Agilent 1200 Series Handheld Control Module

User's Guide

Agilent Technologies

Notices

Manual Part Number

G1323-90010

Edition

02/2006

Printed in Germany

Agilent Technologies
Hewlett-Packard-Strasse 8
76337 Waldbronn, Germany

Warranty

The material contained in this document is provided "as is," and is subject to being changed, without notice, in future editions. Further, to the maximum extent permitted by applicable law, Agilent disclaims all warranties, either express or implied, with regard to this manual and any information contained herein, including but not limited to the implied warranties of merchantability and fitness for a particular purpose. Agilent shall not be liable for errors or for incidental or consequential damages in connection with the furnishing, use, or performance of this document or of any information contained herein. Should Agilent and the user have a separate written agreement with warranty terms covering the material in this document that conflict with these terms, the warranty terms in the separate agreement shall control.

Technology Licenses

The hardware and/or software described in this document are furnished under a license and may be used or copied only in accordance with the terms of such license.

Restricted Rights Legend

If software is for use in the performance of a U.S. Government prime contract or subcontract, Software is delivered and licensed as "Commercial computer software" as defined in DFAR 252.227-7014 (June 1995), or as a "commercial item" as defined in FAR 2.101(a) or as "Restricted computer software" as defined in FAR 52.227-19 (June 1987) or any equivalent agency regulation or contract clause. Use, duplication or disclosure of Software is subject to Agilent Technologies' standard commercial license terms, and non-DOD Departments and Agencies of the U.S. Government will receive no greater than Restricted Rights as defined in FAR 52.227-19(c)(1-2) (June 1987). U.S. Government users will receive no greater than Limited Rights as defined in FAR 52.227-14 (June 1987) or DFAR 252.227-7015 (b)(2) (November 1995), as applicable in any technical data.

Safety Notices

CAUTION

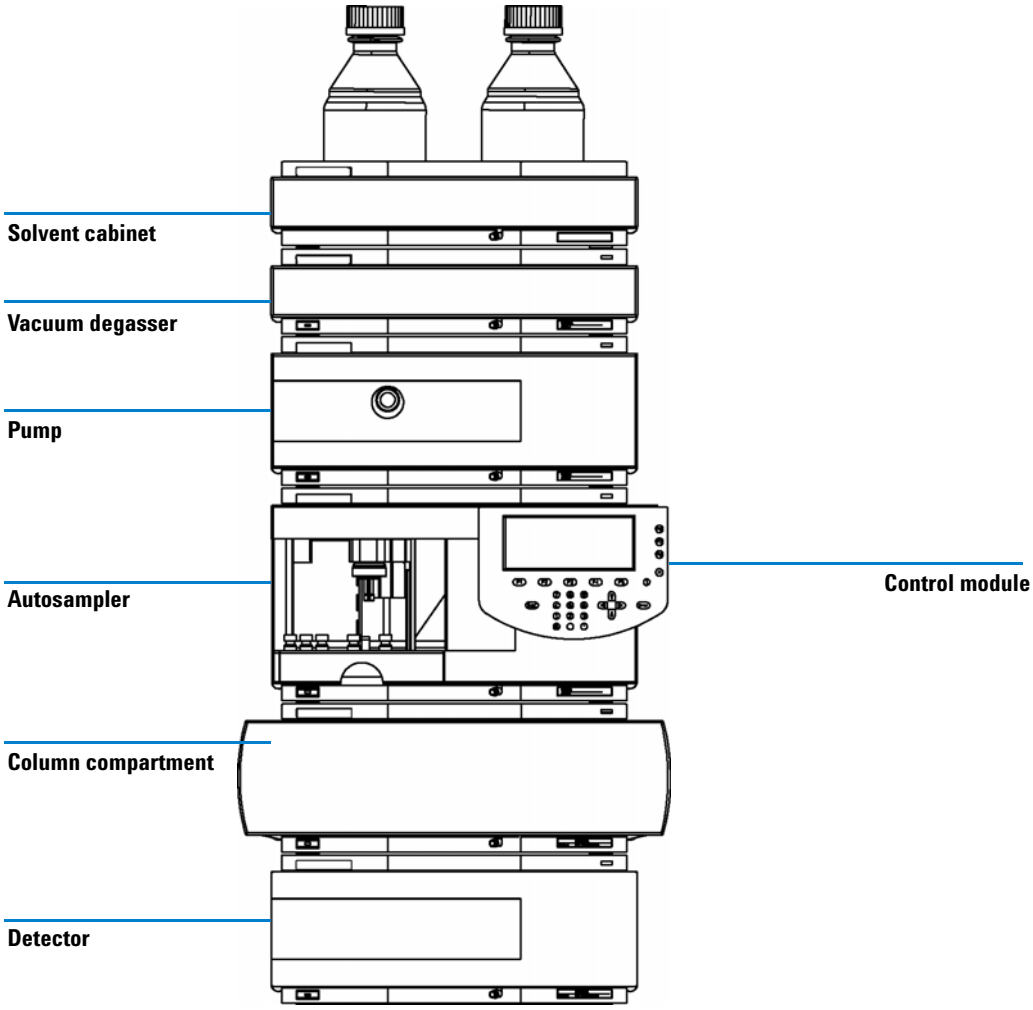
A **CAUTION** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a **CAUTION** notice until the indicated conditions are fully understood and met.

WARNING

A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

In This Guide...

This book describes how to operate the Agilent 1200 Series modules and systems for HPLC using the control module.



The control module provides complete local control and monitoring of a single module or an entire Agilent 1200 Series system. There is no data evaluation in the control module. The control module allows you to do a variety of HPLC tasks including automated sample preparation and injection, isocratic, gradient and multiple method analyses.

Chapter Overview

Part 1 Using the Agilent 1200 Series Control Module

This part describes the control mode, its features and its functionality.

1 The Agilent 1200 Series Control Module

This chapter gives an overview over the Agilent 1200 Series control module.

2 Working with the Control Module

This chapter describes how to use the Agilent 1200 Series control module.

Part 2 Using the Agilent 1200 Series Modules

This part describes how to use the individual HPLC modules to run isocratic, gradient and multiple-vial analyses using a single method or more than one method.

3 Using the Pump

This chapter contains operational details for the Agilent 1200 Series pumping systems.

4 Using the Degasser

This chapter contains operational details for the Agilent 1200 Series vacuum degasser.

5 Using the Autosampler

This chapter contains operational details for the Agilent 1200 Series autosampler.

6 Using the Manual Injection Valve

This chapter contains operational details for the Agilent 1200 Series manual injection valve.

7 Using the Detectors

This chapter contains operational details for the Agilent 1200 Series variable wavelength, multiple wavelength, refractive index, fluorescence light, and diode array detectors.

8 Using the Column Compartment

This chapter contains operational details for the Agilent 1200 Series thermostatted column compartment.

Part 3 Using the Agilent 1200 Series LC System With Control Module

This part describes how to run isocratic, gradient and multiple-vial analyses using a single method or more than one method.

9 Running an Isocratic Analysis

This chapter describes how to analyze the Agilent Technologies isocratic standard sample using a single injection analysis.

10 Running a Gradient Analysis

This chapter describes how to analyze the Agilent Technologies isocratic standard sample using a gradient analysis.

11 Running Multiple-Vial Analyses

This chapter descibes how to setup multiple vial analyses using the same method and different methods.

12 Running an Injector Program

This chapter descibes how to create an injector program.

13 Maintaining the Control Module

This chapter shows the repair items.

A Appendix

This chapter contains safety information.

Related Documents

Each HPLC module is supplied with a *Reference Manual or User Manual*.

The control module is supplied with the following:

- *User's Guide*
- *Software Overview Guide*

Contents

1
The Agilent 1200 Series Control Module

Control Module Features

The control module provides complete local control and monitoring of a single module or an entire Agilent 1200 Series system. You have easy access on every supported function, you can easily control all parameters and settings and you can configure various communication channels with other devices, in order to comfortably analyze the generated data.

- Install any desired configuration of Agilent 1200 Series modules. The control module software will reflect which modules are present in the LC system and adjust the screens accordingly.
- Enter parameter settings for every module, perform reset and on/off functions as well as calibration and configuration settings in a self-explanatory and intuitive way.
- Define automated analyses including methods, timetables, injector programs, method sequences and automated calibration settings using the control module.
- Protect your method from any inadvertent keyboard changes by setting method protection.
- Use PC cards to store and transfer methods and sequences between Agilent1200 systems.
- Monitor all operations and error events using the self-updating logbooks.
- Use the context-sensitive online information system to get further information on all topics.
- Use the context-sensitive menu function to have the quickest access on related functions.
- To help comply with Good Laboratory Practice (GLP) regulations you can select a variety of module tests that will check the performance of the LC system.
- The early maintenance feedback (EMF) limits can be used for scheduling maintenance work.
- Display data graphically using the Plot screen where as many as three different signals can be monitored at the same time.
- Print information to a PCL3 compatible printer connected to the serial RS232 port of a Agilent1200 module.

Control Module Keys

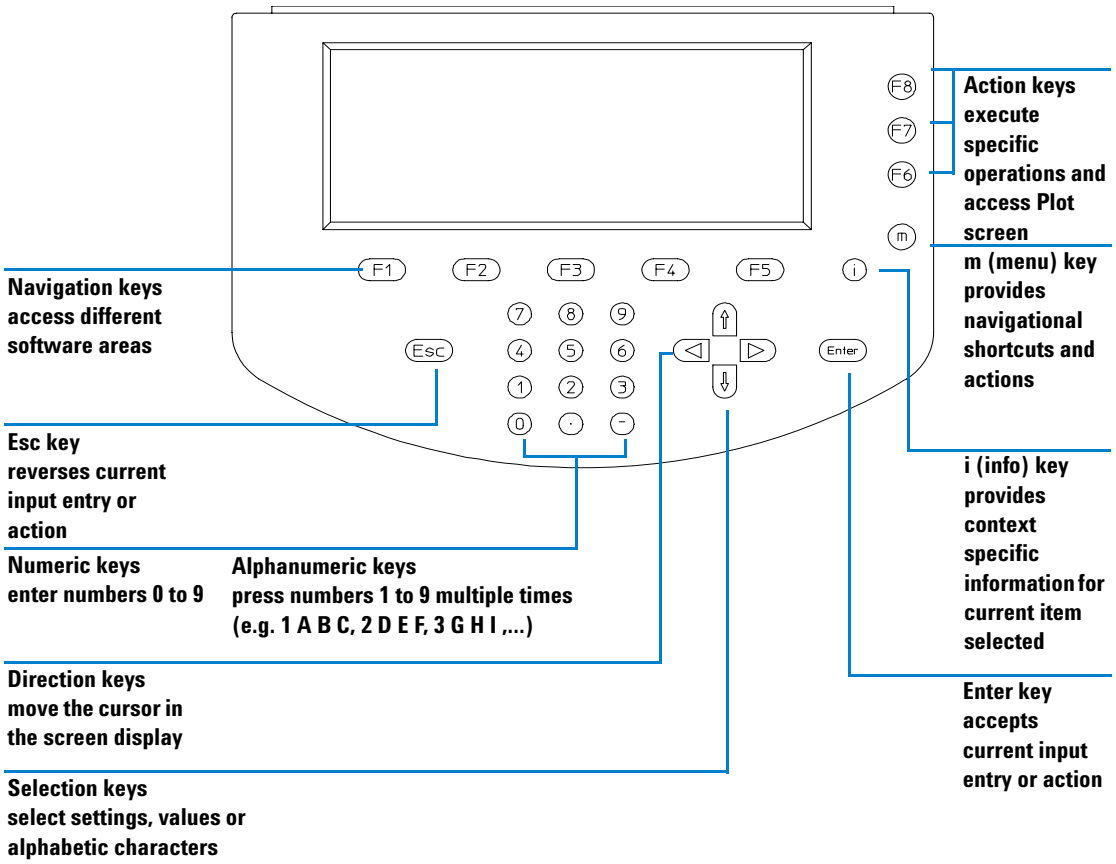


Figure 1 The Agilent 1200 Series Control Module

NOTE A short description of the main keys and the product and serial number is located on the rear of the control module.

The display will show you a variety of menu buttons [F1-F5] (in the lower section) or function buttons [**F6-F8**] (in the right hand section) that can be accessed with the corresponding Navigation (for menus) and Action (for functions) keys.

NOTE

In this context the expression “button” will always refer to a menu or function shown on the display, whereas “key” refers to the actual keys on the keyboard. The key corresponding to a certain button is shown in brackets [**F1**-**F8**]

The i (info) key - Online Information System

The online information system provides a quick and convenient way to look up information about a task you are doing or a feature or screen you would like to know more about. The online information system is context-sensitive and provides information related to the current topic.

You can access the online information system by using the i (info) key on the control module keyboard.

Some words are underlined which indicates available further information. By pressing the Enter key you can display screens providing more specific information about the underlined word.

Some words have a dotted underline which indicates there is an available definition of the word. By pressing **Enter** you can display a small overlay screen with information. You can remove this overlay screen by pressing **Enter**.

- To exit from the online information system press **Esc**.
- To find out what other information topics are available select the Search button [**F8**]. From there you can choose between Contents and Index.

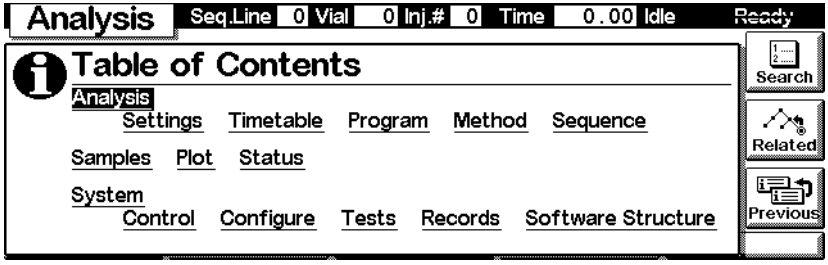


Figure 2 Online Information System - Table of Contents

- To access further screens containing related information on the currently selected screen select the Related button [**F7**].
- To move back to the previous information screen select the Previous button [**F6**].

The m (menu) key

You can use the **m** (menu) key on the control module keyboard to access selected functionality quickly wherever you are in the software. For example, from the Table of Contents you have quick access to the Print function. In other screens you can easily select the Restart or Default functions or a schematic diagram for explanation purposes. Press the Esc key to exit the menu. See the Quick Reference Guide on the availability of context sensitive menus. In Figure 3 Analysis Screen context menus are shown. Depending on the active parameter entry field context sensitive menus provide different options.

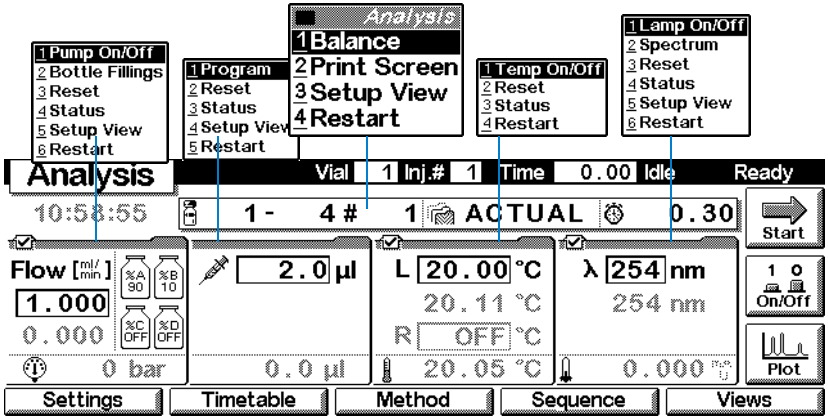


Figure 3 Context Menus in the Analysis Screen

The Esc key

The **Esc** (Escape) key allows you to exit the current window or screen and leads you back to the last window or screen you were working with.

If you are in one of the main screens, you can use **Esc** to toggle between the current and the previous screen.

In an edit field the previous value can be restored by pressing **ESC**.

The Enter key

With **Enter** you accept a current entry or action. When entering a parameter into a certain field, **Enter** leads you on to the next accessible entry field. In this case it has the same function as the right Direction key.

Navigation keys

These 5 keys [**F1 - F5**] allow you to switch between the menus. Within these menus the relevant parameters can be set and certain functions can be accessed. The Navigation keys always correspond to a button displayed above them on the screen. The menus accessed via the buttons vary according to the screen you are working with. In some cases pressing a button will cause a list box to appear. From there you must make a choice in order to proceed.

