosampler using the data system control software. The data system computer will not be able to establish communication with the autosampler unless the autosampler is in serial mode.
>
> Place the autosampler in serial mode by pressing the <SERIAL> soft-function key in the Ready Menu.

Reproducibility Troubleshooting Chart

Figure 7-4 illustrates a flowchart for troubleshooting additional reproducibility problems.

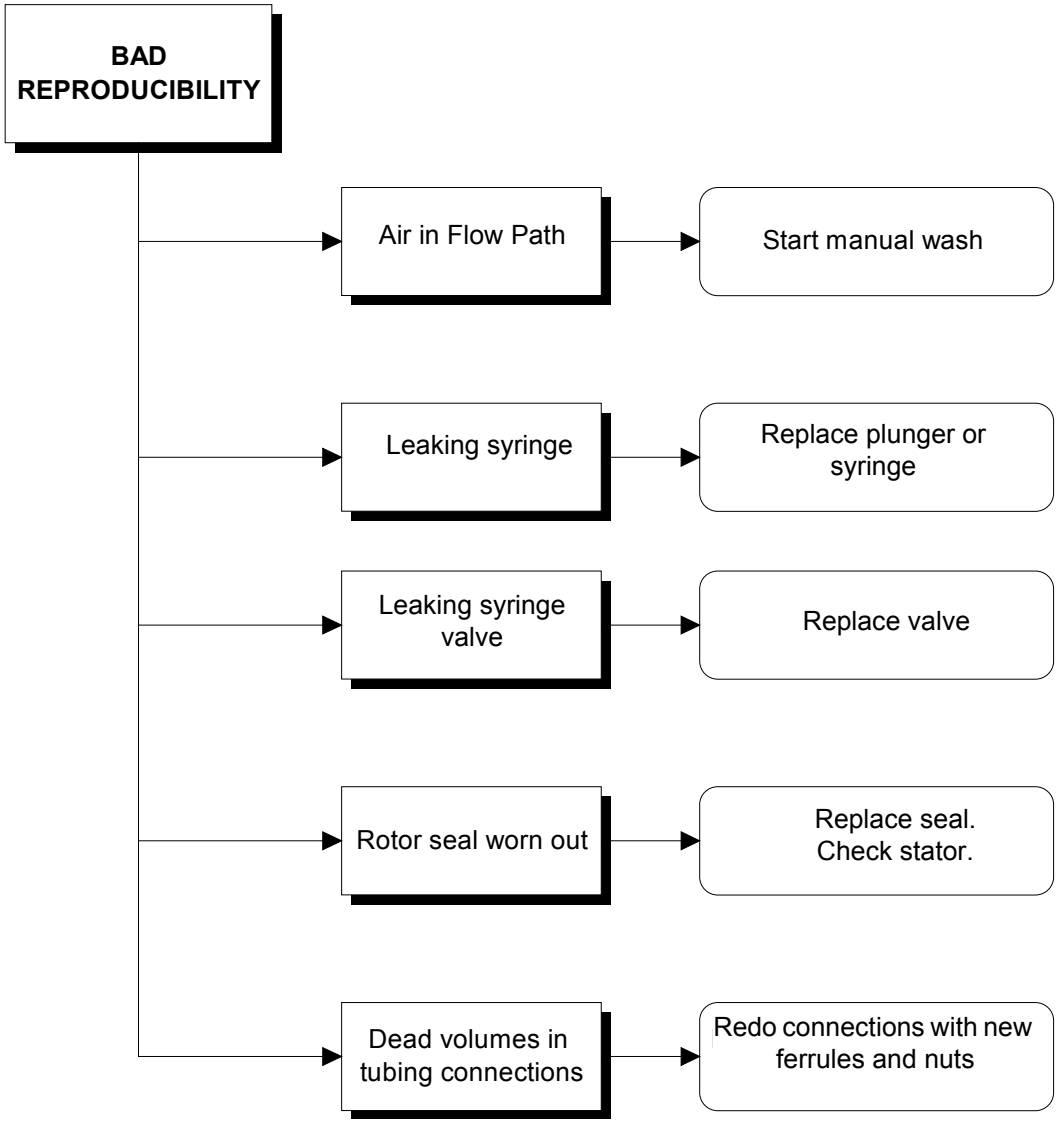


Figure 7-4. Flowchart for troubleshooting reproducibility problems

Chapter 8
Parts and Accessories

This chapter contains a list of parts and accessories that can be ordered from your local Thermo Electron service representative.

This chapter contains the following sections:

- Parts and Accessories Kit
- Additional Replaceable Parts

8.1 Parts and Accessories Kit

The Finnigan Micro AS autosampler is shipped with a parts and accessories kit (P/N 00960-01-00010) that includes the parts listed in Table 8-1.

Table 8-1. Parts and accessories that are shipped with the Finnigan Micro AS

Quantity	Description
1	48-vial adapter
1	Injection marker cable
1	2.4 µL biocompatible fused silica needle
1	5.0 µL biocompatible fused silica needle
1	0.25 in. female Luerlock fitting
1	3-stranded networking cable
2	Glass fuses, UL, ¼ in. × 1¼ in.
4	10 mL vials, 20 mm × 47 mm
4	Septa for vials
4	Caps for vials
1	Masterblock® U 96-well polypropylene plate
1	96-well polystyrene plate
1	Capmat for Masterblock 96-well plate
1	10 µL PEEK injection loop
1	100 µl Luerlock syringe
1.2 m	Silicone tubing, ID 7.0 mm, OD 10.0 mm

8.2 Additional Replaceable Parts

The following additional replacement parts are available from your local Thermo Electron service representative:

Syringe, 25 µL 00950-01-00002
Seal, rotor, C2-1346 injection valve 00950-01-00003
Needle, fused silica, 2.4 µL, biocompatible 00950-01-00004
Valve, syringe 00950-01-00005
Air prepuncturing needle 00950-01-00006
Opto interruptor 00950-01-00007
Stator, C2-1346 injection valve 00950-01-00008
Cable, inject marker 00950-01-00009
Stepper motor, 1.05 A 00950-01-00010
Rubber foot kit (6 pieces) 00950-01-00011
Stepper motor, 2.2 A 00950-01-00012
Tubing, syringe waste 00950-01-00013
Tubing, buffer, 50 µL, PEEK 00950-01-00014
Transport nut M5 00950-01-00015
Sealing ring M5 (10 pack) 00950-01-00016
Needle body 00950-01-00017
Waste outlet 00950-01-00018
Flex PCB with sample needle motor 00960-01-00006
Plate holder assembly, cooler 00960-01-00008
Peltier assembly 00960-01-00009

Appendix A
Introduction to Keypad Operation

This chapter describes how to operate and program the Finnigan Micro AS autosampler from the front keypad.

When you switch on the Finnigan Micro AS autosampler, it defaults to the serial mode of operation. In serial mode, the autosampler is controlled by the data system computer and not from the front keypad.

Before trying any of the programming examples in this chapter or performing other operations involving control of the autosampler from the front keypad, you must place the autosampler into manual mode. Press <EXIT> on the front keypad to exit serial mode and enter manual mode.

When you want to return to controlling the autosampler from the data system computer, you must put the autosampler back into serial mode. The data system computer cannot establish communication with the autosampler unless the autosampler is in serial mode. From the Ready Menu, press <SERIAL> to put the autosampler into serial mode.

This chapter contains the following sections:

- Menus
- Recommended Working Order
- Types of Methods and Links to Series
- Executing a Series
- Executing a Series in Remote Control
- Programming Examples

A.1 Menus

The software of the Finnigan Micro AS is menu-driven. The most important menus are:

- **Ready Menu**: this menu appears after the Finnigan Micro AS has been switched on. It offers general options for methods management and communication with other instruments.
- **System Menu**: this menu appears after you press the **System** key in the keypad. It offers general options for entering settings for an analytical run. The settings programmed into the System Menu affect the options that are displayed in other menus. To keep other menus as concise as possible, enable only the options you need in the System Menu.
- **Methods Menu**: this menu appears after you press the **Methods** key in the keypad. The menu allows you to program methods to be used in analytical runs.
- **Series Menu**: this menu appears after you press the **Series** key in the keypad. The menu allows you to define a series. A series is a program that links one or more methods to a set of sample wells.

Use the following **keys** to navigate through the menus:

- **E**: Enter; to confirm a choice or to select a choice made in a screen, or to step through menu lines
- cursor keys: to change values in a field or to move to a different field in a screen
- **Escape**: to return to a previous menu
- **CL**: Clear; to remove a value from a field and enter NONE or DEFAULT
- soft function keys: to go to sub-menus

If [MENU] or [MN] is displayed in the top right hand corner of the screen, you can press the **Menu** key in the keypad to display more options offered by the menu. Refer to **Keypad and Display of the Finnigan Micro AS** on page 1-7 for an overview of all the keys in the keypad.

A.2 Recommended Working Order

After you have determined what type of analytical run you want to perform, the most convenient working order for the Finnigan Micro AS is:

1. Make any necessary changes to settings in the System Menu.
2. Program a method for the analyses you want to perform in the Methods Menu.
3. Define a series and link a programmed method to a range of wells in the Series Menu.
4. Execute the series.

You can use a different order; however, you should keep in mind that settings entered in the System Menu determine which options appear in the Methods and Series menus. Refer to **Appendix B: Keypad Menu Reference** for more information on specific items in menus and the way they influence the other menus. Refer to **Programming Examples** on page A-7 for a number of examples illustrating this working order.

