

Agilent 1100 Series Autosampler Thermostat

Reference Manual



Agilent Technologies

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WARNING

Warning Symbols Used In This Book



The apparatus is marked with
this symbol when the user
should refer to the instruction
manual in order to protect the
apparatus against damage.

Reference Manual

In This Book

This manual contains information about the Agilent 1100 Series thermostatted autosamplers. Information about the autosamplers can be found in the respective *Reference Manuals*. This supplemental manual describes only the parts of the autosamplers that are different from the standard versions. The manual describes the following:

- installing the thermostatted autosampler,
- theory of operation,
- troubleshooting the ALS thermostat,
- repair procedures for the ALS thermostat,
- parts and materials for autosampler and ALS thermostat.

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Theory of Operation

Theory of operation of mechanical hardware,
electronics, and instrument interfaces

Introduction to the Thermostatted Autosampler

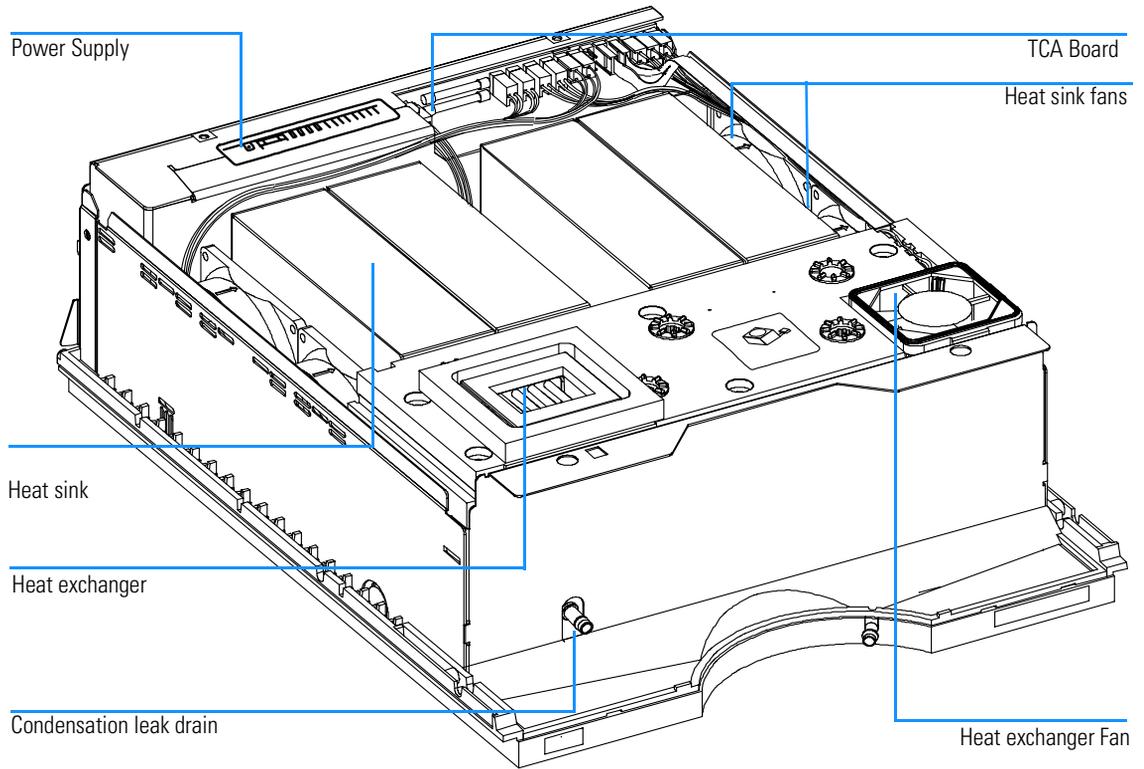
The Agilent 1100 Series thermostatted autosampler is designed for use with other modules of the Agilent 1100 Series LC system, with the HP 1050 Series, or with other LC systems if adequate remote control inputs and outputs are available. The thermostatted autosampler is controlled from the Agilent 1100 Series control module or from the Agilent ChemStation for LC systems.

The specially-designed thermostattable sample trays holds either 100 × 1.8 ml vials or two wellplates and 10 × 1.8 ml vials.

The ALS thermostat contains Peltier-controlled heat exchangers. A fan draws air from the area above the sample vial tray of the autosampler and is then blown through the fins of the cooling/heating module. There it is cooled or heated according to the temperature setting. The thermostatted air enters the autosampler through a recess underneath the specially-designed sample tray. The air is then distributed evenly through the sample tray ensuring effective temperature control, regardless of how many vials are in the tray.