Action keys

The 3 Action keys [**F6-F8**] trigger a variety of functions. The available functions depend on the screen you are working with.

Selection keys

With the Selection keys **(arrow up/down**) you can select settings in various list boxes. You can also change values in certain parameter entry fields or enter alphanumeric characters.

Direction keys

With the Direction keys (**arrow left/right**) you can move back and forth between the entry fields.

Numeric/Alphanumeric keys

These keys allow you to enter numeric values in parameter entry fields. In certain fields where alphabetical characters may be entered you can use the **Numeric/Alphanumeric** keys to do so. Pressing them several times in sequence changes the current value according to Figure 4.

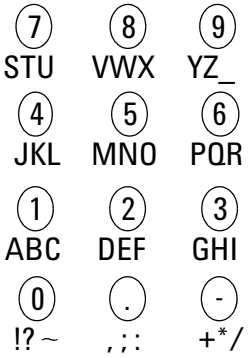


Figure 4 Keypad of the Control Module

Control Module Software

The Control Module User Interface

In a basic configuration of modules there are at least three main screens, the **Analysis**, **Status** and **System** screens. You can move between these screens using the Views button [**F5**]. If an Autosampler is part of your system, a fourth screen called Samples can be accessed. Another important screen is the Plot screen which is accessible via an Action button [**F6-F8]**, depending on the **active** screen.

Figure 5 Main Screens of the Control Module

From these screens other menus can be accessed. When a certain menu is selected by using a Navigation key, in some cases the control module user interface prompts you with a pop-up menu before proceeding. From there you have to make a choice in order to go on, either by using the **up/down** Selection keys or by pressing the corresponding number on the **Numeric/Alphanumeric** keys. The latter will give you quicker access to the choices in most cases. Mostly these pop-up menus will distinguish between the different modules in your system, or in the case of the Views button [**F5**], between screens.

Analysis Screen

The Analysis screen provides access to all LC analytical settings. The most commonly used settings are displayed with their corresponding set and actual values. Since space on the display is limited you will only see a selection of important parameters.
The screen layout will depend on the modules that are included in the system and on the modules selection the user did in the Setup View dialog accessible via the **m** key (the maximum of visible modules on this screen is 4).

The other less used settings of the current method appear in further screens to be accessed from the Settings button [**F1**]. The actual values are updated continuously

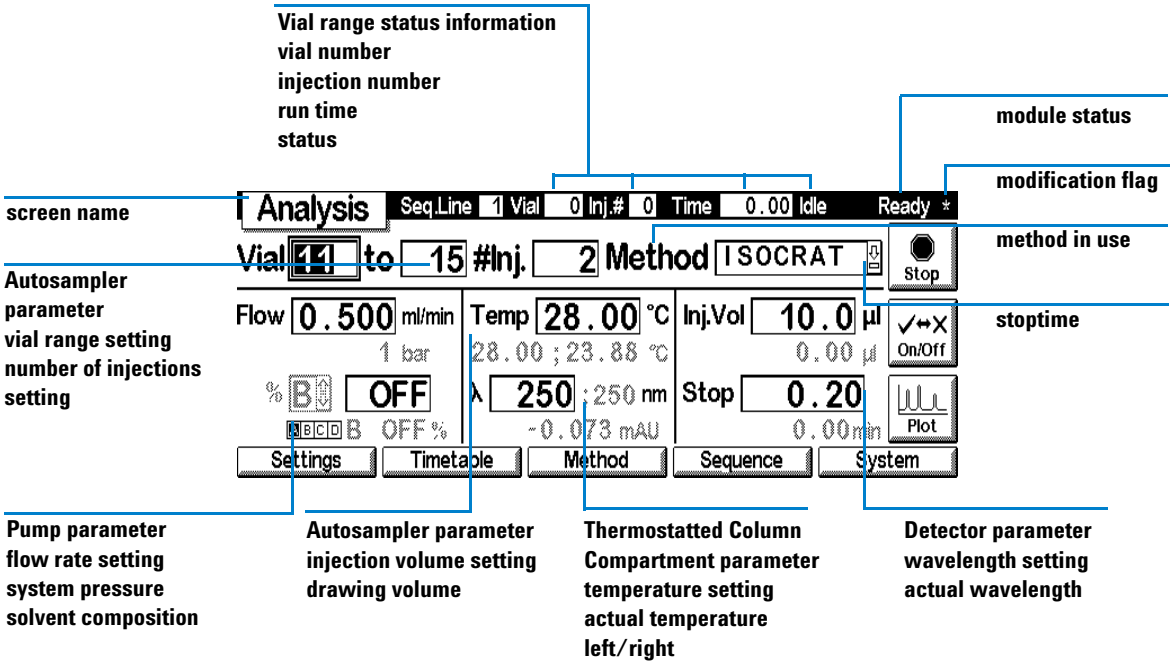


Figure 6 Analysis Screen Information

The screen provides access to:

- Settings — all LC analytical system and module settings,
- Timetable — time programmable settings,
- Method — method management functions (load, save, delete),
- Sequence — multiple method analyses, and
- Views — other screens: Samples (easy access on vials), Status (most important parameters during analysis) and System (control, configuration, tests and records)

The **Start/Stop** button [**F8**] starts or stops a single injection or a multiple injection analysis.

The **On/Off** button [**F7**] turns the pump, detector lamp, heater and thermostatted column on or off.

The **Plot** button [**F6**] provides direct access to the **Plot** screen where all important parameters can be displayed graphically. It is possible to display several parameters at the same time.

Using the **m** (menu) key in the **Analysis** screen prompts context sensitive menus depending on the active parameter entry field (see Figure 3 on page 20).

The Module Status on the top right hand side of the screen and on top of the individual module tabs indicates whether the system/ module is ready or not. Ready indicates the system is ready, Ready indicates the system/ module is not ready, ERROR (only applicable for individual modules) indicates that a vital error has occurred in the module.

The following diagram shows the functionality available in the **Analysis** screen for an LC system comprising a pump, an autosampler, a thermostatted column compartment and a detector (e.g. Variable Wavelength Detector, Diode Array Detector, Multiple Wavelength Detector).

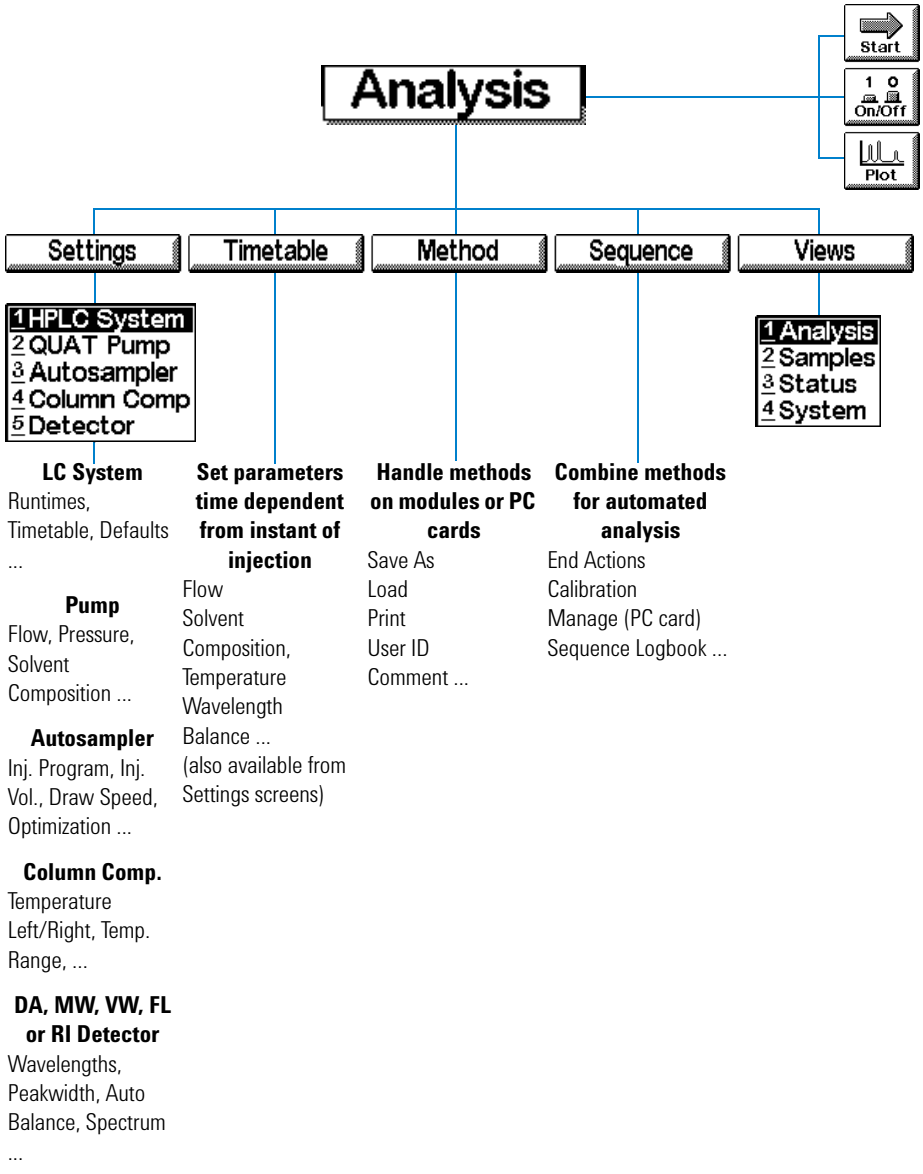


Figure 7 Where to go from the Analysis Screen - Menu Structure

System Screen

The System screen provides access to non-routine settings and provides error checking, control, testing and tracking usage for LC system and modules.

This screen displays the logbook together with the LC system and module status. The EMF (Early Maintenance Feedback) icon will flash to indicate when an EMF limit is exceeded

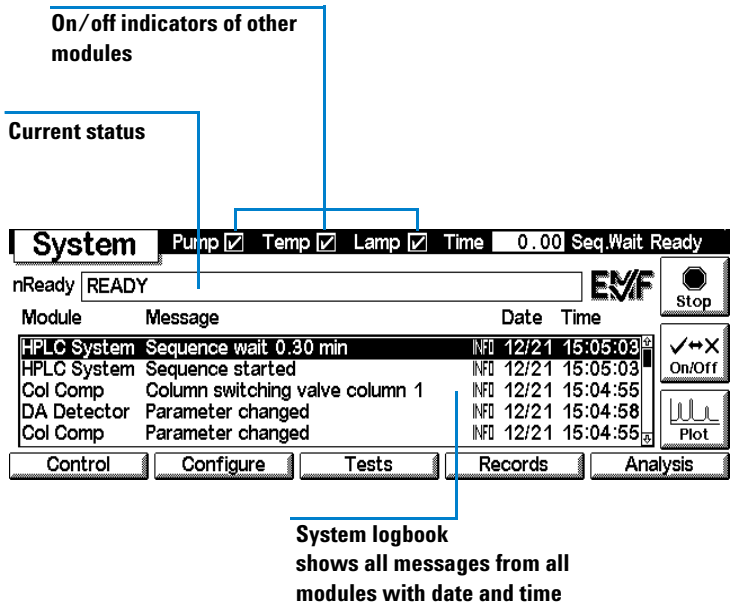


Figure 8 System Screen Information

The screen provides access to:

- LC system and module controls, for example, pump on/off, lamp on/off, heater on/off and injector reset,
- LC system and module configuration,
- module tests, and
- LC system and module records.

The following diagram shows the functionality available from the System screen for an LC system comprising a pump, autosampler, diode array detector, variable wavelength detector and thermostatted column compartment.

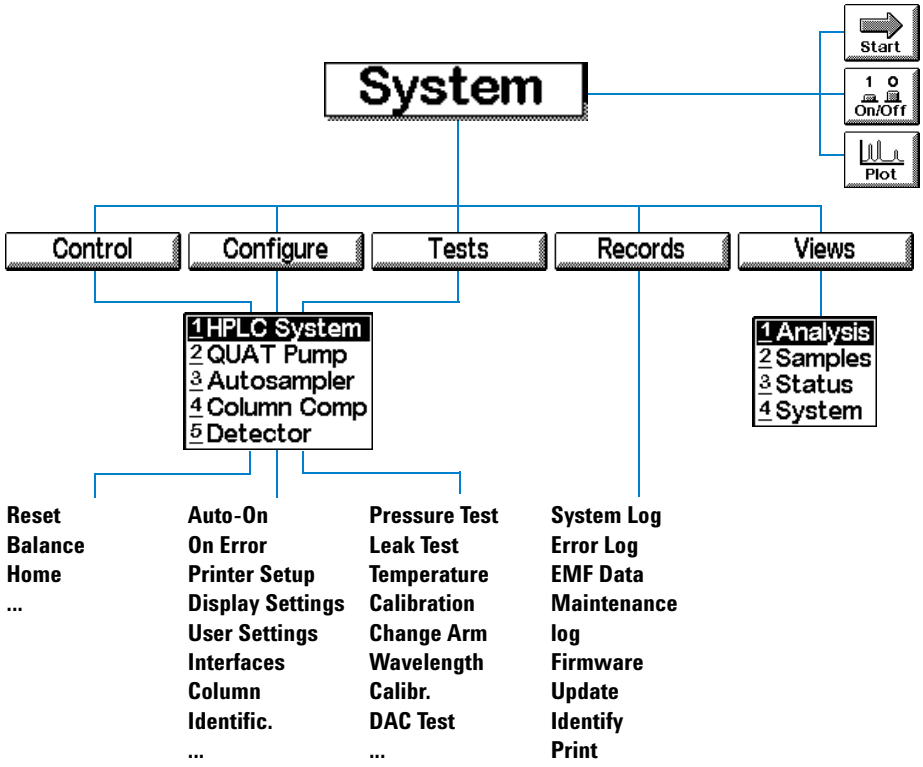


Figure 9 Where to go from the System Screen - Menu Structure

Status Screen

This screen shows the most important parameters of the system in an easy-to-read style. Included parameters are flow, pressure, column temperature, absorbance units, detector wavelength, elapsed time, etc. depending on the LC system configuration. The screen content is updated in short intervals of roughly one second.

You can also monitor the LC system and module status using the Status bar at the top of each screen. The content of the Status bar varies depending on the screen and is very limited. The status for each module can also be displayed. In the respective Setting screen press the m (menu) key. In the appearing context menu select Status.

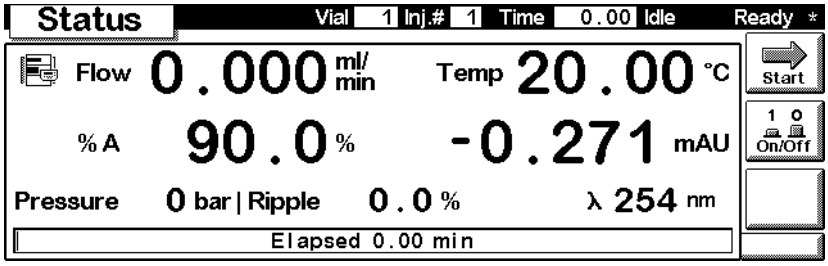


Figure 10 Status Screen

Samples Screen

Operating from this screen you have easy access on the sample tray. Using the Vial Range function you can specify the vials you want to analyze and the desired method. A graphical image of the tray offers a good view of the vials chosen. The Sequence option gives you control over the execution of specified analysis sequence steps programmed before. While the analysis is running you can view the processed samples on the tray image.

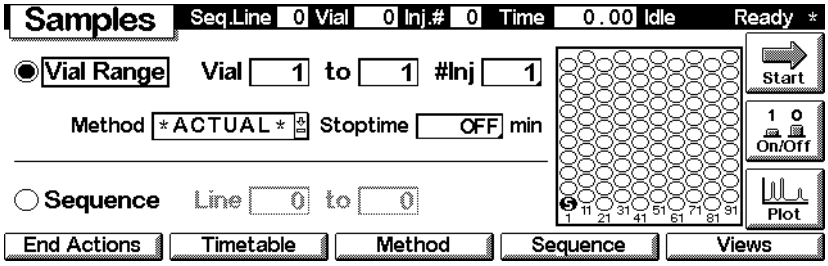


Figure 11 Samples Screen

NOTE This screen is only available if an autosampler is part of your system.