A.3 Types of Methods and Links to Series

The Finnigan Micro AS offers the following types of methods for different parts of the sample handling routine:

- **injection** method: contains information on the injection routine, flush volume and analysis time.
- **wash** method: describes a wash volume and when a wash is executed.
- **mix** method: a pre-injection method in which additional sample handling can be performed (for example, a pre-column derivatization).
- **timebase** method: a post-injection method with which outputs to other devices (for example, an integrator or pump) and switching of the ISS valve are controlled.
- **user program**: offers the option to program sequences of all actions that can be executed by the Finnigan Micro AS in separate steps.

Each programmed method is assigned a number. The Finnigan Micro AS offers the option to store a combination of defined methods in a **template**. A template is also identified by a number.

Methods must be linked to series before they can be used. The following options are offered by the Finnigan Micro AS:

- You can assign an individual **method** to a series. Mix, injection, wash, and timebase methods can be linked to wells in a series.
- You can assign a **template** to a series. A combination of various programmed methods (mix, injection, wash, timebase) can be defined in a template. The template is linked to a range of wells in a series. In this way all steps in an analytical run are stored together.
- You can assign a **user program** to a series. You can program the user program with a sequence containing any of the available actions that the autosampler can perform in the order you choose.

A.4 Executing a Series

Execution of a series is only possible if you have programmed a method and defined a series for the samples you wish to analyze. Series are not stored in battery backup and exist only for as long as the Finnigan Micro AS is switched on.

To execute one or more series, do the following:

1. Press **Start/Stop**.
2. Enter the number of the first series to perform and the number of the last series to perform.
3. Press <START> to start the actual analytical run. The Finnigan Micro AS will begin to execute the series you have defined. Series are executed in numerical order. Undefined series are skipped.

After the Finnigan Micro AS has executed the run, the Ready Menu appears again.

It is possible to program series and methods during a run. Press **Series** or **Methods**; the options offered in the menus are identical to those offered when the Finnigan Micro AS is idle.

If a series or method is changed, the new values will become active the next time the Finnigan Micro AS starts a series. The series currently running are not affected by the changes.

A.5 Executing a Series in Remote Control

To execute a series from remote control, do the following:

1. Press **Start/Stop**.
2. Enter the numbers of the first and the last series to be performed.
3. Press <REMOTE> to enter the remote control mode. The Finnigan Micro AS can now be controlled by another device using the Next injection input and the Next well input. To indicate that remote control is active, an "r" is displayed in the bottom left corner of the display during execution of the series. At the end of the series the message "Series completed via remote control" is displayed.
4. Press **Escape** to return to the Ready Menu.

Refer to **Chapter 4: I/O Connections** for more information on remote control.

A.6 Programming Examples

This section presents a number of examples of programs that can be created and run from the front panel of the Finnigan Micro AS autosampler. You might find it helpful to do these examples to learn how to work with the autosampler. This section does not provide a description of all autosampler commands. Refer to **Appendix B: Keypad Menu Reference** for a complete command reference.

These examples can be executed after the Finnigan Micro AS has been installed in accordance with **Chapter 2: Installation**, and after all items described in **Chapter 3: Preparing for Use** have been correctly set up.

The following examples are described in this section:

- Example 1. A 10 µL Partial Loopfill Injection
- Example 2. A 3 × 1 µL Injection With µL Pick-up and Wash Between Injections
- Example 3. A 1:10 Dilution Followed by Injection
- Example 4. Defining a Template and Adding a Protection Code

Example 1. A 10 µL Partial Loopfill Injection

This example illustrates how to perform a single partial loopfill injection. For this example it is assumed that a loop of 20 µL, needle tubing of 2.4 µL and a syringe of 25 µL have been installed. To execute this example, perform the following steps:

1. Switch on the power to the autosµampler and wait until the Ready Menu appears.
2. Set the System settings as described in Table A-1. All settings not specified should be set to the default values.

Table A-1. System settings for Example 1

Keys Pressed	Description
System	Enters the System Menu
<MICRO> **E**	Selects Micro mode
<GENERAL> **E**	Enters the General Menu
[2000] **E**	Defines the volume of the installed loop
[024] **E**	Defines the volume of the needle tubing
<NORMAL> **E**	Sets the syringe speed to normal
[05] **E**	Sets the sample needle height to 5 mm
<YES> **E**	Enables use of air segment
<NO> **E**	Switches off headspace pressure

Table A-1. System settings for Example 1, continued

Keys Pressed	Description
Escape	Returns to the System Menu
<PLATES> **E**	Enters the Plates Menu
<96-LOW>	Defines the type of plate to be used
<IN ROWS>	Defines the processing order of wells
Escape Escape	Returns to the Ready Menu

3. Program the injection method as described in Table A-2.

Table A-2. Injection Method Program for Example 1

Keys Pressed	Description
Methods	Enters the Methods Menu
<INJECTION> [01] **E**	Selects injection method number 1
<PARTIAL> **E**	Selects partial loopfill injection method
[100] **E**	Defines an analysis time of 1 minute
[050] **E**	Defines a flush volume of 5 µL
[1] **E**	Defines the number of injections per well
[1000] **E**	Sets the injection volume at 10.0 µL
Escape Escape	Returns to the Ready Menu

4. Program a series as described in Table A-3.

Table A-3. Series Program for Example 1

Keys Pressed	Description
Series	Enters the Series Menu
[01] **E**	Defines the Series number
[01] **E**	Defines the injection method number
CL E	Enters <NONE> for wash method
<ROW A> [01] **E**	Defines location of the first sample well
<ROW A> [01] **E**	Defines location of the last sample well
Escape	Returns to the Ready Menu

5. Place a sample in position A 01 of the plate.
6. Run the series:
   a. Press **Start/Stop** to start the autosampler.
   b. Press [01] **E** to start execution with series number 1.

c. Press [01] **E** to end execution after series number 1.

d. Press <START> to start the analytical run.

The Finnigan Micro AS autosampler locates well A 01 and performs a 10 µL partial loopfill injection. The autosampler display indicates the instrument status (Checking tray, Flushing, Loopfill, Running, Rinse buffer, Running). The display also indicates the number of the defined series (01), the method number (01) and the well on which the analysis is performed (A 01).

At the end of the defined analysis time the Ready Menu is displayed again to indicate that the Finnigan Micro AS is ready for the next analytical run.

Example 2. A 3 × 1 µL Injection With µL Pick-up and Wash Between Injections

This example makes use of the µL pick-up injection method rather than the partial loopfill injection method used in the previous example. It also illustrates how to carry out multiple injections from the same well, and how to program a wash step between injections. To execute this example, do the following:

1. From the Ready Menu, program the System settings as illustrated in Table A-4.

Table A-4. System settings for Example 2

Keys Pressed	Description
System	Enters the System Menu
<MICRO> **E**	Selects Micro mode
<GENERAL> **E**	Enters the General Menu
E until Air segment appears	Selects the Air segment field
<NO> **E**	Switches off the air segment
Escape	Returns to the System Menu
<PLATES> **E**	Enters the Plates Menu
E E	Selects the transport vials field
[1] **E**	Defines the position of the first transport vial
[1]	Defines the position of the last transport vial
Escape Escape	Returns to the Ready Menu

2. Program injection and wash methods as described in Table A-5.

Table A-5. Methods program for Example 2

Keys Pressed	Description
Methods	Enters the Methods Menu
<INJECTION> [02] **E**	Selects injection method number 02
<PICK-UP> **E**	Selects the injection mode for this method
[100] **E**	Defines the analysis time as 1 minute
[3] **E**	Defines the number of injections per well
[100] **E**	Defines a volume of 1.0 µL for 1st injection
[100] **E**	Defines a volume of 1.0 µL for 2nd injection
[100] **E**	Defines a volume of 1.0 µL for 3rd injection
Escape	Returns to the Methods Menu
<WASH>	Enters the Wash Menu
[01] **E**	Selects wash method number 01
<INJECTION> **E**	Selects wash between injections
[300]	Defines wash volume
Escape Escape	Returns to the Ready Menu

3. Program the series as described in Table A-6.

Table A-6. Series program for Example 2

Keys Pressed	Description
Series	Enters the Series Menu
[01] **E**	Defines the series number
[02] **E**	Defines the injection method for this series
[01] **E**	Defines the Wash method for this series
<ROW A> [01] **E**	Defines the location of the first sample well
<ROW A> [01] **E**	Defines the location of the last sample well
Escape	Returns to the Ready Menu

4. Place a vial containing transport solvent (mobile phase) in transport vial position 1 (left). Make sure the transport vial is filled before starting the run.
5. Place a 96 well plate with sample in well A1 on the plate holder.

6. Run the series:
   a. Press **Start/Stop** to start the autosampler.
   b. Press [01] **E** to start execution with series number 1.
   c. Press [01] **E** to end execution after series number 1.
   d. Press <START> to start the analytical run.

At the end of the defined analysis time the Ready Menu appears again to indicate that the Finnigan Micro AS is ready for the following next run.

Example 3. A 1:10 Dilution Followed by Injection

This example illustrates how to program a Mix method to carry out a 1:10 dilution followed by a µL pick-up injection of the diluted sample. To execute this example, do the following:

1. From the Ready Menu, program the System settings as described in Table A-7.

Table A-7. System settings for Example 3

Keys Pressed	Description
System	Enters the System Menu
<MICRO> **E**	Selects Micro mode
<USAGE> **E**	Enters the Usage Menu
E E	Selects the Mix field
<ENABLED>	Enables use of mix methods
Escape	Returns to the System Menu
<PLATES> **E**	Enters the Plates Menu
<96-LOW>	Selects 96 well plate
<IN COLUMNS>	Selects processing in columns (A1, B1, etc)
[1] **E**	Defines the position of the first transport vial
[1]	Defines the position of the last transport vial
Escape Escape	Returns to the Ready Menu

As soon as a change has been entered in the System settings, the message "ALL SERIES DEFAULT" appears. You have to redefine the series because the settings have been changed.

2. Program the injection method as described in Table A-8.

Table A-8. Injection method program for Example 3

Keys Pressed	Description
Methods	Enters the Methods Menu
<INJECTION> [03] **E**	Enters the Injection Menu
<PICKUP> **E**	Selects partial loopfill injection mode
[100] **E**	Defines the analysis time
[3] **E**	Defines the number of injections per well
[100] **E**	Enters the injection volume of 1. 0 µL for 1st injection
[100] **E**	Enters the injection volume of 1. 0 µL for 2nd injection
[100] **E**	Enters the injection volume of 1. 0 µL for 3rd injection
Escape	Returns to the Methods Menu

3. Program the mix method as described in Table A-9.

Table A-9. Mix method for Example 3

Keys Pressed	Description
<MIX>	Enters the Mix Menu
[1] **E**	Defines Mix method number 1
<INSERT>	Inserts mix method step 1
<ASPIRATE> [200] <AIR> **E**	Aspirates an air segment of 2.0 µL
<INSERT>	Inserts mix method step 2
<ASPIRATE> [2000] **Menu** <REAG-A> **E**	Aspirates 20 µL from Reagent A vial
<INSERT>	Inserts mix method step 3
<DISPENSE> [1800] **E**	Dispenses 18.0 µL to destination well
<INSERT>	Inserts mix method step 4
<DISPENSE> [400] <WASTE> → [5] **E**	Dispenses 4.0 µL to waste
<INSERT>	Inserts mix method step 5
<REPEAT> [1] ← [4] **E**	Repeats the last four steps once
<INSERT>	Inserts mix method step 6
<ASPIRATE> [200] <AIR> **E**	Aspirates an air segment of 2.0 µL
<INSERT>	Inserts mix method step 7

Table A-9. Mix method for Example 3, continued

Keys Pressed	Description
<ASPIRATE> [600] <SAMPLE> **E**	Aspirates 6.0 µL of sample
<INSERT>	Inserts mix method step 8
<DISPENSE> [400] **E**	Dispenses 4.0 µL to destination well
<INSERT>	Inserts mix method step 8
<DISPENSE> [500] <WASTE> → [5] **E**	Dispenses 5.0 µL to waste
<INSERT>	Inserts mix method step 10
<ASPIRATE> [500] <AIR> **E**	Aspirates an air segment of 5.0 µL
<INSERT>	Inserts mix method step 11
<ASPIRATE> [2000] <DESTINATION> → [3] **E**	Aspirates 20.0 µL from the destination well with syringe speed 3
<INSERT>	Inserts mix method step 12
<DISPENSE> [2000] → [9] **E**	Dispenses 20.0 µL to the destination well with syringe speed 9
<INSERT>	Inserts mix method step 13
<REPEAT> [3]	Repeats the last 2 steps 3 times
Escape Escape	Returns to the Ready Menu

4. Program the series as described in Table A-10.

Table A-10. Series program for Example 3

Keys Pressed	Description
Series	Enters the Series Menu
[01] **E**	Defines series number 1
[01] **E**	Selects Mix method number 1 for this series
[03] **E**	Selects Injection method number 3
CL E	Selects <NONE> for wash method
<ROW A> [1] **E**	Defines location of first sample well
<ROW A> [1] **E**	Defines location of last sample well
<ROW B> [1] **E**	Defines location of first destination well
[1] **E**	Defines position of Reagent A
Escape	Returns to the Ready Menu

5. Load a sample plate with sample in position A 01. Position B 01 is used as an empty sample well.

6. Place a filled reagent vial in position 1 of the reagent/transport vial slots. Make sure that the reagent vial is filled correctly before starting a new series.
7. Run the series:
   a. Press **Start/Stop** to start the autosampler.
   b. Press [01] **E** to start execution with series number 1.
   c. Press [01] **E** to end execution after series number 1.
   d. Press <START> to start the analytical run.

When the run is started, the Finnigan Micro AS transports 18 µL of Reagent A to the destination well (B 01) twice. Then the autosampler adds 4 µL of sample to the destination well, and mixes the sample three times. After mixing, the autosampler performs a 1.0 µL injection.

Example 4. Defining a Template and Adding a Protection Code

This examples illustrates how to incorporate the injection method (02) and wash method (01) defined in Example 2 into a template and how to add a protection code to the methods. When a protection code is enabled, you cannot edit any methods without first entering the code. To execute this example, do the following:

1. From the Ready Menu, program the system settings as shown in Table A-11.

Table A-11. System settings for Example 4

Keys Pressed	Description
System	Enters the System Menu
<USAGE> **E**	Enters the Usage Menu
[123456] **E**	Enters a 6-digit code (memorize or record this code!)
E	Selects the mix methods field
<DISABLED>	Turns off use of mix methods
E E	Selects the template field
<ENABLED>	Enables templates
Escape Escape	Returns to the Ready Menu

After use of templates has been enabled the message "ALL SERIES DEFAULT" appears. You need to redefine the series because the System settings have changed.

2. Select the methods to be incorporated into the template as described in Table A-12.

> **Note**. The template used in this example incorporates the injection method and the wash method programmed in **Example 2. A 3 × 1 µL Injection With µL Pick-up and Wash Between Injections** on page A-9. If you have deleted or change these methods, refer to the above section and reprogram the injection method and wash method before continuing.

Table A-12. Template for Example 4

Keys Pressed	Description
Methods	Enters the Methods Menu
[123456] **E**	Enters the methods protection code
<TEMPLATE>	Enters the Template Menu
[01] **E**	Defines the number for the template
[02] **E**	Defines the injection method for this template
[01]	Defines the wash method for this template
Escape Escape	Returns to the Ready Menu

3. Program the series for the template as described in Table A-13.

Table A-13. Series Program for Example 4

Keys Pressed	Description
Series	Enters the Series Menu
[01] **E**	Defines the Series number
[01] **E**	Defines the Template method number
<ROW A> [01] **E**	Defines the first sample well
<ROW B> [01] **E**	Defines the last sample well
Escape	Defines to the Ready Menu

4. Place a vial with transport solvent (mobile phase) in transport vial position 1 (left).
5. Place a 96-well plate with sample in well A1 on the plate holder.
6. Run the series:
   a. Press **Start/Stop** to start the autosampler.
   b. Press [01] **E** to start execution with series number 1.
   c. Press [01] **E** to end execution after series number 1.
   d. Press <START> to start the analytical run.

The Finnigan Micro AS now performs the same actions as in Example 2, except that analysis is performed on two wells: A 01 and B 01.

> **Note.** Press <DEFAULT ALL> in the Ready Menu (Utilities Menu) to erase all series and methods defined in these examples and to restore all settings to the default values.

Appendix B
Keypad Menu Reference

This chapter describes all the menu options available from the front panel keypad and display of the Finnigan Micro AS autosampler. Menu options are listed in the order they are displayed.

This chapter contains the following sections:

- Ready Menu
- System Menu
- Methods Menu
- Series Menu

B.1 Ready Menu

The Ready Menu allows you to access basic hardware and software functions that are necessary for the maintenance and operation of the autosampler. The Ready Menu contains the following soft function keys:

- <PLATES>
  Press this key to install or exchange plates. Press <EXCHANGE> to move the plate to the left; in this position the plate can be replaced without damage to the equipment. Press <PLATE HOME> to move the plate to operating position again.
- <WASH>
  Press this key to start a standard wash procedure. All tubing connected to the syringe valve is filled and rinsed with wash solvent.
- <SYR END>
  Press this key to move the syringe to end position to replace the syringe or to simplify filling of wash solvent tubing. A syringe volume of wash solvent is aspirated from the wash solvent bottle and the wash solvent tube is filled. Press <SYR HOME> to dispense the syringe content to syringe waste and to move the syringe to standard operating position again.
- <UTILS>
  Press this key to go to the Utilities Menu. If a method protection code is enabled in the System Menu, the code must be entered to access the Utilities Menu. The menu offers the following options:
  - <COPY>
    Press this key to copy a method. Press the appropriate soft function key (<MIX>, <WASH>, <INJECTION>, <TIMEBASE>) to specify the method type, and then enter the number of the method to be copied. Then, enter a number to define the destination method. Any existing method stored under that number will be overwritten.
  - <ERASE>
    Press this key to erase a method, template, or user program. If Template and User Program are switched off in the System Menu, the soft function keys for erasing a standard Method (mix, injection, wash, timebase) appear. Note that it is not possible to erase the user program if the protection code for the user program is enabled in the System Menu.
  - <LOG>
    Press this key to access the instrument log. Two options are available from this menu:
    - <EVENTS>
      Press this key to display a log of system-relevant events, such as error messages. Use the <NEXT> and <PREVIOUS> keys to scroll through the event list.

- <COUNT>
  Press this key to display the cumulative count of valve actions, days powered on, syringe movements, and other system information.

> **Note**. After every 50000 syringe actions, the following message is displayed: "Lifetime of syringe may be exceeded. Check for possible leakage." It is recommended that you replace the syringe at this time. If you do not replace the syringe and choose "Do not display this message again," the message is not be displayed until 50000 more syringe actions have been counted.
>
> After every 200000 syringe valve actions, the following message is displayed: "Lifetime of syringe valve may be exceeded. Check for possible leakage." Contact your local Thermo Electron service representative to have the valve replaced and the counter reset.