Plot Screen

The Plot screen provides an online plot. You can view various signals, depending on the modules in the system, e.g. a chromatogram, pressure signal or temperature signal.

Directly from the Plot screen you can use a cursor to pinpoint information and you can observe information like run time, status, pressure ripple or composition.

Using the Direction and Selection keys of the control module you can change the scale of the plot window. With the Rescale button [**F7**] you can optimize the screen according to the selected signal and parameter ranges.

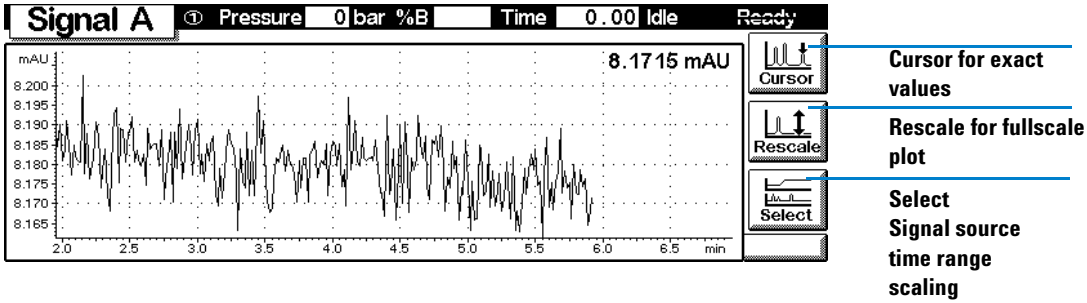


Figure 12 Plot Screen

Control Module Versions

With the introduction of the Agilent 1100 Multiple Wavelength Detector and the Refractive Index Detector, the Control Module G1323B, was introduced.

To find out which version you possess, check the part number label on the back side of your control module. The G1323A version allows to control only a limited set of Agilent HPLC modules, see Table 1.

The G1323B version additionally controls a wide set of other Agilent HPLC modules, see Table 1.

There is no difference in the user interfaces or other functionality.

NOTE

The Control Module G1323B does not control certain Agilent 1200 Modules (the Binary Pump SL G1312B, the Variable Wavelength Detector SL G1314B and the Thermostatted Column Compartment G1316B). These require the Agilent 1200 Instant Pilot G4208A as controller or the Agilent ChemStation B.02.01.

Table 1 Control Module Versions

Version	controls
G1323B	**1100/ 1200 module firmware revision A.06.xx/B.01.xx and above**
Firmware	Agilent 1100/1200 Isocratic (G1310A), Quaternary (G1311A) and Binary (G1312A) pump
B.04.02	Agilent 1100/1200 Autosampler (G1313A) and Thermostatted Autosampler (G1330A)
	Agilent 1100/1200 Variable Wavelength Detector (G1314A)
	Agilent 1100/1200 Diode Array Detector (G1315A/B/C)
	Agilent 1100/1200 Thermostatted Column Compartment (G1316A)
	Agilent 1100/1200 Fluorescence Detector (G1321A)
	Agilent 1100/1200 Preparative Pump (G1361A)
	Agilent 1100/1200 Fraction Collector (G1364)
	Agilent 1100/1200 Refractive Index Detector (G1362A)
	Agilent 1100/1200 Multiple Wavelength Detector (G1365A/B)
	Agilent 1100/1200 Well-plate Autosampler (G1367A)
	Agilent 1100/1200 Capillary Pump (G1376A)
	Agilent 1100/1200 Micro Well-plate Autosampler (G1377A/G1368A)
	Agilent 1100/1200 Dual-loop Autosampler (G2258A)
	Agilent 1100/1200 Preparative Autosampler (G2260A/G2261A)

Table 1 Control Module Versions

Version	controls
G1323B Firmware **B.03.22**	**1100 module firmware revision up to A.05.xx** Agilent 1100 Isocratic (G1310A), Quaternary (G1311A) and Binary (G1312A) pump Agilent 1100 Autosampler (G1313A) and Thermostatted Autosampler (G1330A) Agilent 1100 Variable Wavelength Detector (G1314A) Agilent 1100 Diode Array Detector (G1315A/B/C) Agilent 1100 Thermostatted Column Compartment (G1316A) Agilent 1100 Fluorescence Detector (G1321A) Agilent 1100 Preparative Pump (G1361A) Agilent 1100 Fraction Collector (G1364) Agilent 1100 Refractive Index Detector (G1362A) Agilent 1100 Multiple Wavelength Detector (G1365A/B) Agilent 1100 Well-plate Autosampler (G1367A) Agilent 1100 Capillary Pump (G1376A) Agilent 1100 Micro Well-plate Autosampler (G1377A/G1368A) Agilent 1100 Dual-loop Autosampler (G2258A) Agilent 1100 Preparative Autosampler (G2260A/G2261A)
G1323A Firmware A.02.10	**1100 module firmware revision up to A.05.xx** Agilent 1100 Diode Array Detector (G1315A) Agilent 1100 Fluorescence Detector (G1321A) Agilent 1100 Variable Wavelength Detector (G1314A) Agilent 1100 Quaternary (G1311A) Binary (G1312A) and Isocratic (G1310A) pump, Agilent 1100 Thermostatted Column Compartment (G1316A) Agilent 1100 Autosampler (G1313A) and Thermostatted Autosampler (G1330A).

2
Working with the Control Module

Installing the Control Module

WARNING **The CAN connectors are similar to LAN adapter connectors. Do not insert LAN connectors into the CAN or vice versa, since the CAN uses 24 V and might blow up the LAN card.**

Connect the CAN (controller area network) connector of the control module cable to one of the two CAN connectors on one of the Agilent 1200 Series modules.

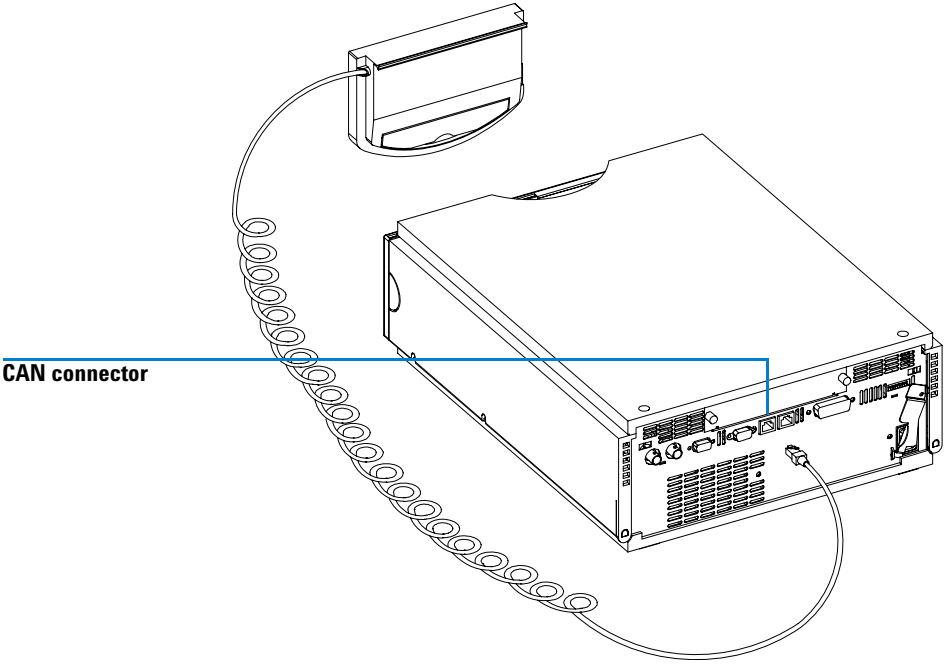


Figure 13 Connecting the CAN Connector to Rear Panel

General Functions

Turning On/Off LC System and Modules

Use the On/Off button [**F7**] in the Analysis screen to turn on or off either the complete system or each module individually.

Setting Date and Time

You can set the date and time using the context menu (m key) while the System screen is active. Choose the Date & Time option and press **Enter** . Press **Setup** button [**F6**] to change the settings. Press **Done** [**F6**] to confirm the new entries. Alternatively, choose **Configure** and select **LC System**. Press **Date& Time** [**F4**]. When date and time are changed in the control module, the settings are automatically stored in all the connected modules. The date and time are backed up by a battery in each module. The control module does not have a clock of its own.

NOTE Upon startup the modules synchronize their internal clocks. The clocks can also be synchronized by an external chromatographic data system, like the Agilent ChemStation.

Setting Display Contrast

From the **System** screen choose **Configure** and select **LC System**. Press **Display** and then use the **Selection** keys to enter values between 0 and 31 to adjust the display contrast according to your personal and location requirements. Then press **Done**.

Adjusting View

Pressing the **m** key in the Analysis screen and selecting Setup view allows to select the modules that will be displayed in the Analysis screen. Choosing this option enables you to select the modules present in the Analysis screen. By pressing the **Remove/Add buttons** [**F7, F8**] you can move the modules from the Selected Modules to the Available Modules list boxes and vice versa, depending on which module is highlighted.

Configuring the LC System

The LC system is self-configuring to a large extent. It recognizes automatically which modules are installed. The layout of the **Analysis** screen changes according to the modules present. You can use the **Configure** button [**F2**] in the System screen to configure various features such as the Auto-on for the system or Loading (a method), and After Error Condition.

If an error event occurs, you can configure the LC system to load a specified method or turn off the LC system using the After Error Condition setting.

Troubleshooting

Internal diagnostics continuously monitor the module's condition and record any unusual events in an electronic logbook. For example, missing vials or leaking solvent will signal errors and record the errors in the logbook together with the time and date the errors occurred. The logbook is self-updating where the newest entry replaces the oldest entry. If a printer is connected you can easily print out the logbook.

Troubleshooting the Control Module

If your control module does not work correctly, disconnect the module CAN connector from the rear of the Agilent 1200 Series module it is attached to and reconnect it.

If the problem still remains, then

- power down all connected devices and computers and wait 1 minute and then restart, or
- try to use just one Agilent 1200 Series module.

If the problem still remains, call Agilent Technologies.

Inserting and Removing PC cards

1 Insert the connecting side of the PC card into the PC card slot of the control module until you feel it will not go in any further.

2 Switch to the Analysis, System or Sample screen, press the m key and select Restart to restart the control module.

3 To remove the PC card, press the card eject button on the left hand side of the module.

NOTE

The control module supports PCMCIA 2.0 type I and II memory cards. In general only cards up to a capacity of 128 MB are supported.

Compatible cards are:

- SanDisk CompactFlash Memory Cards (SDCFBx-yy) with SanDisk CompactFlash PC Card Adapter (SDCF-yy)
- SanDisk Flash Disk PCMCIA/PC Card ATA (SDP3Bx-yy)

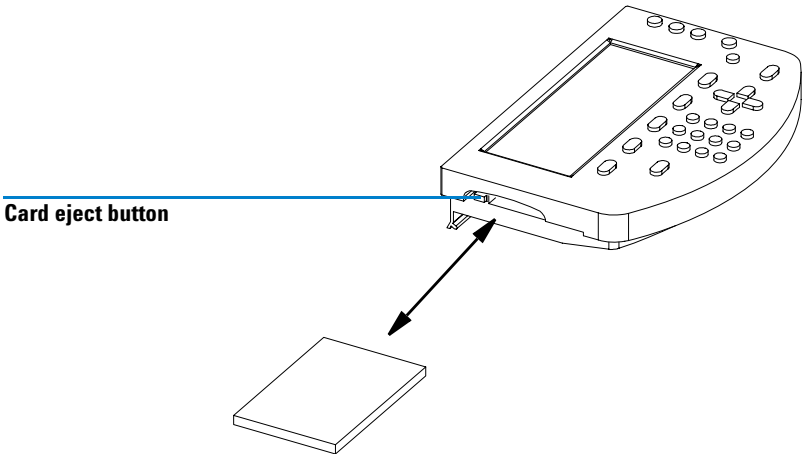


Figure 14 Inserting and Removing the PC card

Working with Methods

A method contains a complete set of injection, separation and detection parameters, including the timetable and injector program. Vial range information is not part of the method.

There are two types of methods:

- The module method. The method parameters are stored in the individual LC modules and not in the control module. A method that is stored in the individual LC modules can be loaded, modified, saved and run from the control module.
- The PC card method. The method parameters are stored on a PC card. A method that is stored on the PC card can be loaded to the LC modules or transferred to another LC system. Methods cannot be run directly from the PC card. The method must first be loaded from the PC card before it can be run. When the PC card method is loaded it becomes a module method.

Unless stated otherwise, the following sections refer to module methods.

Loading a Method

A method can be loaded using the Method button [F3] in the Analysis or Samples screen:

1 Enter the **Analysis** or **Samples** screen.

2 Select **Method**; the current parameters are displayed.

3 Press the **Module** button [**F1**].

4 Select a method from the list.

5 Press **Enter**.

You can also load a method directly from the **Analysis** screen by using the selection keys and changing the method in the method list.

The **Method/Module** screen lists all methods that are stored in the modules. For each method there is a date when the method was last changed and a short user description. When a method is loaded it becomes the current method.

A method might be identified as partial method. This means, that there is a mismatch between the actual and the original system configuration, for example when a module was added to or removed from the system. A partial method can not be loaded as the current method.

Modifying a Method

A method can be modified by changing the settings in the **Analysis** or **Settings** screens.

Many of the commonly-used method settings (flow, injection volume, column temperature, wavelength and stoptime) can be modified in the Analysis screen. Other less commonly-used method settings such as eject speed can be modified using the **Settings** button [**F1**]. This button displays the **Settings** menu from which all LC system and module settings can be accessed.

If you change a method setting, the value is immediately downloaded to the LC module. An asterisk (*) will appear in the right corner of the status line to indicate the current method has been modified.

The time-programmable settings can be modified in the Timetable screen.

The injector program settings can be modified in the Injector Program screen accessed from the **Autosampler Settings** screen.

Specifying a Method Name

1. Select the **Method** button [**F3**] in the **Analysis** or **Samples** screen.
2. Select the **Save As** button [**F8**].
3. Press the **Selection** key up to enter the letter input mode.
4. Select the required letter or number in the method name entry box using the **Selection** keys. Numbers and the minus sign (-) can be entered directly.

NOTE Alphanumeric characters can be entered also by pressing the keys 1 to 9 several times (e.g. 1 A B C, 2 D E F, 3 G H I, ...). See also Figure 4 on page 22.

5 Move the cursor to the next entry position using the right direction key and repeat step 4.

6 Repeat step 4 and step 5 until you have specified your method name.

7 Select the **Done** button [**F6**] to accept the method name.

NOTE The left arrow key can be used as backspace, the right arrow key is used to move to the next character position.

Protecting a Method

To protect the current method.

1 Select the **Method** button [**F3**] in the Analysis screen.

2 Select **Module** from the menu.

3 Select the **Save As** button [**F8**].

4 Select the Protected check box.

5 Select the **Done** button [**F6**].

The method is now protected against inadvertent changes. Any changes to the method will not be accepted until the method is unprotected, by saving it again without protection. For further protection remove the Control Module from the Instrument and store it in a secure place.

Any unauthorized method or instrument changes can be traced by the system logbook.

Saving a Method

Although it may seem that methods are stored within the control module, in fact all data concerning methods is stored in the modules themselves. The control module generates a list of all available methods that can be loaded.

The number of methods that can be stored depends on the number of timetable and injector program lines included. In general about 15 methods may be stored which contain about 50 timetable lines per module. With differing method contents the actual amount of methods to be stored may change significantly.

Use PC cards in order to store infinite numbers of methods for future use or exchange between LC instruments (see "Transferring Methods Between LC Systems" on page 46).

To save the current method:

1 Select the **Method** button [**F3**] in the **Analysis** screen.

2 Select **Save As** using the Action keys.

3 Enter a name as described in "Specifying a Method Name" on page 42, or simply continue with the next step if you want to keep the current method name.

4 Press **Enter**.

NOTE Optionally you may fill in further data. Activate the Protected check box in order to protect the method. By entering a User ID you can identify your personal modules more quickly. You can also enter a personal comment.

5 Select the **Done** button [**F6**] to store the method in the modules. Select **Yes** to confirm save in case you are overwriting an existing method.