- <DEFAULT ALL>
  Press this key to restore all software settings to the default values. All series, methods, templates, and the user program will be erased, unless protected by a protection code.

> **Note.** After restoring settings to default, enter the System Menu and ensure that the System settings are compatible with your hardware configuration.

- <COOL>
  Press this key to enter the programming mode for Peltier plate cooling. The programmable temperature range is 4 °C to 40 °C. The maximum cooling capacity is approximately 12 °C below ambient temperature. (Refer to **Appendix D: Specifications** for specifications.) Press <ON> to switch on cooling, and use the numeric keypad to enter the setpoint value. When the cool option is on the following soft function keys can be selected:
  - <MANUAL>
    Temperature control remains on until switched off again by the user from this menu.
  - <AUTOMATIC>
    Temperature control is switched off after all programmed series have been executed.
  - <DATE-TIME>
    Temperature control is switched on or off (depending on initial state) at a programmed date and time.

- <SERIAL>
  Press this key to put the Finnigan Micro AS in serial mode to allow for control of the autosampler by way of PC (RS232 interface). Select a device identifier in the System Menu (refer to **System Menu** on page B-5). If a method protection code was defined in the system settings, the code must be entered to access serial mode. The following soft function keys appear:
  - <PANIC>
    Press this key to begin a stop sequence in which all tubing is rinsed and the valve and I/O ports are reset. At the end of the sequence, serial mode is resumed.
  - <EXIT>
    Press this key to end serial mode and return to the Ready Menu.
- <SERVICE>
  For service to the apparatus. To be used by authorized personnel only. The Service Menu is protected by a service code.

B.2 System Menu

The System Menu allows you to define and store values for configurable hardware parameters, such as sample loop volume, needle tubing volume, syringe volume, I/O parameters, and so on. Whenever you change the sample loop, needle, or syringe on your autosampler, verify that the System Menu contains the correct settings.

The System Menu also allows you to enable or disable a number of optional software features, such as the use of mix methods, timebase methods, and programmable user templates.

The System Menu settings determine whether certain options appear or do not appear in other menus of the autosampler software. For this reason, you should program the correct settings for your application in the System Menu before going on to the other menus.

When you enter the System Menu, choose one of the following soft function keys:

- <MICRO>
  Press this key if the autosampler hardware is configured for operation in Micro mode. This is the default hardware configuration for the Finnigan Micro AS and supports use of the 25 µL syringe and the 10 µL or 20 µL sample loops.
- <CONVENTIONAL>
  Press this key if the autosampler hardware is configured for operation in Conventional mode. Conventional mode supports the use of larger syringes and sample loops than those supported in Micro mode. The Xcalibur 1.4 / ProteomeX 2.0 software does not support use of the Finnigan Micro AS in Conventional mode.

> **Note.** Switching the autosampler from one mode of operation to the other requires that the System Menu settings be reset to their default values. If you attempt to switch the mode of operation, you will see a warning message, "ALL DATA DEFAULT!! PRESS E TO ACCEPT." Press **E** to switch modes and reset all System Menu settings. Press **CL** to cancel the change and leave System Menu settings as they are.

After you have chosen the mode of operation, you can program the system settings using the following soft function keys:

- <GENERAL>
  Press this key to enter values for:
  - **loop volume, needle tubing, syringe volume**: Enter these values to reflect the installed sample loop, needle, and syringe. Note that when the autosampler is operated in Micro mode, the syringe volume is automatically set to 25 µL and cannot be varied.

- **syringe speed and scale factor:** The aspirating speed of the syringe used in injection methods can be set to either low, normal, or high to accommodate differing sample viscosities. In addition, for finer control of the syringe speed, you can enter a scaling factor between 0.1 and 1.0. The specified syringe speed is reduced by multiplying by the scaling factor. The speed of the syringe during the wash or the rinsing procedure of the buffer is not affected by this setting.
- **needle height:** This parameter defines the distance between the needle point and the plate holder. (The default distance is 5 mm.) The value is only used in injection methods; for mix methods this value is programmable in the method itself.
- **skip missing vials**: This parameter appears only if a plate with 48 vials is selected in System Menu (Plates Menu). YES means that empty spaces are skipped during the run. NO means that the Finnigan Micro AS stops if a missing vial is encountered during the run; an error code is generated.
- **air segment**: This parameter allows you to choose whether an air segment will be used for analytical runs. For more information about the air segment, refer to **Injection Methods** on page 1-9.
- **headspace pressure**: This parameter allows you to switch headspace pressure on or off. The Finnigan Micro AS uses headspace pressure to facilitate transport of sample into the loop. Headspace pressure will always be used during a wash procedure. Note that accuracy and reproducibility might decrease if headspace pressure is switched off. However, headspace pressure is only useful if sample wells are airtight. Refer to **Needle Assembly** on page 3-9 and **Plates and Sample Handling** on page 3-11 for more information.
- **time display**: This parameter offers a choice between two types of time representation. Select HH:MM:SS to display the time in hours, minutes, and seconds. Select HH:MM.mm to display the time in hours, minutes, and decimal fractions of minutes.
- **key click, error beep and alarm buzzer**: These parameters allow you to switch sound signals on or off.

Table B-1 gives an overview of the allowed ranges for the General Menu settings when the autosampler is operated in Micro mode:

Table B-1. Ranges for General Menu settings in Micro mode

Parameter	Default	Programmable Range
Loop volume	100 µL	0.01 to 25 µL
Needle tubing	15 µL	0.1 to 99.9 µL
Syringe speed	normal	low, normal or high
Scale factor	1.0	0.1 to 1.0
Needle height	5 mm	0 to 40 mm
Skip missing vials	yes	yes or no
Air segment	yes	yes or no
Headspace pressure	no	yes or no
Time display	HH:MM:SS	H:MM:SS or H:MM.mm
Key click	on	on or off
Error beep	on	on or off
Alarm buzzer	on	on or off

- <USAGE>
  Press this key to enter the following Usage settings:
  - **protection code**: Enter a six digit code (000000-999999) for protection of all methods. Press **CL** to erase the code. If a code has been defined it is not possible to enter the System Menu or the Methods Menu without entering the protection code. By default, there is not protection code.

> **Caution**. If you enter a protection code, be sure to write down the code and keep it in a safe place. Without this code, you will not be able to make changes to the System Menu settings or to programmed methods.

  - **timebase methods**: This parameter allows you to enable the option to program timebase methods. When a timebase method is run, the Finnigan Micro AS autosampler controls other connected equipment during the analysis time. Program timebase methods in the Methods Menu. By default, timebase methods are not enabled.
  - **mix methods**: This parameter allows you to enable the option to program mix methods for the Finnigan Micro AS. Program mix methods in the Methods Menu. Note that the Finnigan Micro AS cannot analyze priority samples during a run if the mix method is enabled. By default, mix methods are not enabled.

- **user program**: This parameter allows you to enable the option to program a user program. If this function is enabled you can enter a user program protection code (6 digits) that protects the user program from unauthorized editing. (Note that this is a separate protection code from the methods protection code described above. The user program protection code protects the user program only and does not prevent access to the System or Methods Menus.) Program the user program in the Methods Menu. Note that the Finnigan Micro AS cannot analyze priority samples during a run if the user program is enabled. By default, the user program is not enabled.
- **labeled wells**: This parameter allows you to enable the option to program labeled wells. When the autosampler reaches a labeled well during a run, it sends an output signal to the P2 TTL marker and P4 contact closure outputs. (Refer to **Chapter 4: I/O Connections** for more information.) These output signals can be used to trigger an external device. Program the location of labeled wells in the Series Menu. By default, the use of labeled wells is not enabled.
- **templates**: This parameter allows you to enable the option to program templates. Program templates in the Methods Menu. By default, templates are not enabled.
- **calibration wells**: This parameter allows you to enable the option to program the use of a calibration vial. Program the calibration vial in the Series Menu. By default, calibration wells are not enabled.

> **Note**. Switching off all unnecessary options in the Usage Menu ensures that other menus are not cluttered with options that are irrelevant to the types of analyses you want to perform.

- <PLATES>
  Press this key to define the type of plate to be used. Four types can be selected: 96-low (default), 96-high, 384-low or 48-vials. After a plate type has been selected, enter the following:
  - **well processing method**: Choose processing in rows (left to right) or in columns (top to bottom).
  - **first transport vial**: Enter a number 1 to 4, or press **CL** if transport vials are not used.
  - **last transport vial**: enter a number 1 to 4.

  Vials can be placed in any of the four positions. Transport vials must be placed in a continuous row.
- <IO>
  Press this key to enter the I/O configuration mode and define the following:
  - **inject-marker pulse length**: the length of the inject-marker pulse.

- **well-marker pulse length**: the length of the well-marker pulse.
- **labeled well-marker pulse length**: the length of the well-marker pulse of the labeled well.
- **input edge next injection**: the edge sensitive inputs for the next injection.
- **input edge next well**: the edge sensitive inputs for the next well.
- **freeze input active**: whether the freeze input is active when high, or freeze input is active when low.
- **reset outputs after last series**: whether the outputs should be reset to default after the last series.

Table summarizes the possible ranges for the I/O parameters. Refer to **Chapter 4: I/O Connections** for more specific information on I/O connections.