The stored method now contains all the current LC system and module settings. The method settings are stored in the individual modules, e.g., all the pump method settings are stored in the pump and not in the control module.

If you disconnect the control module from one LC system and connect it to another LC system, the current method and settings are now shown for the new LC system. To transfer methods from one LC system to another use a PC card.

Deleting a Method

1 Select the **Method** button [**F3**] in the **Analysis** screen.
2 Select **Module** from the menu.
3 Select the method from the method list.
4 Select the **Delete** button [**F6**].
5 Choose Selected Method from the pop up menu. If you want to delete all methods choose **All Methods**.
6 Press **Enter**.
7 Select **Yes** to confirm the deletion by pressing the **Enter** key.

Exchanging Methods With the PC Card

To store and retrieve methods from PC card you can use a comfortable screen that allows easy copying to and from PC card.

1 Insert the PC card into the control module as described in "Inserting and Removing PC cards" on page 40.

NOTE Methods from a freshly installed PC card are not available. Restart the control module using the Restart function via the m (menu) key from the main screens.

2 Select the **Method** button [**F3**] in the **Analysis** or **Samples** screen.
3 Select the **PC card** button [**F2**].

NOTE Use the **Initialize** button [**F1**] available in this screen in order to initialize a pre-formatted PC card for use with the control module. This has to take place prior to first use in the control module. Be aware that all data on the PC card will be lost.

4 Use the Selection and Direction keys to navigate within and between the method list boxes.
5 Use the "**Copy** >>" and "**Copy** <<" buttons [**F7, F8**] to copy methods from and to the PC card.

If you want to store the current method on PC card, you have to use the Save As function (see “Saving a Method” on page 44) in order to store it in the modules first. From there you can copy it to PC card as described in this section.

Transferring Methods Between LC Systems

Methods can be transferred from one LC system to another using a PC card.

1 Save the method you want to transfer onto a PC card. See section “Exchanging Methods With the PC Card” on page 45.

2 Remove the PC card from the control module.

3 Insert the PC card into the control module of the other LC system.

NOTE If this system does not have a control module connected, use any available control module.

4 Restart the control module using the Restart function via the **m** (menu) key (available from the main screens).

5 Load the method from the PC card. See section “Exchanging Methods With the PC Card” on page 45.

Time Programming

To time-program selected settings during the analysis you can create a timetable. Using the Timetable screen, you can create a time based program that will automatically control the pump, detector, column compartment and external contacts.

In some cases the settings will change instantaneously from the initial value to the value specified after a certain time in the timetable (e.g. wavelength). In other cases (solvent composition) these changes take place dynamically, approaching the set value in a step wise and linear manner.

NOTE The timetable becomes part of the current method when the method is saved.

The timetable is accessed by selecting the **Timetable** button [**F2**] in the **Analysis** screen.

A timetable line can be inserted by pressing the **Insert** button [**F7**] and consists of the following:

- Time
  Set the time span between the instant of injection and the desired parameter change.
- Module
  Choose the module that controls the parameter you want to change.
- Setting
  Select the parameter to be changed.
- Value
  Enter the desired parameter value.

You can edit an existing timetable line by pressing the **Enter** key. Use the **Delete** button [**F6**] and make a choice from the pop-up menu to delete either the selected line or the whole timetable.

You can copy and paste timetable lines by selecting the respective choices available from the context menu (**m** key).

Automating Analyses

You can use the Sequence screen to create completely automatic unattended analyses from sample preparation to injection. The Sequence screen is accessed by using the **Sequence** button [**F4**] in the **Analysis** or **Samples** screen.

Using the Sequence screen you can link several methods together. For example, you can first run a method containing an injector program to do sample preparation followed by an analytical run to analyze a batch of samples. You can then run a second method to analyze further samples with different analytical conditions. A delay time can be set in the sequence line. When the second method is loaded, it waits for a specified time before starting the analysis, allowing the column to equilibrate to the new conditions. All sequence events can be traced in the Sequence Logbook available through the **Logbook** button [**F5**] in the **Sequence** screen.

At the end of the sequence you can specify either to load a method (e.g. to flush the LC system to remove buffer salts to avoid crystallization or to program a soft shut-down method) or to turn off the LC system using the **End Actions** button [**F1**]. If both options are selected, the shut-down method will be loaded to be available for the next user. However, it will not be executed before the turning off.

You can set up automatic recalibrations using the **Calibration Settings** screen. This screen allows you to attach calibration settings to a sequence line. The **Calibration Settings** screen is accessed by selecting the **Calibration** button in the **Sequence screen**.

You can recalibrate using one or more standards and have the flexibility of choosing various calibration intervals and patterns. You can define within a sequence line the frequency to recalibrate and the order of calibration vial analysis using the Alter and Multi settings. Alter analyzes the calibration vials alternately. Multi analyzes the calibration vial or vials in complete groups according to the calibration interval.

A sequence line consists of the following:

- Line Number
  Starting with 1 the sequence lines are automatically counted up.
- Vial Range Information
  Just like in the Analysis screen you can specify a range of vials together with the number of injections per vial.
- Injection Volume
  Although the injection volume is stored as a method parameter, a sequence has its own injection volume setting (overriding method information). If DEF is specified here the volume as set in the method is kept.
- Method Name
  Choose a method stored in the modules from the method list box (see "Working with Methods" on page 41). The method has to contain all the relevant parameters as well as timetable or injector program settings.

NOTE In the Sequence screen you create a program of several methods to be executed in a specified order. Editing of methods or their components (timetables, injector programs etc.) is not possible.

- Wait Time
  Specify a wait time that creates a gap between method loading and execution. This allows certain module parameters to stabilize before the next analysis is performed.
- Calibration Settings
  For each sequence line you can define calibration settings by pressing the **Calibration** button [**F1**] and choosing Edit/Delete from the pop up menu. You can specify a range of calibration vials, number of injections, injection volume, calibration method and a wait time after method loading. You can also enter specific recalibration parameters, such as the recalibration interval and pattern.

The Online Information System provides accurate information on recalibration options.

Displaying Data Graphically

Using the Plot screen you have many opportunities to display a wide variety of signals on a graphic display while the analysis is performed.

Selecting Signals

Among all the signals available up to 3 can be chosen for graphical display.

1 From the Plot screen press the **Select** button [**F6**] to show the **Plot selection** menu.

2 Use the **Direction** and **Selection** keys to navigate within and between the Available Signals and Selected Signals list boxes.

3 Exchange signals between the list boxes by pressing the **Move** button [**F8**] or the **Enter** key.

   On the right hand side from the Selected Signals list box you can see the legend to the signals.

   You can also enter a time range (X axis) for the plot in this screen.

   The different signals can be set up by pressing the **Setup** button [**F7**]. Depending on which signal is highlighted you can enter an individual Y-Range setting here.

4 When the signals and their X (time) and Y (signal unit) ranges have been specified press the **Done** button [**F6**] to switch to the graphic view.

Rescaling the Plot Screen

X (time) axis

To rescale the X (time) axis there are several possibilities:

- Enter a time in the Plot Selection windows (available from the Plot screen via the **Select** button [**F6**])
- Perform a rescale directly in the Plot screen by pressing the Direction left/right keys. The right key will shorten the time range by the factor 2. The left key will enlarge the range by the same factor. Press the keys several times to set up the appropriate time frame.

The time range is indicated at the bottom of the **Plot** screen. This setting is independent from the active signal.

Y (signal unit) axis

To rescale the Y (signal unit) axis there are several possibilities:

- From the Plot Selection windows (available from the Plot screen via the **Select** button [**F6**]) choose a signal from either list box and press the **Setup** button [**F7**]. You can specify a Y range separately for each signal. This setting can also be made for signals not being part of the Selected Signals list box. Rescaling directly from the Plot screen will overwrite these settings.
- Use the **Rescale** button [**F7**] in the **Plot** screen to adjust the Y axis according to the minimum and the maximum signal value within the set time range. Using this function provides the optimum signal display. It refers only to the active signal indicated at the top of the screen.
- Use the selection keys to change the scaling of the Y axis by a factor of 2 respectively 1/2.

NOTE Using the **m** (menu) key and choosing maximize you can enlarge the diagram to full display size. Press the **Restore** button [**F6**] to return to the regular view.

Toggling Signals

You can monitor up to 3 different signals from different modules in real-time (updates every second) on the **Plot** screen. Although all 3 signals are shown in the display, the **Rescale** button [**F7**] only refers to the active signal. The active signal is shown in the **Plot** screen title and can be toggled by pressing the 1, 2, 3 keys on the numeric keypad.

Displaying Exact Signal Values

Selecting the **Cursor** button [**F8**] in the **Plot** screen displays the X and Y value of the current cursor position for the active signal. In this mode, using the Selection keys you can rescale the Y axis. Using the Direction left/right keys you can move the cursor along the graph in an X direction in order to find the position you want.

Print Graph

If a printer is connected to your system you can print the contents of the **Plot** screen by pressing the **m** (menu) key and selecting Print Plot. This works also for the maximized view.

Logbooks

The control module keeps track of all kinds of system parameter changes, error messages and maintenance data. You can access the logbooks by pressing the **Records** button [**F4**] in the **System** screen. Information on this screen includes the module product and serial number, firmware version number and the operation time from power-on until now. Additionally an EMF (Early Maintenance Feedback) indicator shows if maintenance is required.

NOTE You can identify the individual modules by highlighting them in the Records screen and pressing the **Identify** button [**F8**]. For several seconds the module's LED will be blinking.

Logbook settings may be entered by pressing the m (menu) key in the System screen and choosing the Setup Logbook option. In the appearing logbook settings menu you can choose which events are to be displayed in the logbooks.

Choose a module from the list box and press the button [**F1-F4**] corresponding to the type of logbook you want to open.

Maintenance Logbook

On the screen you see the most recent maintenance work together with date and time. Use the **Add** button [**F7**] to record maintenance work and update the logbook. The contents of this logbook is permanently stored in the respective modules, but when memory capacity is exceeded the newest entry replaces the oldest entry.

Error Logbook

This logbook displays the most recent error messages with date and time. It is automatically updated whenever an error message is generated by the respective module. This logbook is stored permanently in the module, but when memory is full the newest error will replace the oldest one.

System Logbook

Here all relevant system or event messages are stored until the module is restarted or turned off.

EMF (Early Maintenance Feedback)

In the Records screen the EMF indicator shows if a regular maintenance is needed. The EMF limits can be scheduled by pressing the **EMF** button [**F1**] in the Records screen and choosing Setup Limits. Depending on the highlighted module you enter a window where the maintenance intervals can be set. Consult the online information system on Setting EMF Limits.

You can also display EMF events by choosing the Show Events option. This windows shows all EMF limits for the modules that have been operated beyond them. This windows is only updated during startup.

Printing Screens

You can connect a printer with an RS-232 interface to any module using the proper cable.

NOTE

A converter from a serial (RS-232) to a parallel (Centronics) connection is available from Agilent Technologies, part number 5181-1529. The RS-232 settings in the 1200 module must be the same as set with the dip-switches on the cable:

Serial - 19200 baud - 8 databits, 1 stopbit - no parity

You can configure the printer by pressing the **Configure** button [**F2**] in the **System** screen and then selecting LC System. In the following **Config** screen press the **Printer** button [**F1**] to open the respective dialog. In this dialog you can choose the printer model and the module it is connected to. Define a page layout (including paper size, a banner text and the margins) using the **Page** button [**F8**]. Use the **Serial** button [**F7**] to enter settings for the RS-232 connection, such as baudrate, bits and parity. This setting can be made individually for each module in the respective configuration settings (see "Connecting External Devices" on page 57).

If the setup is complete you may print a test page using the corresponding button.

NOTE

In many cases a print function is provided via the context menu to be accessed with the m (menu) key, e.g. from the vial range entry fields in the Analysis screen, from the Samples screen and from the online information system.

Print Plot

In the Plot screen you can create a screen hard copy using the **m** (menu) key and selecting **Print Plot** from the context menu. The printout will also include a legend and the date and time.

Print Logbooks

Using the **m** (menu) key to show the context menu in the System screen allows you to choose the Print Logbook function. In the following dialog you can also configure the printer using the **Setup** button [**F8**]. The **Spooler** button [**F7**] enables you to delete print jobs if several jobs are on the stack. Additionally you may choose the number of copies to be printed.

In the **Records** screen you can choose the **Print** button [**F6**] to create a Configuration Report including the modules' product, serial and firmware version numbers together with the operation time. This button is also available from the System Log, Error Log, Main Log and EMF windows.

Print Method

The current method settings can be printed out using the **Print** button [**F6**] in the **Method** screen. The print dialog as described above will appear. This will print all method settings excluding vial range information.

Print Timetable

Pressing the **m** (menu) key in the Timetable screen allows you to choose Print Timetable. This will lead to the regular print dialog.

Print Sequence

Entering the **Sequence** screen and pressing the **m** (menu) key offers the Print Sequence option.

Print Injector Program

From the Autosampler **Settings** screen press the I**nj. Program** button [**F3**] to enter the **Program** screen. Via the **m** (menu) key you have the option to print out the program.

Connecting External Devices

There are several kinds of interfaces that enable the Agilent 1200 Series modules to communicate with a range of other output devices. For some of them extra hardware needs to be installed.

Configuration of selected interface parameters is possible using the **Interfaces** button [**F1**] available from the **Configure** button [**F2**] in the **System** screen. This is handled individually for each module, since some interfaces are only available from certain modules (depending on installation).

For further information on interfaces see the corresponding sections in the modules' reference manuals.

APG Remote

Via the 9-pin APG remote connector (included in all modules) the system can communicate with external devices in order to synchronize the analyses. This is necessary when an external device needs some time in order to get ready for a new analysis and thus transmitting of a start request is required (see also "Synchronizing Analyses with External Devices" on page 144 for details on sequence modes). Detailed descriptions of the APG Remote connector are available in the modules' reference manuals.

Among the available signals are:

Power On

This signal is active as soon as all modules connected to the system are switched on.

Shut Down

When the system has a serious problem (e.g. a leak occurs) this alerts all modules to stop relevant operation in order to reduce safety risks.

Stop

This signal asks all modules to reach the ready state as soon as possible. It works only during the analytical run (controlled by the stoptime setting) and causes the system to begin counting down the postrun time.

Ready

When all Agilent 1200 Series modules are ready for the next analysis, this signal is on. Other modules or external devices now can react (e.g. by issuing a start request).

Prepare

This causes the modules to get ready for the next analysis (e.g. the detector will perform a balance).

Start Request

This signal causes the modules to get ready for the analysis (e.q. the autosampler will begin the injection cycle). As soon as all conditions to start the analysis (the injection needle is placed in the seat and the valve is in the proper position) are fulfilled, a Start signal is generated to inform the other modules that now the analytical run starts.

Start

In standard mode only the autosampler creates this signal. This sends an order to start run-time controlled activities to all the modules connected to the APG remote bus. From now on (moment of injection) the runtime counts up.

GPIB

With the GPIB interface (included in all modules) your system is able to communicate with a Personal Computer configured as the Agilent ChemStation. Connect all modules with CAN cables and use one of them to connect to the Agilent ChemStation via an GPIB cable. See “Coexecution with Agilent ChemStation” on page 61 for further details on how to operate the system using the GPIB interface.

Serial / RS-232

Use a standard RS-232 cable to connect a printer to the serial interface (included in all modules). The module communication is enabled with the CAN cables. Choose one module to connect the printer to.

MIO

This interface enables the Agilent 1200 Series modules to communicate with PCs configured as Agilent ChemStations using a local area network (LAN). You can use the MIO interface if the respective extension board is installed in one of your modules and your system is integrated in a LAN.

BCD

If the appropriate extension board is part of your system, you can use this output to inform external devices about the vial number currently processed.

External Contacts

With an optional external contacts board you can use various opportunities to synchronize LC activities with external devices.

Firmware Updates

The firmware updates can be done using the control module and a PC card. The firmware is loaded from a PC card either into the control module itself or into the modules of the system. You can also update the firmware using a Personal Computer configured as the Agilent ChemStation and connected via the GPIB cable or LAN connection. All Agilent 1200 LC modules can be updated using a Personal Computer and the G1323B control module.

The firmware of Agilent HPLC modules or the Control Module can be updated using the Control Module and a PC-card that holds the firmware files.

Table 2 Firmware Update Tools

Module / Update via	Control Module G1323B	LAN/RS-232 Update Tool 2.00 and a PC with LAN or RS-232
Control Module G1323B	Y (PC-card)	Y (via the HPLC system)
HPLC Modules	Y (PC-card)	Y (requires LAN / RS-232)

The installation of older firmware might be necessary:

- to keep all systems on the same (validated) revision, or
- if third-party control software requires a special version.

To upgrade/downgrade the firmware,

1 Download the firmware and the documentation from the Agilent web

http://www.chem.agilent.com/scripts/cag_firmware.asp.

NOTE The use of the LAN/RS-232 Update Tool 2.00 is also possible. It is also available via the above-mentioned Agilent web. For systems that still use GIPB, use the Firmware Update Tool 4.00.

2 Load the firmware into the module(s) as described in documentation provided with the Firmware Update Tools.

Coexecution with Agilent ChemStation

Features

- Both user interfaces, the control module and the Agilent ChemStation, can be connected to a Agilent 1200 Series system at the same time.
- Parameter entry is possible from both user interfaces. Parameters will be updated on the other user interface within a few moments.
- An Agilent ChemStation sequence can be stopped and aborted from the control module and vice versa.
- The Agilent ChemStation can generate data files from a control module method or sequence. In this case the pre-fix and file name counter in the Single Sample Info section of the Agilent ChemStation must be enabled (protocol mode only).
- If the control module starts an analysis, the Agilent ChemStation is the slave/monitor system.

In general, however, it is not recommended to run both the Agilent ChemStation and the Control Module at the same time. Since the Agilent ChemStation offers a wider variety of controls over the LC Series system and handling it is much more comfortable it should be preferred over the Control Module. Since problems in diagnosis and verification may occur in some configurations the following restrictions apply:

Restrictions

- If a parameter window is open for parameter entry on the Agilent ChemStation, this specific entry field is disabled on the control module.
- If an analysis is running with the control module, the Agilent ChemStation should not be turned on or rebooted.
- If the Agilent ChemStation starts an analysis, the control module is the slave/monitor system.
- Parameter changes to a method will be identified on the other user interface as modification.
- The control module and the Agilent ChemStation have a different method handling (Agilent ChemStation method can have more information than the method on the control module, e.g. additional DAD parameters that are only accessible from the Agilent ChemStation). To have a method available on both controllers proceed as follows:

  If the method is on the Agilent ChemStation and should be saved on the control module or PC card, load the method on Agilent ChemStation and then save the method on the control module (or PC card) with Method – Save As.

  If the method is on the control module or PC card and should be saved on the Agilent ChemStation, first load method DEF_LC.M on the Agilent ChemStation (to have no additional parameter in the format) and then load the required method on control module. Then save the method on the Agilent ChemStation with the same name.

WARNING **A method that is available on the control module as protected method can be modified by the Agilent ChemStation and then be saved on the control module without any warning.**

3
Using the Pump

Turning the Pump On and Off

To turn the pump on or off you can use the **On/Off** button [**F7**] in the Analysis or **System** screen:

1. Enter the **Analysis** or **System** screen.
2. Select the **On/Off** button [**F7**].
3. Select the **Pump** button [**F8**].
4. Choose the desired function either with the **Action** buttons [**F6-F8**] or by selecting the **On/Off** buttons in the pop-up window. Uncheck the “to Standby mode only” if you want to turn the pump on or off without going to standby mode.

You can also access this function from the **Settings** button [**F1**] available in the **Analysis** screen or the **Control** button [**F1**] in the **System** screen.

Entering Settings

All pump settings can be entered in the Pump **Settings** screen. You can access this screen by selecting the **Settings** button [**F1**] in the **Analysis** screen and then choosing the pump. Commonly-used settings such as flow and solvent composition can be set directly in the **Analysis** screen. The choices available there depend on how many other modules are installed.

Purging the Pump

By opening the purge valve you can redirect the solvent flow from the pump out through the valve exit instead of passing through the injection valve and column. This purging process removes any undegassed or previously used solvent within the pumping system.

Purging Procedure

1 Ensure that an outlet tube is connected from the purge valve to a waste solvent bottle.

2 Open the purge valve.

3 Enter the **Analysis** screen.

4 Set the purge flow rate in the regular flow rate section of the **Analysis** screen, for example, to 5 ml/min.

NOTE If a flow rate of more than 5 ml/min is used on a quaternary pump, redefine the upper pressure limit to 200 bar (Accessible from the Analysis screen, press the Settings button [F1], choose pump from the list and press the Enter key. Then choose More ...)

5 Set the first channel to be purged to 100%. We recommend you start with the organic solvent channel first. Channel A will automatically be set to 100% when all other channels are set to zero or OFF.

6 Turn on the pump using the **On/Off** button [**F7**] in the **Analysis** screen.

7 Wait until a continuous stream of solvent comes out of the outlet tube from the purge valve.

8 Turn off the pump using the **On/Off** button [**F7**] in the **Analysis** screen and then close the purge valve.

9 Repeat the procedure for the other channels you need to purge.

NOTE The channels of a pumping system are named A, B, C and D (depending on the pump type). %A is automatically calculated by 100% - (%B + %C + %D). If no values for %B, %C and %D are entered, %A is always 100%. To purge the pump you have to go through steps step 5 to step 8 individually for each of the channels, setting the composition to 100% for the channel to be purged.

Adjusting Compressibility

Liquid chromatographic solvents are compressible under pressure. This solvent compressibility produces a change in flow rate as the pressure changes. To compensate for this effect, you can use the pump compressibility setting to maintain a uniform and accurate flow regardless of the system pressure. The compressibility setting can be accessed by using the Pump **Settings** button [**F1**] in the **Analysis** screen.

Table 3 lists compressibility values for common solvents used in LC.

Table 3 Compressibility Values for Common LC Solvents

Solvent	Compressibility (10^{-6} per bar)
Acetone	126
Acetonitrile	115
Benzene	95
Carbon tetrachloride	110
Chloroform	100
Cyclohexane	118
Ethanol	114
Ethyl acetate	104
Heptane	120
Hexane	150
Isobutanol	100
Isopropanol	100
Methanol	120
1-Propanol	100
Toluene	87
Water	46

When the compressibility setting is set to Off, the pump makes no compensation for the compressibility of the mobile phase.

For each particular compressibility value, the piston stroke (distance piston moves) and the speed at which the piston moves are adjusted accordingly, compensating for the solvent compressibility. For a mixture of solvents we recommend that you choose the compressibility value of the solvent that is present in the highest amount.

Adjusting Stroke Volume

The stroke volume defines the volume of mobile phase which is displaced by one stroke of pump piston 1. You can set the stroke volume to AUTO (automatic) or a value between 20 and 100 µl. When the stroke is set to AUTO, the pump uses large strokes at high flow and shorter strokes at low flow rate. This can improve the mixing performance and gradient linearity by reducing the size of the solvent packets to be mixed.

The stroke volume can be accessed by using the **Settings** button [**F1**] in the **Analysis** screen, selecting the pump and then pressing More ...

The amplitude of the pressure pulsation is directly proportional to the stroke volume. Decreasing the stroke volume decreases the pulsation amplitude, giving a better signal-to-noise ratio with flow-sensitive detectors. To maintain the flow, the pumping frequency is increased, increasing the frequency of the pressure pulsation. Increasing the pump frequency gives better peak area reproducibility at low flow rates.

Automatic Shut-down

At the end of a sequence you can set the pump to be automatically turned off using the Sequence End **Actions** button [**F1**] in the **Sequence** screen. You can turn off the pump completely or load a specific shut-down method.

Troubleshooting the Pump

1 Select the **Tests** button [**F3**] in the **System** screen.

2 Select Pump from the menu.

You can now select various tests to check the pump. For further information about these tests see the *Reference Manual* for the Agilent 1200 Series pump.

Tracking Pump History / Pump EMF Limits

1 Select the **Records** button [**F4**] in the **System** screen.

2 Select Pump from the list.

3 Press **Enter**.

You can now check the amount of solvent the pump has delivered (liquimeter) and the wear count.

The liquimeter displays the total volume of solvent that the pump has delivered since it was last reset. You can use the liquimeter limit to set up a preventive maintenance schedule for the pump. For example, make a note of the total number of liters pumped when you change the piston seals. This volume is a benchmark, reflecting the lifetime of the seals for your solvents and application. When the limit is exceeded an early maintenance feedback message will appear indicating it is time to change the seals. Changing the seals in advance will prevent you having to repeat analyses, due to leaking seals.

The wear count displays a calculated value indicating the wear of the pump seals. You can also use the seal wear limit to set up a preventive maintenance schedule for changing the pump seals when the limit is exceeded.

Resetting the Pump

1. Select the **Control** button [**F1**] in the **System** screen.
2. Select Pump from the menu.
3. Press **Enter**.
4. Select the **Reset** button [**F7**] to stop the pump operation and perform a hardware initialization.

Resetting the Pump Settings

1. Select the **Settings** button [**F1**] in the **Analysis** screen.
2. Select Pump from the menu.
3. Press **Enter**.
4. Select the **Default** button [**F7**] to reset the pump settings to their default values.

4
Using the Degasser

Starting the Degasser

1 Press the line-power switch on the front panel.

2 Turn on your pump by selecting the **On/Off** button [**F8**] in the **Analysis** screen.

3 Observe the degasser status lamp on the front panel.

The status lamp is off when there is sufficient vacuum in the degasser.

During operation, the status lamp may be yellow for several seconds. This indicates there is insufficient vacuum in the online degasser and the vacuum pump is on to create sufficient vacuum.

Removing Gas Bubbles

If you see gas bubbles in the solvent tubing or inside the solvent filter:

1 Disconnect the solvent tube of the first solvent channel from your pump.

2 Connect the syringe adapter onto the syringe from degasser accessory kit.

3 Pull the syringe plunger to draw solvent through the degasser and tubing. Continue to draw solvent through tubing until no gas bubbles are visible.

4 Disconnect the syringe adapter from the solvent tube.

5 Connect the solvent tube to your pump.

Repeat step 1 through step 5 for other solvent channels.

Changing Solvents

If you are changing to a solvent that is immiscible with the solvent currently in the tubing:

1 Replace the current solvent:
   - with iso-propanol, if current solvent is organic, or
   - with water, if current solvent is an organic buffer or salt.
2 Flush the online degasser and all tubing thoroughly.
3 Replace the iso-propanol or water with the new solvent.

5
Using the Autosampler

Configuring the Autosampler

1 Select the **Configure** button [**F2**] in the **System** screen.
2 Select Autosampler from the menu.
3 Press Enter.

You can configure the syringe volume, seat capillary volume, action on missing vial, trays, interfaces etc.

Configuring Interfaces

1 Select the **Configure** button [**F2**] in the **System** screen.
2 Select Autosampler from the menu.
3 Press **Enter**.
4 Select the **Interfaces** button [**F1**].
5 Select the interfaces you want to operate (see "Connecting External Devices" on page 57).
6 Select the **Done** button [**F6**].

Entering Settings

All autosampler settings can be entered in the Autosampler Settings screen. You can access this screen by selecting the **Settings** button **[F1]** in the Analysis screen. From here you can access the timetable function (to set up a timetable for the Autosampler only), the runtimes screen and the injector program screen. Commonly-used settings such as injection volume and vial number can be set directly in the Analysis screen. More specific settings (draw speed, eject speed, draw position offset) can be entered using the **More...** button [**F1**] and choosing the Settings option.

Setting the Injection Mode

There are two modes which can be set:

- Standard
  - without pre-defined needle wash,
  - with pre-defined needle wash (wash vial number can be set).

  If the pre-defined needle wash function is enabled, the needle moves prior to the injection (with reagent in the needle) into the wash vial to remove sample deposits from the needle outside. This prevents sample stay in the seat and create memory effects on the next injection cycle.
- Injector Program

  See “Running an Injector Program” on page 149.

Optimizing Autosampler Performance

There are two optimization modes available on the autosampler (called prefetch and overlap). Both options allow to shorten the analysis time for operations that require a high sample throughput.

The optimization modes can be chosen from the Analysis screen:

1 Press the **Settings** button [**F1**].

2 Choose the Autosampler from the list.

3 Select the **More...** button [**F1**].

4 Choose Optimization from the list.

5 In the appearing window the optimization mode can be chosen from the list box as well as a delay time.

If you choose the Prefetch Sample Vial option, the next vial (for multiple injections the same vial) will be moved close to the injection port after the specified elapsed runtime. The injection cycle will not be started. This procedure reduces the total injection time without interfering with the current run.

By choosing the Overlap Injection Cycle option the next vial will be placed in the injection port after the selected elapsed runtime. The following restrictions apply when using the Overlap option:

- The elapsed runtime entry before the sample is processed must not interfere with the current running analysis.
- Overlapping works only for a given vial range (e.g. within one sequence line).
- The first run for a new vial range is done without overlap.
- Injector programs using valve switching commands must not be executed when overlapping is selected. They will fail with an error message. Since all injector programs created with the Agilent ChemStation require such commands in order to function correctly, none of them will work in the overlap mode.

The screen also allows you to enable/disable the option 'always keep transport arm next to last used vial'.

Setting up the Thermostatted Autosampler

If a thermostatted autosampler is part of your system you can enter specific setting using the Thermostat option in the settings screen.

Using this option you can set the temperature of the airflow into the autosampler. This setting is available in the Analysis screen, too. Activate the check box to have the temperature controlled as soon as the cooled autosampler is turned on.

Using the **More ...** option in the **Settings** screen and selecting Signals you can choose among several thermostat parameters (ambient temperature, heat sink, heat sink fan etc.) that will be referred to as “Autosampler: Auxiliary” in the Plot - Signals screen. This allows you to access a variety of thermostatted autosampler signals without overloading the Available Signals list box (see “Plot Screen” on page 31).

Aligning Transport Arm/Gripper

1. Press the **Tests** button [**F3**] in the **System** screen.
2. Choose Autosampler from the list.
3. Press the **Align** button [**F1**].
4. Choose Transport.
5. Enter the desired values in the corresponding fields.

   The field X Correction sets the default value for the axis parallel to the front panel (left-right motion).

   Theta Correction describes the default angle of the transport arm towards the front-back axis of the module (rotation).

   For detailed information on the axes consult your Autosampler reference manual.
6. Select the **Done** button [**F6**] to accept settings.

The new values will be valid after performing the next hardware initialization or reset.

Tracking Autosampler History / EMF limits

1 Select the **Records** button [**F4**] in the **System** screen.
2 Select Autosampler from the list.
3 Press **Enter**.

You can check the number of 'Needle into Seat' injections the autosampler has made and the number of injection valve cycles. A limit can be specified for each function which you can use to schedule preventive maintenance.

Resetting the Autosampler

1 Select the **Control** button [**F1**] in the **System** screen.
2 Select Autosampler from the menu.
3 Press **Enter**.
4 Select the **Reset** button [**F7**] to reset the autosampler hardware.

This resets the injection valve, metering device and sampling unit.

Reset to Default Settings

1 Select the **Settings** button [**F1**] in the **Analysis** screen.
2 Select Autosampler from the menu.
3 Press **Enter**.
4 Select the **Default** button [**F7**] to reset the autosampler settings to their default values.

Troubleshooting the Autosampler

1 Select the **Tests** button [**F3**] in the **System** screen.

2 Select Autosampler from the menu.

3 Press **Enter**.

You can select a variety of injector steps to move individual parts of the autosampler.

The injector step functions can be used in troubleshooting to check the single steps of the injection cycle. For a complete description of each step, see the *Reference Manual* for the Agilent 1200 Series autosampler.

If you have a thermostatted autosampler, you can also test the auxiliary signals by pressing the Signal button in the Test screen. The auxiliary signals will be displayed graphically now (see "Setting up the Thermostatted Autosampler" on page 79).

6
Using the Manual Injection Valve

About the Injection Valve

The injection valve has six ports and can be moved manually between two positions. In the LOAD position, the mobile phase is led from the pump directly to the column, allowing you to inject your sample into the sample loop. In the INJECT position, the mobile phase is led through the sample loop, flushing the contents of the loop onto the column.