Table B-2. Summary of allowed values for I/O parameters

Parameter	Default	Range
inject-marker pulse length	1.0 s	0.1 to 2.0 s
well-marker pulse length	1.0 s	0.1 to 2.0 s
labeled well marker pulse length	1.0 s	0.1 to 2.0 s
input edge next injection	falling	falling or rising
input edge next well	falling	falling or rising
freeze input active	low	low or high
reset outputs after last series	no	yes or no

- <CLOCK>
  Press this key to switch the system clock on or off. Select ON to enter the clock menu in which you can set date (yy,mm,dd) and time (hh,mm). This date and time will be displayed in the Ready Menu.
- <COMM.>
  Press this key to define a device identifier for communication with other equipment (for example, a data system computer). An identifier between 20 and 29 can be selected for the Finnigan Micro AS.

B.3 Methods Menu

This menu allows you to program various types of methods. It is possible to define 24 separate injection methods, 5 wash methods, 5 timebase methods, 9 mix methods, and one user program.

It is also possible to program a combination of methods and save them in a **template**. The settings entered in the System Menu determine the options offered by the Methods Menu.

- <TEMPLATE>
  Press this key to enter a menu in which a template can be defined. First assign a number to the template, then link the numbers of methods to the template. The following items can be entered to fill a template:
  - **user program instead of methods**:
    - If soft function key <YES> is selected, the complete template is filled with the user program; no other methods can be added.
    - If soft function key <NO> is selected, the following can be entered into the template: mix method number, injection method number, wash method number, and timebase method number.

You can program a maximum of 24 templates.

- <METHODS>
  Press this key to enter a menu for defining the following types of methods:
  - **<**MIX**>** (if enabled in System Menu, Usage Menu)
    Press this key to program a method that allows you to perform pre-injection sample handling, such as pre-column derivatization, dilution or adding of internal standard. Nine mix methods can be programmed; the maximum number of steps that can be programmed for the total of 9 mix methods and the user program is 240. After you assign a number to the mix method, the Mix Menu appears with the following soft function keys:
    - <EDIT> an existing step or a new step for a new mix method.
    - <INSERT> a new step in an existing method before the displayed step.
    - <DELETE> the displayed step.

If the mix method is empty, “End of mix method” is displayed. If an existing mix method is selected, the first line of the mix method is displayed. Scroll through the steps of the existing method with the cursor keys and use the soft function keys to enter changes in an existing method.

The following types of steps can be programmed for a mix method:

- <ASPIRATE>
  Aspirate a programmed volume of sample, air, liquid from destination vial, or liquid from reagent vial. The syringe speed can be set to a value between 1 and 9. The height (H) indicated is the distance from the needle point to the plate holder. (The default height is 5 mm.) The maximum aspiration volume is equal to the total volume of the syringe.
- <DISPENSE>
  Dispense a programmed volume from the buffer tubing into a sample, destination, or reagent vial, or to waste. The syringe speed can be set to a value between 1 and 9. The height (H) indicated is the distance from the needle point to the plate holder. (The default height is 5 mm.) It is possible to dispense a larger volume than that aspirated in previous actions. In that case, the aspirated amount is complemented with liquid from the wash solvent bottle to equal the total programmed dispense volume.

Caution. During a dispense action, the pressure in the buffer tubing increases. To prevent damage to the buffer tubing, do not allow flow rates to exceed 6 mL/min for water or liquids of similar viscosity. See Table B-3 for flow rates achieved by different syringes at different speeds.

- <WAIT>
  Pause for the programmed period of time (H:MM:SS). Maximum wait time is 9 hours, 59 minutes, and 59 seconds.

Note. During the pause, the needle moves to the home position (if the previous step was an aspirate or dispense action). If you want the needle to stay in the same position, program an aspirate or dispense step of 0 µL at the desired position.

- <REPEAT>
  Designate a sequence of previous steps to be repeated, and specify how many times they will be repeated.
- <WASH>
  Enter the volume for a needle wash. Buffer is rinsed to waste.

- <INJECTION>
  Use this key to program an injection method for a run of the type full loop, partial loopfill or µL pick-up. Enter a number for the injection method you are going to program.

> **Note.** If you have programmed changes in the System Menu that are not compatible with a programmed injection method, the method will be locked and you will not be able to use it in a run. If the selected method is locked, the word 'LOCK' is displayed. You can unlock a method by restoring the System Menu settings to their previous values, or by programming new valid parameters in the injection method itself.

Use the soft function keys to select an injection method, then enter values for:

- **analysis time**: the time between switching the injection valve to inject and the start of processing the next sample.
- **flush volume**: the amount of sample taken from a vial before the loop is filled with sample. The default value is 5 µL.

> **Note**. Flush volumes of less than twice the volume of the needle and tubing will result in decreased performance.

- **number of injections per vial:** maximum value is 9.
- **injection volume:** can be entered for each injection per vial. For maximum injection volumes, refer to **Injection Methods** on page 1-9.
- **valve to load:** Use this option to switch the injection valve back to the LOAD position after injection. Enter a value for the time between start of injection and switching back to LOAD. If the time is set to 00:00:00, the valve will remain in the INJECT position until the next programmed injection sequence, if any.

- <WASH>
  Use this key to program wash methods. It is possible to program a wash between injections, samples or series. The default wash volume is 300 µL.
- <TIMEBASE> (if enabled in System Menu, Usage Menu)
  Press this key to enable control of external devices via auxiliary or binary outputs. A maximum of 5 timebase methods can be programmed. The menu offers the following soft function keys:
  - <AUX>
    Scroll through all program lines by pressing **E**, or press AUX to move to the next auxiliary output.
  - <VALVES>
    The Finnigan Micro AS autosampler does not use this function.

- <CODE>
  Enter a time and a value between1 and 15, hexadecimal output. Press **E** to scroll through the programming lines.
- <END>
  Enter the end time for a timed events program. If no value is entered, or if **CL** is pressed, an end time is generated automatically based on the analysis time programmed for the injection method used in the relevant series.

> **Note**. If the programmed end time exceeds the programmed analysis time, the end time overrides the analysis time. It is possible to program events after the end time, but these events are not executed during a run.

- <USER PROGRAM>
  The user program allows you to program all possible actions required for a sample handling sequence in separate steps. Note that the total number of steps for the user program and all nine mix methods cannot exceed 240. The user program can be protected by a special user program protection code (System Menu, Usage Menu). If no user program has been programmed yet, "end of user program" is displayed. Otherwise, the first line of the programmed method appears. The following soft function keys are available:
  - <EDIT> an existing step or program a new step for the user program
  - <INSERT> a new step before the displayed step
  - <DELETE> delete the displayed step.

The Edit and Insert Menus offer the following soft function keys:

- <ASPIRATE>
  Aspirate a programmed volume from a sample well, air, a destination vial, wash, or one of the reagent vials into the buffer tubing. Syringe speed and needle height can be entered. The maximum volume that can be aspirated is the total volume of the syringe.
- <DISPENSE>
  Dispense a programmed volume from the buffer tubing into a sample well, waste, destination vial, wash, or one of the reagent vials. The syringe speed and needle height can be entered. Unlike DISPENSE actions programmed in a mix method, DISPENSE actions in a user program cannot be set to dispense a larger volume than that aspirated in previous actions.

> **Caution**. During a dispense action, the pressure in the buffer tubing increases. To prevent damage to the buffer tubing, do not allow flow rates to exceed 6 mL/min for water or liquids of similar viscosity. See Table B-3 for flow rates achieved by different syringes at different speeds.

- <SYR_VALVE>
  Press this key to control the connection between the syringe and other tubing:
  - <NEEDLE>: Press this key to connect the syringe with the sample needle.
  - <WASH>: Press this key to connect the syringe with the wash solvent bottle.
  - <WASTE>: Press this key to connect the syringe with the syringe waste tubing.
- <SYR>
  Press this key to control the movements of the syringe:
  - <LOAD>: Press this key to load the programmed volume.
  - <UNLOAD>: Press this key to unload the programmed volume.
  - <HOME>: Press this key to dispense a previously aspirated volume to the last programmed position, and then re-initialize syringe.
- <WASH>
  Press this key to execute a needle wash. The content of the buffer tubing is not rinsed to waste before the start of the wash. The programmed volume of wash solvent is used to wash the needle at the wash position.

Note. The wash position might become contaminated with the contents of the buffer tubing, which can lead to cross-contamination. To prevent contamination of the wash position, program a dispense to waste action before programming a wash action.

- <VALVES>
  Press this key to program positions of high pressure valves. The injection valve has two positions, <INJECT> and <LOAD>.
- <WAIT>
  Press this key to program a pause. The maximum wait time is 9 h, 59 min, and 59 s.

Note. During the pause, the needle moves to the home position (if the previous step is an aspirate or dispense action). If you want the needle to stay in the same position, an aspirate or dispense step of 0 µL must be programmed at the desired position.

- <COMPRES>
  Press this key to activate the compressor to put air pressure on a sample. The compressor stays active until it is switched off in a subsequent programmed step.

- <AUX>
  Press this key to control the contact closure auxiliaries (connector P5). Refer to **Chapter 4: I/O Connections** for more information.
- <WAIT-IN>
  Press this key to program a pause during which the Finnigan Micro AS waits for one of the four inputs (connector P6) to become <HIGH> or <LOW> before continuing with the next step. Refer to **Chapter 4: I/O Connections** for more information.
- <PROG-OUT>
  Press this key to program the contact closure programmable outputs (connector P1). These outputs are similar to the auxiliaries, but are only available in the user program. Refer to **Chapter 4: I/O Connections** for more information.
- <CODE>
  Control the timed output (connector P3). This is a hex output in the range 0 to 15. Refer to **Chapter 4: I/O Connections** for more information.
- <MARKERS>
  The markers normally generated by the Finnigan Micro AS are not active during a user program by default, but can be activated by choosing this menu option. Select marker and status (inject, vial, or labeled).
- <SSV>
  This function is not used with the Finnigan Micro AS autosampler.

When programming dispense actions in mix methods and user programs, it is important to take into account the liquid flow rate. When liquid is dispensed, the pressure in the buffer tubing increases. If the flow rate is too high, the buffer tubing can be damaged. For water, or liquids of similar viscosity, the flow should not exceed 6 mL/min. If more viscous liquids are used, the flow should be reduced.

Table B-3 shows flow rates for various combinations of syringes and syringe speeds. The gray shaded area indicates speeds that exceed the recommended maximum flow of 6 mL/min.

Table B-3. Flow rates for various syringe speeds and syringe volumes

Speed	Syringe Volume					
	25 µL	**100 µL**	**250 µL**	**500 µL**	**1000 µL**	**10 mL**
1	12.5 µL/min	50 µL/min	125 µL/min	250 µL/min	500 µL/min	0.5 mL/min
2 (low)	31 µL/min	125 µL/min	315 µL/min	630 µL/min	1255 µL/min	1.3 mL/min
3 (normal)	63 µL/min	250 µL/min	625 µL/min	1250 µL/min	2495 µL/min	2.5 mL/min
4 (high)	94 µL/min	375 µL/min	940 µL/min	1880 µL/min	3765 µL/min	3.8 mL/min
5	193 µL/min	770 µL/min	1920 µL/min	3840 µL/min	7680 µL/min	7.7 mL/min
6	268 µL/min	1070 µL/min	2675 µL/min	5335 µL/min	10665 µL/min	10.7 mL/min
7	343 µL/min	1370 µL/min	3430 µL/min	6855 µL/min	13710 µL/min	13.7 mL/min
8	436 µL/min	1745 µL/min	4365 µL/min	8725 µL/min	17450 µL/min	17.5 mL/min
9	534 µL/min	2135 µL/min	5335 µL/min	10670 µL/min	21335 µL/min	21.3 mL/min

B.4 Series Menu

This menu allows you to define the run sequence in a series. A maximum of 24 series can be programmed. A series contains information about the methods to be used for a range of wells. This can be a template, a separate method (mix, injection, wash, timebase), or the user program. Information on location of wells, labeled wells or calibration wells is also programmed in a series.

> **Note**. The settings entered in the System Menu and the methods defined in the Methods Menu determine which options appear in the Series Menu.

After you have entered the required settings in the System Menu and after you have programmed methods to be used for an analytical run, press **Series** to enter the Series Menu. Figure B-1 gives an overview of the parameters you need to define for each series. Parameters shown in bold in this figure must be set for all series. The availability of other parameters depends on the method used and the settings enabled in the System Menu.

Two types of series can be programmed:

- Series With Templates
- Series Without Templates

> **Note**. Series are stored in the Finnigan Micro AS memory for as long as the power is on. As soon as power is switched off, all programmed series are deleted.
>
> It is not possible to leave the Series Menu until all values have been programmed

Series With Templates

To program a series with a template, enter the template number, the location of the first sample well, and the location of the last sample well. If your System Menu settings have been configured correctly, you can also enter parameters for calibration vials, mix methods, and labeled wells. See Figure B-1 for the order in which these parameters are programmed.

If you have enabled the use of calibration vials in the System Menu (Usage Menu), specify whether you will use calibration vials and indicate the number of wells between calibration vials. See Figure B-2 for an illustration of an example calibration sequence.

If you have enabled the use of a Mix Method in the System Menu (Usage Menu), specify the location of the first destination well and of the reagent vials.

Series Without Templates

To program a series without a template, enter an injection method number, a wash method number, the location of the first sample well, and the location of the last sample well. If your System Menu settings have been configured correctly, you can also enter parameters for the user program, time base methods, calibration vials, mix methods, and labeled wells. See Figure B-1 for the order in which these parameters are programmed.

If you have enabled the use of calibration vials in the System Menu (Usage Menu) specify whether you will use calibration vials and indicate the number of wells between calibration vials. See Figure B-2 for an illustration of an example calibration sequence.

If you have enabled use of a Mix Method in the System Menu (Usage Menu), specify the location of the first destination well and of the reagent vials.

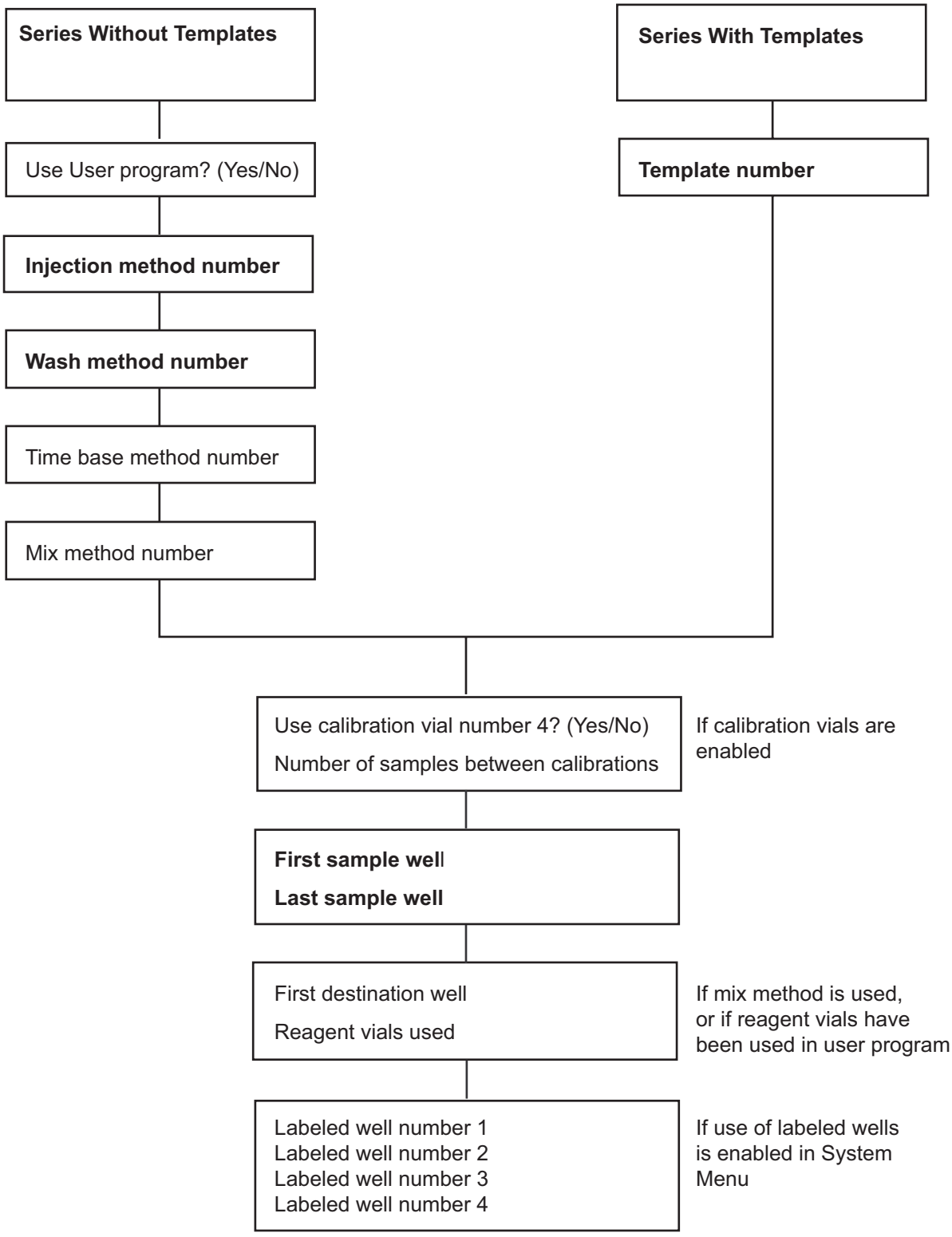


Figure B-1. Series programming parameters

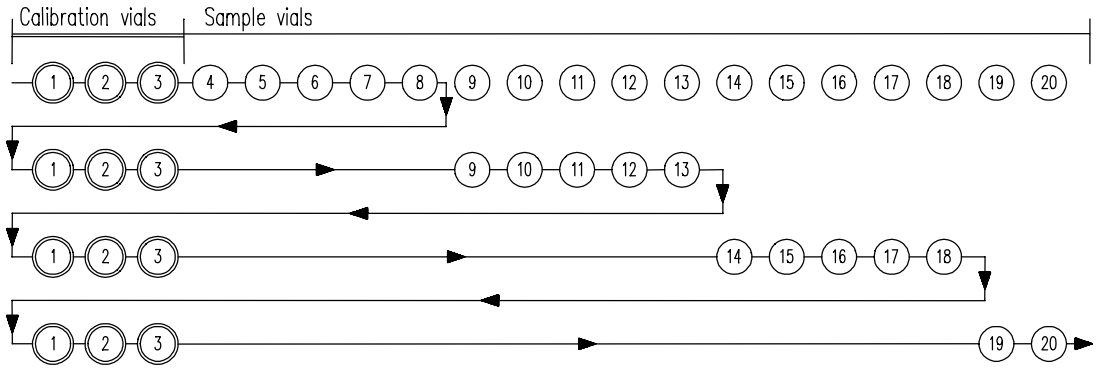


Figure B-2. Injection sequence with three calibration vials after every five sample vials

Appendix C
Programming Reference Chart

The chart in Figure C-1 shows all of the programming options for the Finnigan Micro AS autosampler.