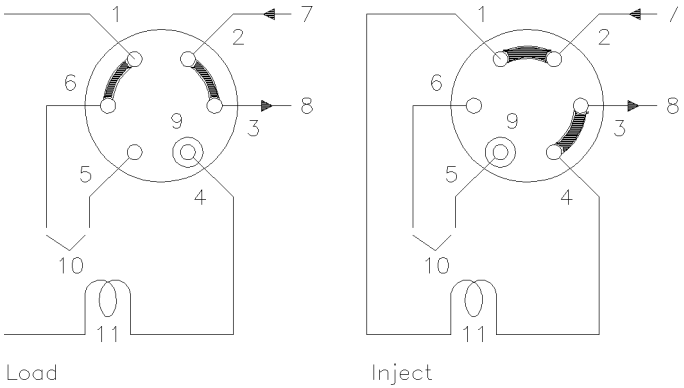


Figure 15 Valve Positions

Valve Positions:

1 to 6	valve ports
7	inlet (from pump)
8	outlet (to column)
9	needle port
10	vents
11	sample loop

Making An Injection

The sample loop can be either completely or partially filled. This depends on the amount of sample you have.

Completely Filling the Sample Loop

This is the conventional method in which an excess of sample is used to fill the sample loop completely. The volume of the loop determines the injection volume.

1 Fill syringe with sample.

2 Move valve to LOAD position.

3 Insert needle of syringe into needle port until needle touches stator face. Do not press too hard.

4 Slowly inject sample.

5 Leave syringe in position and move valve to INJECT position.

6 Remove syringe.

Partially Filling the Sample Loop

Use this method when only small quantities of sample are available. In this method the syringe determines the injection volume.

1. With valve in INJECT position, use needle port cleaner to flush needle port with about 1 ml of mobile phase (this will reduce residual contamination from previous injection).
2. Move valve to LOAD position.
3. Fill syringe with required volume of sample (not more than half of loop volume).
4. Insert needle of syringe into needle port until needle touches stator face. Do not press too hard.
5. Slowly inject sample.
6. Leave syringe in position and move valve to INJECT position.
7. Remove syringe.

How Much Sample Is Actually Injected?

When the sample loop is completely filled, the amount of sample injected is equal to the volume of the sample loop plus the volume of the valve passages (1 in rotor and 2 in stator). This means that the actual amount of sample injected will be different to the nominal value designated to your sample loop. However, since both standards and samples are analyzed using the same loop, you rarely need to know the absolute volume of the loop.

If you do need to know the actual volume of a sample loop, we recommend you calibrate it fitted to the valve, so that you also take the valve passages into account.

How Much Sample Do I Need?

To completely fill the sample loop an excess of sample is required. This is about 2 to 3 loop volumes of sample to achieve 95 % of the maximum loop volume (the remainder is residual mobile phase in the sample loop). Determine the optimum number of loop volumes experimentally for your particular application.

When you partially fill the sample loop, do not inject more than half of the sample volume. As you inject your sample into the loop, the sample mixes with the solvent already in the loop and some of the sample could be lost through port 6 if you try to inject too much.

An Alternative Way to Fill The Loop

When the sample loop is completely filled you can either inject the sample into the loop or use the syringe to draw the sample through the loop.

1 Move valve to LOAD position.

2 Place vent tube from port 6 into sample vial.

3 Insert needle of syringe into needle port until needle touches stator face. Do not press too hard.

4 Slowly draw sample into syringe.

5 Leave syringe in position and move valve to INJECT position.

6 Remove syringe.

If you use this method, always flush the loading passages (vent tube on port 6) after each injection to prevent cross-contamination between injections. Remember — to flush port 6 and the vent tube, the valve must be in the LOAD position.

7
Using the Detectors

Turning the Lamp On and Off

To turn the lamp on and off use the **On/Off** button [**F7**] in the **Analysis** screen:

1 Enter the **Analysis** screen.

2 Select the **On/Off** button [**F7**].

3 Select the Lamp button [**F6**].

The same can be achieved by using the **On/Off** button [**F8**] in the Detector **Settings** or **Control** screen available through the **Analysis** or **System** screens.

NOTE When the lamp is turned on, a lamp ignition routine is started. For more information "Lamp Ignition Routine (VWD only)" on page 98.

Entering Settings

All detector settings can be entered in the Detector **Settings** screen. You can access this screen by selecting the **Settings** button [**F1**] in the **Analysis** screen and choosing the appropriate detector. Commonly used settings such as wavelength can be set directly in the **Analysis** screen.

Diode Array Detector

The wavelength for signal A can be entered in the **Analysis** screen. The sample wavelength, reference wavelength, bandwidth, peakwidth and slit width can be entered in the DA Detector **Settings** screen. This screen is accessed by selecting the **Settings** button [**F1**] in the **Analysis** screen. Additional entries (autobalance etc.) and the spectrum settings (range, threshold) are accessed by selecting the **More...** button [**F1**] under DA Detector Settings.

Variable Wavelength Detector

Settings for this detector include the wavelength, peakwidth and signal polarity. Pressing the **More ...** button [**F1**] and choosing Settings you can enter autobalance settings and the margin for negative absorbance. The option Spectrum allows you to enter a wavelength range for a sample spectrum.

Fluorescence Light Detector

For the fluorescence light detector the following settings can be entered: Excitation wavelength, emission wavelength and Multi wavelength settings can be set in the regular **Settings** screen. With the **More ...** button [**F1**] you can specify further detector settings, i.e. peakwidth and PMT-Gain (baseline behaviour, reference, polarity, spectral range fit), multi wavelength settings (spectrum, excitation range), 3D scanning settings (excitation and emission ranges) and phosphorescence detection mode settings.

Multiple Wavelength Detector

The wavelength for signal A can be entered in the Analysis screen. The wavelength for signal B, slit width and peak width can be entered in the MW Detector Settings screen. This screen is accessed by selecting the **Settings** button [**F1**] in the **Analysis** screen. Additional signals and functions are accessed by selecting the **More...** button [**F1**] under MW Settings.

NOTE Only the G1323B version of the control module allows control of the Multiple Wavelength Detector. The G1323A will display "resident or unsupported module" if a RI detector is configured in the Agilent 1200 system.

Refractive Index Detector

The control module allows to set the RID cell temperature in the **Analysis** screen.

Temperature, Peakwidth, polarity and automatic recycling can be set in the RI detector settings screen. This screen is accessed by selecting the **Settings** button [**F1**] in the **Analysis** screen.

Automatic zero and automatic purge can be set by selecting the **More...** button [**F1**] under RI Settings.

NOTE Only the G1323B version of the control module allows control of the Refractive Index Detector. The G1323A will display "resident or unsupported module" if a RI detector is configured in the Agilent 1200 system.

Resetting the Baseline

You can reset the baseline using the **Balance** button [**F1**] **(Zero** button [**F1**] when using the Refractive Index Detector) in the Detector Control screen. Please note that this procedure is not available for the Fluorescence Light Detector:

1 Select the **Control** button [**F1**] in the **System** screen.

2 Select the Detector from the menu.

3 Press **Enter**.

4 Select the **Balance** button [**F1**].

You can achieve the same using the m (menu) key in the Detector Settings window available from the **Analysis** screen.

Configuring the Detector

1 Select the **Configure** button [**F2**] in the **System** screen.

2 Select the Detector from the list.

3 Press **Enter**.

You can now configure the detector analog output(s), lamp-on at power-on and the interfaces.

Troubleshooting the Detector

1 Select the **Tests** button [**F3**] in the **System** screen.

2 Select the Detector from the menu.

3 Press **Enter**.

4 Select the test you require.

The selection of tests depends on the. For information about each test, see the *Reference Manual* for the Agilent 1200 detectors.

NOTE The full test capability is only available from the LC ChemStation.

Tracking Detector History

1 Select the **Records** button [**F4**] in the **System** screen.

2 Select the Detector from the menu.

3 Press Enter to display the logbook.

You can check, change and reset the lamp burn time and number of ignitions. For the FL detector the flash lamp lifetime and for the RI detector the time since last purge can be checked.

Resetting the Detector

1. Select the **Settings** button [**F1**] in the **Analysis** screen.
2. Select the Detector from the menu.
3. Press **Enter**.
4. Select the **Default** button [**F7**] to reset the detector settings to their default values.

Lamp Ignition Routine (VWD only)

When the lamp is turned on, the following routine is implemented:

- 1-minute warm-up, within this time the grating position is re-initialized.

  Check of wavelength setting at 656 nm emission (must be within 1 nm) at reference side only (to have no influence from flow cell condition).

  If not correct, a message for calibration is displayed. Perform a wavelength calibration (available within VWD Tests).

- Check of intensity
  - at 250 nm without cut-off filter inserted,
  - at 250 nm with cut-off filter inserted.

  If the intensity check is not OK, the cut-off filter operation is not OK.

Configuring the Analog Channel Output

You may use the LC Series 1200 detectors to test or monitor optical parameters on external analog equipment connected via the analog output (Fluorescence Light, Diode Array and Multiple Wavelength Detectors have two analog outputs, Variable Wavelength Detector and Refractive Index Detector have one) at the back side of the module.

To configure the analog outputs:

1. Press the **Settings** button [**F1**] in the **Analysis** screen.
2. Choose the detector and press **enter**.
3. Press the **Analog** button [**F3**].
4. Either select the signal you want to monitor from the signal source drop down list. Or, if you have a variable wavelength detector (fluorescence light detector), choose the signal(s) from the list(s) to be routed to the analog output(s).
5. Enter the values for Zero Offset (sets a baseline offset in order to recognize negative drifts) and Attenuation (sets an absorbance range) for each of the two connectors.
6. Press the **Done** button [**F6**].

8
Using the Column Compartment

Turning the Column Compartment On and Off

You can turn the column compartment on and off by using the **On/Off** button [**F7**] in the **Analysis** screen:

1 Enter the **Analysis** screen.

2 Select the **On/Off** button [**F7**].

3 Select the **Temp** button [**F7**].

The same can be achieved through the **Settings** or **Control** buttons [**F1**] in the **Analysis** or **Systems** screens.

Entering Settings

The temperature can be entered in the Analysis screen. The temperature (for left and/or right heater) can be entered in the **Column Compartment Settings** screen. This screen is accessed by selecting the **Settings** button [**F1**] in the **Analysis** screen. Additional settings are accessed by selecting the **More...** button [**F1**] under Column Compartment Settings.

Configuring the Column Compartment

1 Select the **Configure** button [**F2**] in the **System** screen.

2 Select Column Comp from the list.

3 Press**Enter**.

You can now configure the leak-detection mode, temperature-on at power-on, the interfaces and the column identification module.

Configuring the Column ID Module

1 Select the **Configure** button [**F2**] in the **System** screen.
2 Select Column Comp from the list.
3 Press **Enter** to enter the **Column Compartment Configuration** screen.
4 Press the **Column ID** button [**F4**] to enter **Column ID** screen.
5 To toggle between left and right column press the **Left/Right** button [**F8**].

NOTE If no column tag is sensed, the record fields are not active and the left/right tag sign in the upper right corner or the window is crossed out.

6 Enter your column data into the fields as required. Additional fields are available by pressing the **More ...** button [**F1**].
7 Pressing the **Write** button [**F7**] will transfer the information into the column tag.
8 Pressing the **Right** button [**F8**] will show the information fields of the right column tag (if column is installed).

NOTE The column ID information is updated as soon as a column with ID tag is installed correctly. So you can check the number of injections that have been made on the column in this screen.

Selecting Separated or Combined Mode

This mode allows the temperature setting of both heaters independent from each other. If not enabled both heaters are kept on the same temperature.

1 Select the **Settings** button [**F1**] in the **Analysis** screen.

2 Select Column Comp from the menu.

3 Enable the Separated mode by selecting the check box.

4 To enable the Combined mode, deselect the check box.

Selecting the Column Switching Valve (optional)

The column switching valve is optional.

1 Select the **Settings** button [**F1**] in the **Analysis** screen.

2 Select Column Comp from the menu.

3 Press the **Column Switch** button.

4 Select mode 1 or 2.

5 Press the **Done** button [**F6**] and leave this screen.

Troubleshooting the Column Compartment

1 Select the **Tests** button [**F3**] in the **System** screen.

2 Select Column Comp from the menu.

3 Press **Enter**.

4 Select the test you require.

You can select the Calibrate test to check the operation of the Column Compartment. For information about the test, see the *Reference Manual* for the Agilent 1200 Series column compartment.

Tracking Column Compartment History

1 Select the **Records** button [**F2**] in the **System** screen.

2 Select Col. Comp from the list.

3 Press the **System** or **Maint. Log** button [**F4**] to display the logbook.

Tracking Column ID History

1 Select the **Configure** button [**F4**] in the **System** screen.

2 Select Column Comp from the list.

3 Press **Enter** to enter the **Column Compartment Configuration** screen.

4 Press the **Column ID** button [**F2**] to enter the **Column ID** screen.

NOTE If no column tag is sensed, the parameter entry fields are not active, the left/right tag sign is crossed out and the More ... button is unavailable.

By selecting the **More ...** button [**F1**] you can enter values and check a variety of features for the installed column. For example, the maximum pressure allowed and the maximum recommended temperature.

You can check the number of injections that have been made on the column.

Resetting the Column Compartment

1. Select the **Settings** button [**F1**] in the **Analysis** screen.
2. Select Column Comp from the menu.
3. Press**Enter**.
4. Select the **Default** button [**F7**] to reset the detector settings to their default values.

9
Running an Isocratic Analysis

What You Will Need

Instruments Agilent 1200 Series isocratic, binary or quaternary pump, autosampler and a UV-detector.

Column A 125 mm × 4.0 mm Hypersil ODS, 5 µm (Agilent Technologies part number 7982618-564).

Solvents For the isocratic pump, a solvent mixture of LC grade bidistilled water (35 %) and acetonitrile (65 %).

Sample The Agilent Technologies isocratic standard sample (Agilent Technologies part number 01080-68704). This contains 0.15 wt.% dimethylphthalate, 0.15 wt% diethylphthalate, 0.01 wt.% biphenyl and 0.03 wt.% o-terphenyl dissolved in methanol.

Preparing the LC System

1. For the isocratic pump, fill the solvent bottle with the mixture of LC-grade bidistilled water (35 %) and acetonitrile (65 %). For the binary or quaternary pump, fill one solvent bottle with bidistilled water (channel A) and the other with acetonitrile (channel B).
2. Turn on the detector lamp and pump using the On/Off button [F7] in the Analysis screen. (Use Action keys then to select the module)
3. For the quaternary pump, turn on the degasser by pressing the line-power switch.
4. Purge the pump. For more information see Chapter 3, “Using the Pump”.
5. Allow the detector at least 15 minutes to provide a stable baseline.
6. Fill the contents of a Agilent Technologies isocratic standard sample ampoule into a vial and seal the vial with a cap. Place the vial in position 1 of the autosampler tray.
7. Pump the water/acetonitrile (35/65 %) mobile phase through the column for 10 minutes at a flow rate of 2 ml/min.

Entering Settings

To set up the isocratic analysis you will set the LC system settings to default and then modify selected settings, the other settings will remain with their default values. You will then save these settings to a method called ISO.

1 Enter the **Analysis** screen.

2 Set the vial range as 1 to 1.

3 Set the number of injections to 1.

4 Press Enter to skip the method name section.

5 Select the **Settings** button [**F1**].

6 Select LC System from the menu.

7 Select the **Default** button [**F7**] and select the **Yes** button to load defaults.

8 Press **Esc**.

9 Select the **Settings** button [**F1**].

10 Select the pump from the menu (either ISO, BIN or QUAT).

11 Press the **Pressure** button [**F3**].

12 Enter 400 as the upper pressure limit.

13 Select the **Done** button [**F6**].

14 Enter the following values: %B 65, (%C OFF, %D OFF for quarternary pump. If you have a binary pump, set %B to 65.).

15 Set the Flow to 1,5 ml/min.

16 Confirm by selecting "**Done**" to enter the **Analysis** screen

17 Enter the values shown in Table 4 in the **Analysis** screen.

Table 4 Values in Analysis Screen

Setting	Value
Detection wavelength	254 nm
Injection volume	1 µl
Stoptime	6 min

NOTE

The channels of a pumping system are named A, B, C and D (depending on the pump type). %A is automatically calculated by 100% - (%B + %C + %D). If no values for %B, %C and %D are entered, %A is always 100%.