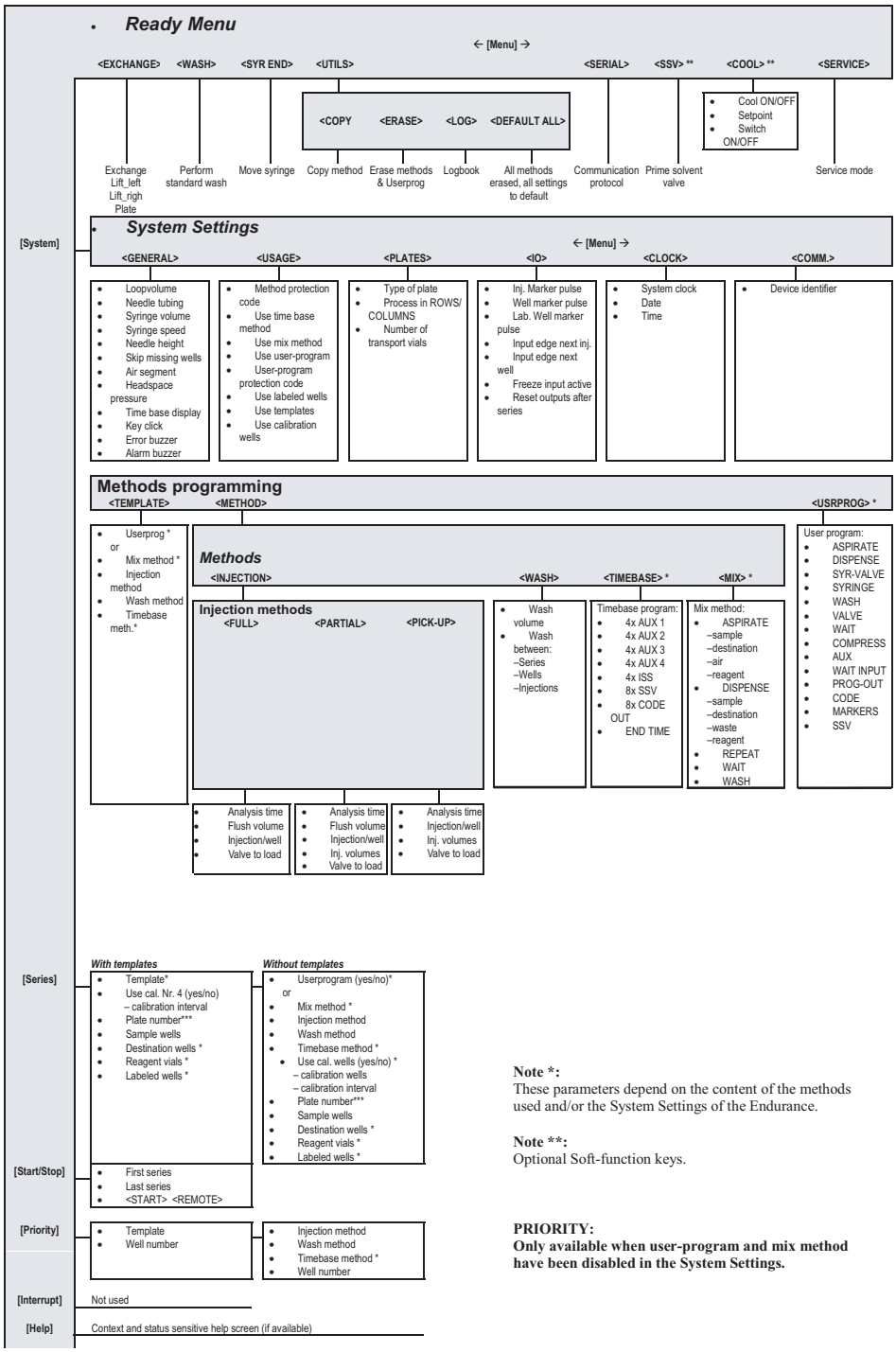


Figure C-1. Autosampler programming options

Appendix D
Specifications

This chapter describes the specifications for the parts and operation of the Finnigan Micro AS. The following types of specifications are given:

- General Specifications
- Analytical Performance Specifications
- Programming Specifications
- Physical and Electrical Specifications
- Communication Specifications

D.1 General Specifications

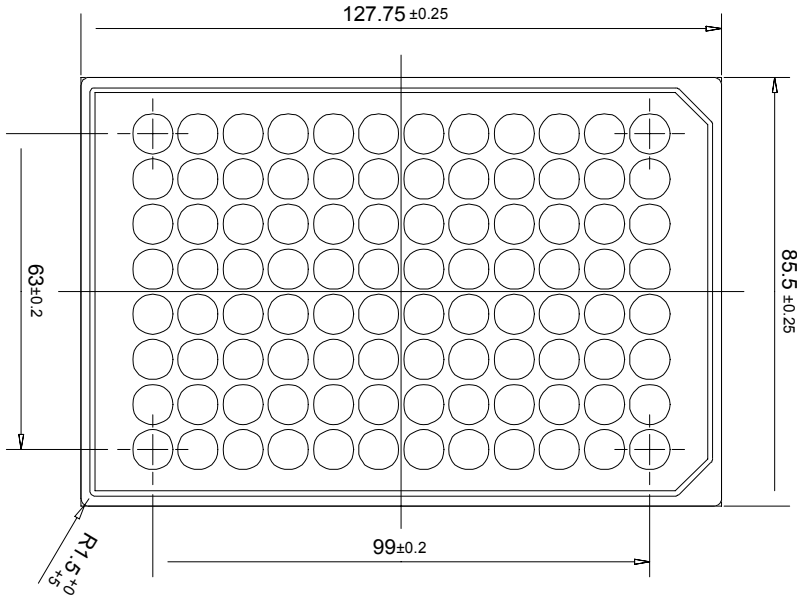
Table D-1 gives the general specifications for the Finnigan Micro AS autosampler.

Table D-1. Finnigan Micro AS general specifications

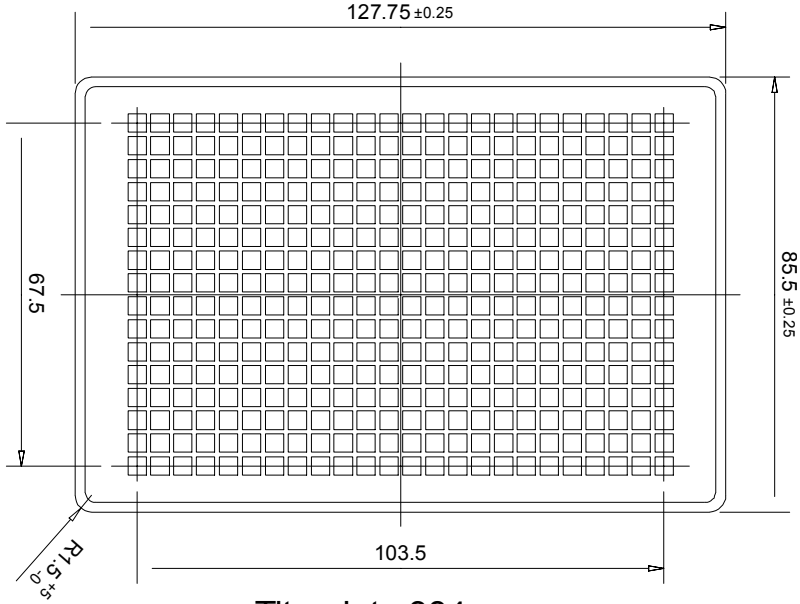
Parameter	Specification
Sound pressure level	Less than 70 dB (Leaq)
Working temperature	5 to 40 °C
Storage temperature	-25 to +60 °C
Humidity	20% to 80% relative humidity
Sample viscosity	0.1 to 5 cP
Plates (refer to Figure D-1)	Types: 48 vials, 96 low, 96 high, 384 low Maximum height vials: 47 mm (incl. cap); minimum height vials:12.5 mm (incl. cap). Only plates of rigid material can be used.
Vial dimensions	6 x 8 vials, dimensions base plate 128 x 85.8 mm Maximum outer diameter for 48-vials: 12 mm
Reagent/transport vials	Dimensions 10 mL vials: 22 x 47 mm (maximum height including cap)
Loop volume	5 to 20 µL
Puncturing needle accuracy	± 0.5 mm
Pre-puncturing septa/caps	With air needle, dual needle action
Plate & height detection	Missing plate & height detection by vial sensor
Plate tray drive	Greater than 5 cm/s
Sample cooling	Built-in Peltier cooling processing unit Programmable Range : 4 °C to 40 °C Cooling capacity: Ambient -12 °C (measured on cooling plate)
Injection valve switching time	(Electrically) Less than 100 ms
Headspace pressure	Built-in compressor
Wash solvent	250 mL internal wash solvent bottle
Dispenser syringe	25 µL syringe in Micro mode.
Wetted parts	SS316, PTFE, Tefzel®, Vespel®, Glass, Teflon®, PEEK, Fused silica

Figure D-1 illustrates the specified dimensions of compatible titerplates. The sides and ends of plates will be straight within ±0.50 mm. This is defined as the maximum variation from a theoretical line connecting the applicable outside corners. When the plate is measured at its point of maximum deflection, dimensions will be as follows:

- Length:127.75 ± 0.50 mm (384 titerplate and 96 titerplate)
- Width: 85.5 ± 0.50 mm



Titerplate 96



Titerplate 384

Figure D-1. Schematic of titerplates, showing dimensions of compatible plates

D.2 Analytical Performance Specifications

Table D-2 gives the analytical performance specifications of the Finnigan Micro AS as measured using capped and sealed vials.

Table D-2. Analytical performance specifications

Parameter	Specification
full loop injections	RSD ≤ 0.3%
partial loopfill injections	RSD ≤ 1.0%, injection volumes greater than 0.2 µL, with headspace pressure on the vial and 6 µL pre-flush without air segment.
µL pick-up injections	RSD ≤ 1.0 %, injection volumes greater than 0.2 µL, with headspace pressure on the vial.
Memory effect	< 0.01% with programmable needle wash

D.3 Programming Specifications

Table D-3 gives the programming specifications for the Finnigan Micro AS.

Table D-3. Programming specifications

Injection methods	Full loop, partial loopfill, and µL pick-up injections
Injection volume	Full loop: 0.01 to 99 µL Partial loopfill: 0.01 to 99 µL in 0.01 µL increments µL pickup: 0.01 µL - max. volume in 0.01 µ L increments. Max. volume = (loop volume - 3 × needle volume)/2
Injections per vial	Maximum of 9 (volumes are programmable for each injection)
Analysis time	Maximum of 9 h 59 m 59 s
Needle wash	Programmable (between injections, wells, or series)
Priority sample	Freely programmable
Series	Freely programmable

D.4 Physical and Electrical Specifications

Table D-4 gives the physical and electrical specifications for the Finnigan Micro AS.

Table D-4. Physical and electrical specifications

Parameter	Specification
Dimensions	280 mm × 400 mm × 440 mm (11 in. x 15.75 in. × 17.3 in.)
Weight	26 kg (57.2 lbs.)
Power requirements	115 V ac; +15/-20%; 50 Hz/60 Hz; 250 VA 230 V ac; +15/-20%; 50 Hz/60 Hz; 250 VA
Fuses	For 115 V ac; two 5.0 AT-fuses (¼ in. × 1¼ in., UL/CSA) For 230 V ac; two 2.5 AT-fuses (5 × 20 mm, IEC 127) All fuses UL-listed and CSA-certified

D.5 Communication Specifications

Table D-5 gives the communications specifications for the Finnigan Micro AS.

Table D-5. Communications specifications

Parameter	Specification
OUTPUTS	Inject marker
	Well marker
	Labeled well marker
	Stop I/O
	4 Auxiliary outputs
	2 Programable outputs
	Alarm output
	4-bit timebase
INPUTS	Next injection input
	Next well input
	Freeze input
	Stop I/O
	4 Programmable inputs
Serial Communication Port	RS232C or RS422 or RS485
PC-control	Microsoft Windows® XP ProteomeX 2.0 Xcalibur 1.4

Appendix E
Logbooks

This chapter contains sample pages for logbooks that can be used with the Finnigan Micro AS autosampler. Use photocopies of the pages provided to keep records of system settings and programmed methods and templates for future reference.

The following logbook pages are provided:

- Instrument Information
- System Menu Settings
- Templates
- Injection Methods
- Wash Methods
- Timebase Methods
- Mix Methods
- User Program

E.1 Instrument Information

User Information

Name of user:

Company:

Department:

Address:

Telephone:

Fax

Finnigan Micro AS Information

Serial number:

Firmware version:

Purchase date:

Installed options:

Local dealer:

Service engineer:

Address:

Telephone:

Fax:

Comments:

E.2 System Menu Settings

<MICRO>___ or <CONVENTIONAL>___					
<GENERAL>			**<USAGE>**		
Loop volume		µL	Protection code		_____
Needle tubing volume		µL	Timebase methods		__enabled __off
Syringe volume		µL	Mix methods		__enabled __off
Syringe speed	_____	factor: ___	User program		__enabled __off
Needle height		mm	User program protection code		_____
Skip missing vials	__yes	__no			
Air segment	__yes	__no	Labeled wells		__enabled __off
Headspace pressure	__yes	__no			
Time display	HH:MM:SS	HH:MM:mm	Templates		__enabled __off
Key click	__on	__off			
Error beep	__on	__off	Calibration wells		__enabled __off
Alarm buzzer	__on	__off			

<PLATES>	**<IO>**		
__96-low	Inject-marker pulse length		___s
__96-high	Well-marker pulse length		___s
__384-low	Labeled well-marker pulse length		___s
__48-vials	Input edge next injection	__falling	__rising
Processing in: __ROWS __COLUMNS	Input edge next well	__falling	__rising
Position first transport vial _____	Freeze input active	__low	__high
Position last transport vial _____	Reset outputs after last series	__yes	__no

<CLOCK>	**<COMM.>**
__on __off	Device identifier: 2__

Comments:

E.3 Templates

Template number	Injection method	Mix method	Wash method	Timebase method	User program Y/N	Comments
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						

Comments:

E.4 Injection Methods

Meth. #	Inj. type	Anal-ysis time	Flush vol.	Inj. per well	Valve to Load	Injection volumes:								
						1	2	3	4	5	6	7	8	9
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														
14														
15														
16														
17														
18														
19														
20														
21														
22														
23														
24														

Comments:

E.5 Wash Methods

Wash method number	Wash between	Wash volume	Comments:
1	__injections __wells __series		
2	__injections __wells __series		
3	__injections __wells __series		
4	__injections __wells __series		
5	__injections __wells __series		

Comments:

E.6 Timebase Methods

Method number:

	Action	Time		Action	Time
AUX 1	1 AUX-1 ON AT TIME:		ISS-A	1 ISS-A POSITION 6-1 AT TIME:	
	1 AUX-1 OFF AT TIME:			1 ISS-A POSITION 1-2 AT TIME:	
	2 AUX-1 ON AT TIME:			2 ISS-A POSITION 6-1 AT TIME:	
	2 AUX-1 OFF AT TIME:			2 ISS-A POSITION 1-2 AT TIME:	
	3 AUX-1 ON AT TIME:			3 ISS-A POSITION 6-1 AT TIME:	
	3 AUX-1 OFF AT TIME:			3 ISS-A POSITION 1-2 AT TIME:	
	4 AUX-1 ON AT TIME:			4 ISS-A POSITION 6-1 AT TIME:	
	4 AUX-1 OFF AT TIME:			4 ISS-A POSITION 1-2 AT TIME:	
AUX 2	1 AUX-2 ON AT TIME:		SSV	1 SSV PORT: AT TIME:	
	1 AUX-2 OFF AT TIME:			2 SSV PORT: AT TIME:	
	2 AUX-2 ON AT TIME:			3 SSV PORT: AT TIME:	
	2 AUX-2 OFF AT TIME:			4 SSV PORT: AT TIME:	
	3 AUX-2 ON AT TIME:			5 SSV PORT: AT TIME:	
	3 AUX-2 OFF AT TIME:			6 SSV PORT: AT TIME:	
	4 AUX-2 ON AT TIME:			7 SSV PORT: AT TIME:	
	4 AUX-2 OFF AT TIME:			8 SSV PORT: AT TIME:	
AUX 3	1 AUX-3 ON AT TIME:		CODE	1 CODE-OUT: AT TIME:	
	1 AUX-3 OFF AT TIME:			2 CODE-OUT: AT TIME:	
	2 AUX-3 ON AT TIME:			3 CODE-OUT: AT TIME:	
	2 AUX-3 OFF AT TIME:			4 CODE-OUT: AT TIME:	
	3 AUX 3 ON AT TIME:			5 CODE-OUT: AT TIME:	
	3 AUX 3 OFF AT TIME:			6 CODE-OUT: AT TIME:	
	4 AUX 3 ON AT TIME:			7 CODE-OUT: AT TIME:	
	4 AUX 3 OFF AT TIME:			8 CODE-OUT: AT TIME:	
AUX 4	1 AUX 4 ON AT TIME:				
	1 AUX 4 OFF AT TIME:				
	2 AUX 4 ON AT TIME:				
	3 AUX 4 OFF AT TIME:				
	3 AUX 4 ON AT TIME:				
	3 AUX 4 OFF AT TIME:				
	4 AUX 4 ON AT TIME:				
	4 AUX-4 OFF AT TIME:				
			END	END OF TIMED EVENTS AT:	

E.7 Mix Methods

Method number:											
Line	Action	Value	Position	Speed	Height	Line	Action	Value	Position	Speed	Height
1						41					
2						42					
3						43					
4						44					
5						45					
6						46					
7						47					
8						48					
9						49					
10						50					
11						51					
12						52					
13						53					
14						54					
15						55					
16						56					
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27						67					
28						68					
29						69					
30						70					
31						71					
32						72					
33						73					
34						74					
35						75					
36						76					
37						77					
38						78					
39						79					
40						80					

Comments:

E.8 User Program

Line	Action	Value	Position	Speed	Height	Line	Action	Value	Position	Speed	Height
1						41					
2						42					
3						43					
4						44					
5						45					
6						46					
7						47					
8						48					
9						49					
10						50					
11						51					
12						52					
13						53					
14						54					
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16						56					
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22						62					
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24						64					
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28						68					
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30						70					
31						71					
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33						73					
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35						75					
36						76					
37						77					
38						78					
39						79					
40						80					

Comments:

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