Saving Settings in a Method

1. Select the **Method** button [**F3**] in the **Analysis** screen.
2. Select the **Save As** button [**F8**].
3. Enter the method name as ISO using the selection keys (also see "Specifying a Method Name" on page 42)
4. Press the **Done** button [**F6**] to save the method.
5. Press the **Esc** key to return to the **Analysis** screen.

Observing the Chromatogram

1 Select the **Plot** button [**F6**] in the **Analysis** screen.
2 Press the **Select** button [**F6**].
3 Choose a Signal from the Available Signals list box.
4 Press **Enter**.

NOTE You can choose several signals at a time. The plot function will display all signals that are shown in the Selected Signals list box. Use the selection keys to navigate within the list boxes and press the Enter key to move Signals from one box to the other.

5 Select the **Done** button [**F6**] to display the chromatogram.
6 Press the **Esc** key to go back to the **Analysis** screen.
7 Press the **Start** button [**F8**].
8 Select OK to confirm the vial range and injection number and press **Enter** to start the analysis.

9 Press the **Plot** button [**F6**] to show the chromatogram

A typical chromatogram for this analysis is shown in Figure 16.

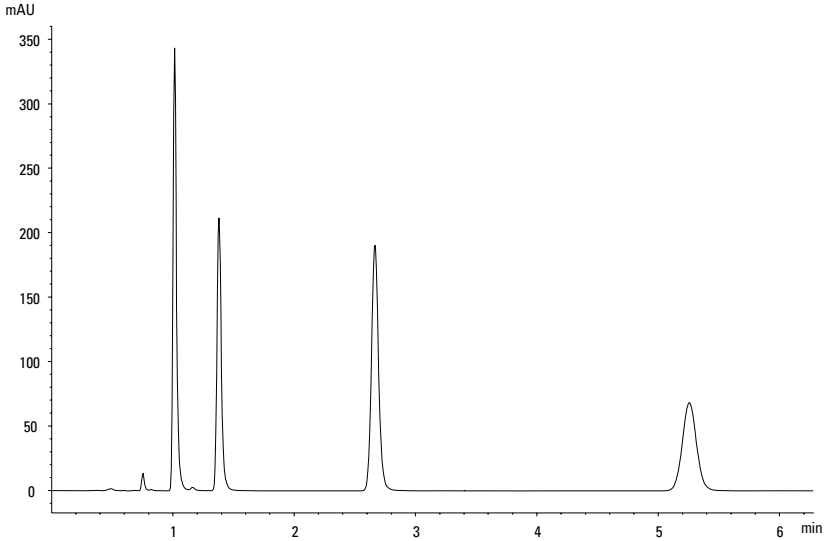


Figure 16 Analysis of Isocratic Standard Sample

The exact profile of the chromatogram will depend on the column you have used. Differences in retention times and areas of the peaks in your chromatogram and the one shown in Figure 16 might be a result of variations in the concentration of the sample from batch to batch, the quality of the solvents used and the column temperature.

NOTE You can rescale the plot using the Rescale button [F7], or the cursor keys or you define the plot window within the Setup.

Starting the Analysis

NOTE The analysis can be started from various other screens, e.g. System, Status, Sampels or Sequence screen.

1 Enter the **Analysis** screen.

2 Select the **Start** button [**F8**].

3 Select OK to confirm the vial range and injection number and press the Enter key to start the analysis.

10
Running a Gradient Analysis

What You Will Need

Instruments Agilent 1200 Series binary or quaternary pump, autosampler, UV-detector and degasser.

Column A 125 mm × 4.0 mm Hypersil ODS, 5 µm (Agilent Technologies part number 7982618-564).

Solvents LC-grade bidistilled water and acetonitrile.

Sample The Agilent Technologies isocratic standard sample (Agilent Technologies part number 01080-68704). This contains 0.15 wt.% dimethylphthalate, 0.15 wt% diethylphthalate, 0.01 wt.% biphenyl and 0.03 wt.% o-terphenyl dissolved in methanol.

Preparing the LC System

1. Fill one solvent bottle with bidistilled water (channel A) and the other with acetonitrile (channel B).
2. Turn on the detector lamp and pump using the **On/Off** button [**F7**] in the **Analysis** screen.
3. For the quaternary pump, turn on the degasser by pressing the line-power switch.
4. Purge the pump. For more information see Chapter 3, “Using the Pump”.
5. Allow the detector at least 15 minutes to provide a stable baseline.
6. Fill the contents of a Agilent Technologies isocratic standard sample ampoule into a vial and seal the vial with a cap. Place the vial in position 1 of the autosampler tray.
7. Pump the water/acetonitrile (35/65 %) mobile phase through the column for 10 minutes at a flow rate of 2 ml/min.

Entering Settings

To set up the gradient analysis you will set the LC system settings to default and then modify selected settings, the other settings will remain with their default values. You will then save these settings to a method called GRAD.

To set up the solvent gradient, you will create a timetable in the method. This is done using the Timetable screen, accessed by selecting the Timetable button [F2] in the Pump settings screen.

The example assumes that the Timetable is empty. If the Timetable is not empty, use the All Lines item, accessed by pressing the Delete button.

1 Enter the **Analysis** screen.

2 Set the Vial Range as 1 to 1.

3 Set the Number of Injections to 1.

4 Skip the method name field

5 Select the **Settings** button [**F1**].

6 Select LC System from the menu.

7 Press **Enter**.

8 Select the **Default** button [**F7**] and select the **Yes** button to load defaults.

9 Press the **Esc** key to enter the **Analysis** screen.

10 Enter the following values in the **Analysis** screen.

Table 5 Values in the Analysis Screen

Setting	Value
Flow	1.5 ml/minute
Detection wavelength	254 nm
Injection volume	1 µl
Stoptime	5 min

11 Select the **Settings** button [**F1**].

12 Select BIN or QUAT pump from the menu.

If you have a quaternary pump set %B to 65, %C and %D to OFF.

If you have a binary pump set %B to 65.

NOTE The channels of a pumping system are named A, B, C and D (depending on the pump type). %A is automatically calculated by 100% - (%B + %C + %D). If no values for %B, %C and %D are entered, %A is always 100%.

13 Select the **Pressure** button.

14 Set the upper pressure limit to 400 bar.

15 Select the **Done** button.

16 Select the **Timetable** button.

17 Select the **Insert** button.

18 Enter a value of 2 minutes and select Composition as the setting.

If you have a quaternary pump, set the %B composition to 65, %C and %D to 0.00.

If you have a binary pump, set the %B composition to 65.

19 Select the **Enter** button to accept entries (Action Key **F7**).

20 Enter the following information for another two lines.

time 4 : %B = 95

time 5 : %B = 65

21 Press the **Done** button and verify your timetable entries.

22 Press the **Esc** key until you are in the **Analysis** screen.

NOTE Use Enter to store timetable lines.
Use Done when all lines have been entered.
By pressing the Esc key you return to the previous screen.

Saving Settings in a Method

1 Select the **Method** button [**F3**] in the **Analysis** screen.

2 Select the **Save As** button [**F8**].

3 Enter the method name as GRAD using the selection keys (also see "Specifying a Method Name" on page 42)

4 Press the **Done** button [**F6**] to save the method.

5 Press **ESC** to return to the **Analysis** screen.

Observing the Chromatogram

1 Select the **Plot** button [**F6**] in the **Analysis** screen.

2 Press the Select button [**F6**].

3 Choose a Signal from the Available Signals list box.

4 Press **Enter**.

NOTE You can choose several signals at a time. The plot function will display all signals that are shown in the Selected Signals list box. Use the selection keys to navigate within the list boxes and press the Enter key to move Signals from one box to the other.

5 Select the **Done** button [**F6**] to display the chromatogram.

6 Press **Esc** to go back to the **Analysis** screen.

7 Press the **Start** button [**F8**].

8 Select OK to confirm the vial range and injection number and press **Enter** to start the analysis.

9 Press the **Plot** button [**F6**] to show the chromatogram.

A typical gradient chromatogram for this analysis is shown in Figure 17.

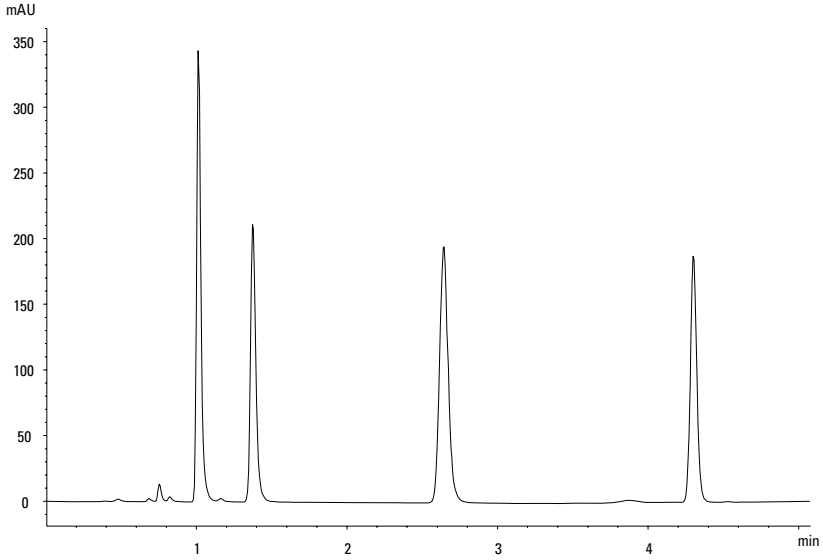


Figure 17 Gradient Analysis of Isocratic Standard

The exact profile of the chromatogram will depend on the column you have used. Differences in retention times and areas of the peaks in your chromatogram and the one shown in Figure 17 might be a result of variations in the concentration of the sample from batch to batch, the quality of the solvents used and the column temperature.

If you compare this chromatogram with the one from Chapter 9, “Running an Isocratic Analysis” you will notice the solvent gradient has reduced the elution time of the fourth peak in the chromatogram.

NOTE You can rescale the plot using the **Rescale** button [**F7**], or the cursor keys or you define the plot window within the Setup.

Starting the Analysis

NOTE The analysis can be started by pressing the Start button [F8] from the Samples screen, the System screen, or the Status screen.

1 Enter the **Analysis** screen.

2 Select the **Start** button [**F8**].

3 Select OK to confirm the vial range and injection number and press **Enter** to start the analysis.

11
Running Multiple-Vial Analyses

Analyzing Multiple Vials Using the Same Method

This section describes how to set up a 25-vial analysis with one injection from each vial. You will use a previously created method. The samples are located in positions 1 to 25 of the autosampler tray. For details "Working with Methods" on page 41.

1. Enter the **Analysis** screen.
2. Set the Vial Range from 1 to 25.
3. Set the number of injections to 1.
4. Select the method you want to use with the scroll buttons (▲▼).
5. Select the **Start** button [**F8**].
6. Select OK to confirm the vial range and injection number and press **Enter** to start the analysis.

Analyzing Multiple Vials Using Different Methods

This section describes how to set up a 50-vial analysis using three methods which you have previously created called e.g. METH1, METH2 and METH3. For example: METH1 and METH2 have the same analytical settings but differ in the injection volume and stoptime values. METH3 uses a different temperature and requires a wait time of 30 minutes for the LC system to equilibrate.

NOTE This way of combining methods is called *Sequence*.

- The first 20 vials are analyzed using METH1 with one injection per vial,
- the next 20 vials are analyzed using METH2 with two injections per vial,
- the last 10 vials are analyzed using METH3 with three injections per vial.

The vials are located in positions 1 to 50 of the autosampler tray.

The example assumes that the sequence table is empty. If the sequence table is not empty, use the All Lines item, accessed by pressing the **Delete** button [**F6**].

1 Select the **Sequence** [**F4**] in the **Analysis** screen.

2 For sequence line 1, select the **Insert** button [**F7**] and **enter**:

Vial Range	1 to 20
#Inj.	1
Inj. Volume	Default
Method	METH1

3 VSelect the **Enter** button to accept entries.

4 For sequence line 2, enter:

Vial Range	21 to 40
#Inj.	2
Inj. Volume	Default
Method	METH2

5 Select the **Enter** button to accept entries.

6 For sequence line 3, enter:

Vial Range	41 to 50
#Inj.	3
Inj. Volume	Default
Method	METH3
Wait	30 minutes

7 Select the **Done** button [**F6**] to enter sequence line 3 settings and complete the sequence.

8 Select the **Start** button [**F8**] in the **Sequence** screen.

9 Select the OK button to start the sequence.

Single-Level Calibration Sequences

The following procedure describes how to set up a calibration sequence for an analysis which uses single-level calibration.

There is one calibration standard (C) and 9 samples (S).

The analysis requires that:

- each sample is analyzed in duplicate,
- the calibration standard is analyzed once before the samples and re-analyzed once after every 2 samples,

  C S S C S S C S S C S S C S C

- the calibration standard is located in position 90 and the 9 sample vials are in positions 1 to 9 of the autosampler tray, and
- the method called METH1 is used for the samples and standards.

The example assumes that the sequence table is empty. If the sequence table is not empty, use the All Lines item, accessed by pressing the **Delete** button [**F6**].

1 Select the **Sequence** button [**F4**] in the Analysis screen.

2 For sequence line 1, select the **Insert** button [**F7**] and **enter**:

Vial Range	1 to 9
#Inj.	2
Inj. Volume	Default
Method	METH1

3 Select the **Calibration** button [**F1**] to display the **Calibration Settings** screen for sequence line 1 and choose **Edit**.

4 Enter the following information:

Calibration vial range	90 to 90
Number of injections	1
Calibration method	METH1
Recalibrate every	2 vials multi
Before	On
After	On

5 Press the **Done** button [**F6**] until the **Sequence** screen appears.

6 Select the **Start** button [**F8**] in the **Sequence** screen.

7 Press **Enter** to start the sequence.

Multiple-Level Calibration Sequences

The following sections describe how to set up calibration sequences for analyses which use multiple-level calibration.

Recalibrating With the Same Group of Standards

There are three calibration standards of different concentrations (C1, C2, C3) and 15 samples (S). The standards and samples are analyzed using the same method.

The analysis requires that:

- each sample is analyzed once,
- the calibration standards are analyzed twice before the samples and re-analyzed twice after every 5 samples,

  C1 C2 C3 S10-S14 C1 C2 C3 S15-S19 C1 C2 C3 S20-S24 C1 C2 C3
- the calibration standards are located in positions 90 to 92 of the autosampler tray,
- the 15 sample vials are located in positions 10 to 24 of the autosampler tray, and
- the samples and standard are analyzed using a method called METH1.

The example assumes that the sequence table is empty. If the sequence table is not empty, use the All Lines item, accessed by pressing the **Delete** button [**F6**].

1 Select the **Sequence** button [**F4**] in the **Analysis** screen.

2 For sequence line 1, select the **Insert** button [**F7**] and **enter**:

Vial Range	10 to 24
#Inj.	2
Inj. Volume	Default
Method	METH1

3 Select the **Calibration** button [**F1**] to display the **Calibration Settings** screen for sequence line 1 and choose **Edit**.

4 Enter the following information:

Calibration vial range	90 to 92
Number of injections	2
Calibration method	METH1
Recalibrate every	5 vials multi
Before	On
After	Off

5 Select the **Done** button [**F6**] to accept entries.

6 Select the **Start** button [**F8**] in the **Sequence** screen.

7 Press **Enter** start the sequence.

The autosampler now analyzes:

- the three calibration standards in duplicate,
- sample vials 10 through 14,
- the three calibration standards in duplicate,
- sample vials 15 through 19,
- the three calibration standards in duplicate,
- sample vials 20 through 24, and
- the three calibration standards in duplicate.

Recalibrating With Multiple Groups of Standards

There are two different types of samples, A and B that need to be analyzed.

The analysis for sample type A requires a 5 µl injection and a stoptime of 8 minutes.

The analysis of sample type B requires a 2 µl injection and a stoptime of 5 minutes.

For sample type A:

- there are 3 calibration standards of different concentrations and 6 samples,
- each sample must be analyzed once,
- the calibration standards must be analyzed in duplicate and re-analyzed after every 2 samples,

  C1 C2 C3 S7 S8 C1 C2 C3 S9 S10 C1 C2 C3 S11 S12 C1 C2 C3
- The calibration standards of type A are in positions 1, 2 and 3 of the autosampler tray and the 6 sample vials are in positions 7 to 12, and
- the samples and the calibration standards use the same method called METH1.

For sample type B:

- there are 3 calibration standards of different concentrations and 9 samples,
- each sample must be analyzed once,
- the calibration standards must be analyzed twice and re-analyzed after every 3 samples,

  C1 C2 C3 S13-S15 C1 C2 C3 S16-S18 C1 C2 C3 S19-S21 C1 C2 C3
- the calibration standards of type B are in positions 4, 5 and 6 of the autosampler tray and the 9 sample vials are in positions 13 to 21, and
- the samples and calibration standards of type B use different methods.

The samples use METH2 and the calibration standards use METH3. These methods contain the same analytical parameters and differ only in the analysis stoptime.

The example assumes that the sequence table is empty. If the sequence table is not empty, use the All Lines item, accessed by pressing the **Delete** button [**F6**].

1 Select the **Sequence** button [**F4**] in the **Analysis** screen.

2 For sequence line 1, select the **Insert** button [**F7**] and **enter**:

Vial Range	7 to 12
#Inj.	1
Inj. Volume	Default
Method	METH1

3 Select the **Calibration** button [**F1**] to display the **Calibration Settings** screen for sequence line 1 and choose Edit.

4 Enter the following information:

Calibration vial range	1 to 3
Number of injections	2
Inj. Volume	Default
Calibration method	METH1
Recalibrate every	2 vials multi
Before	On
After	Off

5 Select the **Done** button [**F6**] to accept entries.

6 Move the highlighted bar to line 2 (by pressing the Selection key down) and press **Enter**.

7 For sequence line 2 enter:

Vial Range	13 to 21
#Inj.	1
Inj. Volume	Default
Method	METH2

8 Select the **Calibration** button [**F1**] to display the **Calibration Settings** screen for sequence line 2 and choose **Edit**.

9 Enter the following information:

Calibration vial range	4 to 6
Number of injections	2
Inj. Volume	Default
Calibration method	METH3
Recalibrate every	3 vials multi
Before	On
After	Off

10 Select the **Done** button [**F6**] to accept entries.

11 Select the **Start** button [**F8**] in the **Sequence** screen.

12 Press **Enter** to start the sequence.

The autosampler now analyzes:

- three type A calibration standards in duplicate,
- type A samples in vials 7 and 8,
- three type A calibration standards in duplicate,
- type A samples in vials 9 and 10,
- three type A calibration standards in duplicate,
- type A samples in vials 11 to 12,
- three type A calibration standards in duplicate,
- three type B calibration standards in duplicate,
- type B samples in vials 13, 14 and 15,
- three type B calibration standards in duplicate,
- type B samples in vials 16,17 and 18,
- three type B calibration standards in duplicate,
- type B samples in vials 19, 20 and 21, and
- three type B calibration standards in duplicate.

Synchronizing Analyses with External Devices

With an APG remote connector the system can be connected to external devices in order to synchronize the analyses. This is necessary when an external device needs some time in order to get ready for a new analysis and when transmitting of a start request is required (see "Connecting External Devices" on page 57 for further information on interfaces).

When executing an analysis by pressing the **Start** button [**F8**] you will see a window where sequence modes can be chosen.

In any case, do all the analysis preparation using the control module.

NOTE

A "Start" command is used to start the analytical run from the point of injection and is usually issued by the autosampler.
A "Start Request" command causes the autosampler to take the next vial and place it under the injection needle (also see "APG Remote" on page 57 and "Optimizing Autosampler Performance" on page 78)
The "Start button" [F8] on the control module is used to start a vial range or sequence analysis.

Standard

In the standard mode the analysis is under the command of the control module. The control module will issue a Start Request command to the autosampler as soon as all modules are ready for the next analysis. The autosampler issues the Start command at the point of injection. With an Agilent 1200 Autosampler integrated in the system and no external devices this is the normal operation mode.

Send Single Start Request

After you start the analysis with the control module it will generate a single start request on the APG remote lines. This allows to trigger the external device which will start each injection by sending a start signal. The vial range or sequence will be started by the control module, but for every new injection the external device must give the start command.

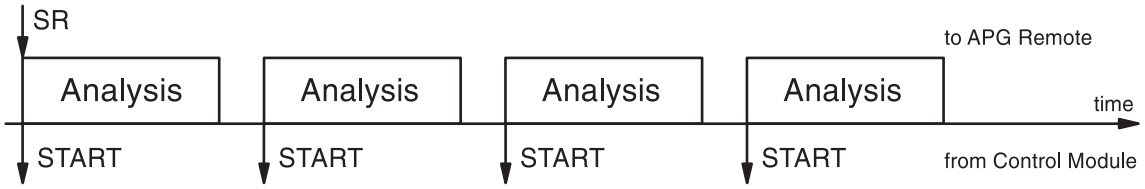


Figure 18 Send single external start request

In this mode the control module will simply track the progress of the vial range or sequence. It will indicate the proper sample, change sequence lines, load methods or other sequence related actions for each run.

Send Repeated Start Request

This will cause the control module to generate start requests before each run. The external device starts each injection then by sending a start signal to the APG remote line. That is, after all the programming has been completed on the control module and the **Start** button [**F8**] has been pressed, a Start Request is issued before each run and the external device must give the Start command for the injection process.

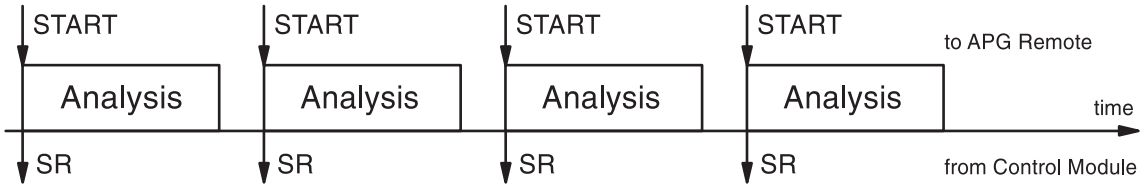


Figure 19 Send repeated external start request

Here, too, the module will simply track the progress of the analysis.

Wait for Single (External) Start Request

After pressing the **Start** button [**F8**] the autosampler will wait for a single external start request on the APG remote lines. When the start request is received, the complete vial range or sequence is done as in standard mode under the command of the control module.

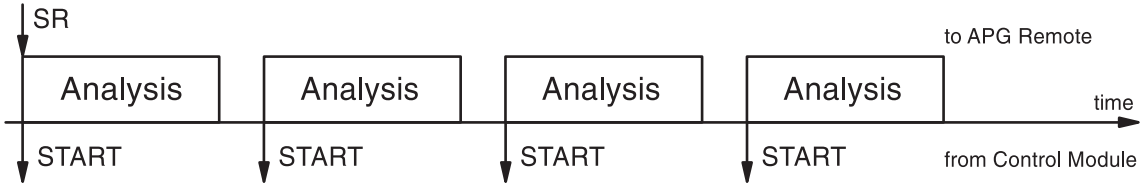


Figure 20 Wait for single external start request

Wait for Repeated Start Request

After pressing the **Start** button [**F8**] the autosampler will wait for external start requests before each vial in the range or sequence. They have to be generated by the external device. This mode is necessary when the external device needs extra time to get ready for the next analysis and thus has to be in charge of the start event.

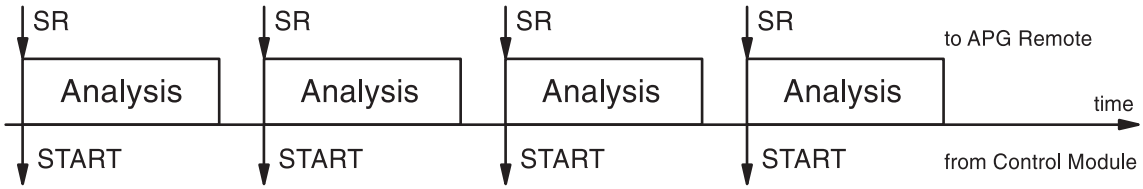


Figure 21 Wait for repeated external start request

NOTE

An Agilent 1200 variable wavelength detector or diode array detector will perform a balance (provided that Auto Balance is set to Prerun in the More ... Settings screen) when receiving a start command from the control module. This will only happen in the Standard and Wait for single (repeated) start request modes. In the Send single (repeated) start request modes a balance before the run will NOT be performed. If regular balancing is required, set the Auto Balance check box to Postrun.

12
Running an Injector Program

Creating an Injector Program

The injector program is part of the method. The injector program screen can be accessed using the Inj. **Program** button [**F3**] in the **Autosampler** Settings screen.

This section describes an injector program to do sample preparation involving a precolumn derivatization reaction. This is required when the analytes lack chromophores and in their original chemical structure cannot be detected with the required sensitivity.

To create this injector program you will:

- set the LC system to the default settings
- modify the injector program settings in the Inj. Program screen, the other settings will remain with their default values, and
- save the method with the name DERIV.

When the method called DERIV is started, the program is executed followed by the analytical run.

The first step of the program involves drawing derivatization reagent into the needle capillary, followed by sample and then reagent again. To ensure the reagent and sample react efficiently, the plunger in the metering device of the autosampler is moved back and forth. This mixes the sample and reagent as they travel up and down the capillary. Following mixing, the derivatization requires a pause to allow the sample and reagent to fully react, before the derivatized sample is injected onto the column.

Entering Injector Program Settings

1 Enter the **Analysis** screen.
2 Select the **Settings** button [**F1**].
3 Select LC System from the menu.
4 Select the **Default** button [**F6**] and select the Yes button to load defaults.
5 Press **Esc** to go back to the **Analysis** menu.
6 Select the **Settings** button [**F1**].
7 Select Autosampler from the menu.
8 Select the Inj.**Program** button [**F3**] to display the **Program** screen.
9 For program line 1, select the **Insert** button [**F7**].
10 Select the DRAW function and enter the draw settings as described in Table 6 on page 152.
11 Select the **Enter** button [**F7**] to accept entries.
12 Repeat the procedure for the other functions to complete the program.
13 Press the **Esc** key until you are back in the **Settings** screen.

Injector Program Lines

Table 6 describes the program lines which will complete the required derivatization reaction.

Table 6 Injector Program Lines

Line	Function	Parameters	Comment
1	DRAW	2 µl (AMOUNT) from Air (SOURCE)	Draw 2 µl from air into the needle capillary, to separate the mobile phase sitting in the capillary from the sample.
2	DRAW	1 µl (AMOUNT) from vial 1(SOURCE)	Draw 1µl from derivatization reagent from vial #1 in the autosampler tray into the needle capillary.
3	WASH	in vial 2 (VIAL), 1 time (Cycles)	Wash the needle tip in the wash vial #2.
4	DRAW	2 µl (AMOUNT) from sample (SOURCE)	Add 2 µl of the sample in the autosampler tray to the derivatization volume already in the needle capillary.
5	WASH	in vial 2 (VIAL), 1 time (CYCLE)	Wash the needle tip in the wash vial #2.
6	DRAW	1 µl (AMOUNT) from vial 1 (SOURCE)	Add 1 µl of derivatization reagent from vial #1 in the autosampler tray to the derivatization reagent and sample already in the needle capillary.
7	MIX	6 µl (AMOUNT) in seat (SOURCE), at 500 µl/min (SPEED), 8 times (REPEAT)	Mix 6 µl with a repetition of 8 times at a speed of 500 µl/minute in the seat.
8	WAIT	0.5 minutes (WAIT)	Wait for 0.5 minute for the mixture to completely react.
9	INJECT		Inject the mixture and start the analysis.

Saving the Method

1 Select the **Method** button [**F3**] in the **Analysis** screen.

2 Select the **Save As** button [**F8**].

3 Enter the method name as DERIV using the selection keys (also see "Specifying a Method Name" on page 42)

4 Press the **Done** button [**F6**] to save the method.

5 Press the **Esc** key to return to the **Analysis** screen.

The injector program is now part of the method called DERIV and can be started by selecting the **Start** button [**F8**] in the **Analysis** screen.

13
Maintaining the Control Module

This chapter shows the repair items.

Control Module Parts

The Controll Module's repair level is shown below.

Table 7 Control Module Parts

Item	Description	Part Number
	Control Module, replacement part including cable	G1323-67011
	Plastic Housing Kit, includes front, back and a clamp	5065-9984
	CAN cable Agilent module to control module	G1323-81600

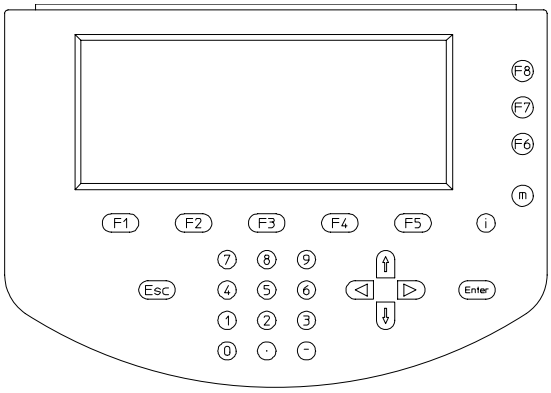


Figure 22 Control Module

A
Appendix

Safety Information

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Agilent Technologies assumes no liability for the customer's failure to comply with these requirements.

General

This is a Safety Class I instrument (provided with terminal for protective earthing) and has been manufactured and tested according to international safety standards.

Operation

Before applying power, comply with the installation section. Additionally the following must be observed.

Do not remove instrument covers when operating. Before the instrument is switched on, all protective earth terminals, extension cords, auto-transformers, and devices connected to it must be connected to a protective earth via a ground socket. Any interruption of the protective earth grounding will cause a potential shock hazard that could result in serious personal injury. Whenever it is likely that the protection has been impaired, the instrument must be made inoperative and be secured against any intended operation.

Make sure that only fuses with the required rated current and of the specified type (normal blow, time delay, and so on) are used for replacement. The use of repaired fuses and the short-circuiting of fuseholders must be avoided.

Some adjustments described in the manual, are made with power supplied to the instrument, and protective covers removed. Energy available at many points may, if contacted, result in personal injury.

Any adjustment, maintenance, and repair of the opened instrument under voltage should be avoided as much as possible. When inevitable, this should be carried out by a skilled person who is aware of the hazard involved. Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present. Do not replace components with power cable connected.

Do not operate the instrument in the presence of flammable gases or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

Do not install substitute parts or make any unauthorized modification to the instrument.

Capacitors inside the instrument may still be charged, even though the instrument has been disconnected from its source of supply. Dangerous voltages, capable of causing serious personal injury, are present in this instrument. Use extreme caution when handling, testing and adjusting.

Safety Symbols

Table 8 shows safety symbols used on the instrument and in the manuals.

Table 8 Safety Symbols

Symbol	Description
	The apparatus is marked with this symbol when the user should refer to the instruction manual in order to protect the apparatus against damage.
	Indicates dangerous voltages.
	Indicates a protected ground terminal.
	Eye damage may result from directly viewing the light produced by the Xenon flash lamp used in this product. Always turn the xenon flash lamp off before removing it.

WARNING **A warning alerts you to situations that could cause physical injury or damage to the equipment. Do not proceed beyond a warning until you have fully understood and met the indicated conditions.**

CAUTION A caution alerts you to situations that could cause a possible loss of data. Do not proceed beyond a caution until you have fully understood and met the indicated conditions.

Radio Interference

Never use cables other than the ones supplied by Agilent Technologies to ensure proper functionality and compliance with safety or EMC regulations.

Test and Measurement

If test and measurement equipment is operated with equipment unscreened cables and/or used for measurements on open set-ups, the user has to assure that under operating conditions the radio interference limits are still met within the premises.

Agilent Technologies on Internet

For the latest information on products and services visit our worldwide web site on the Internet at:

http://www.agilent.com

Select “**Products**”- “**Chemical Analysis**”

A Appendix

Agilent Technologies on Internet

Index

C

D

E

F

G

H

I

K

L

U

V

W

X

Y

Z

www.agilent.com

In This Book

This book provides information about the control module and how to operate the Agilent 1200 Series modules and system for HPLC.

- The Agilent 1200 Series Control Module
- Working with the Control Module
- Using the Pump
- Using the Degasser
- Using the Autosampler
- Using the Manual Injection Valve
- Using the Detectors
- Using the Column Compartment
- Running an Isocratic Analysis
- Running a Gradient Analysis
- Running Multiple-Vial Analyses
- Running an Injector Program

Printed in Germany
02/2006

G1323-90010

Agilent Technologies