In cooling mode condensation is generated on the cooled side of the Peltier elements. This condensed water is safely guided into the leak system.

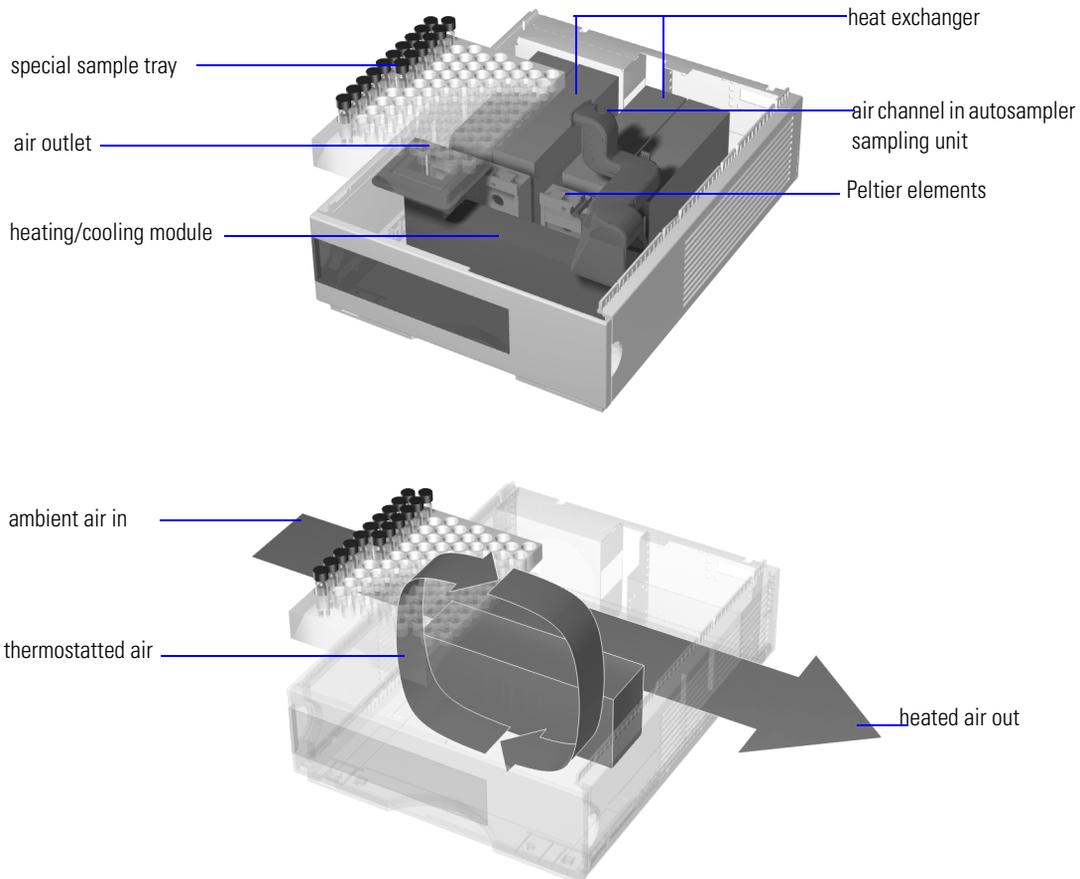
Figure 1 Overview of the ALS Thermostat



ALS Thermostat Operation

Figure 2

ALS Thermostat Principle



The thermostatted autosampler is equipped with a cooling/heating module which uses Peltier elements for efficient air cooling. When turned on the front side of the Peltier elements is heated/cooled according to the temperature setting. A fan draws air from the sample tray area and blows it through the channels of the heating/cooling module. The fan speed is determined according to the environmental conditions (e.g., ambient temperature, humidity). In the heating/cooling module the air reaches the temperature of the Peltier elements and this thermostatted air is blown

ALS Thermostat Operation

underneath the special sample tray where it is evenly distributed and streams back into the sample tray area. From there it is again drawn into the ALS thermostat. This “recycle” mode assures a very efficient cooling/heating of the sample vials.

In cooling mode the opposite side of the Peltier element will become very hot and to maintain the performance of the elements they have to be cooled down. This is done with large heat exchangers in the back of the ALS thermostat. Four fans blow air from left to right through the instrument to remove the heated air. The fan speed is controlled according to the temperature of the Peltier elements.

During cooling condensation will appear in the heating/cooling module. The condensed water will be guided out of the ALS thermostat.

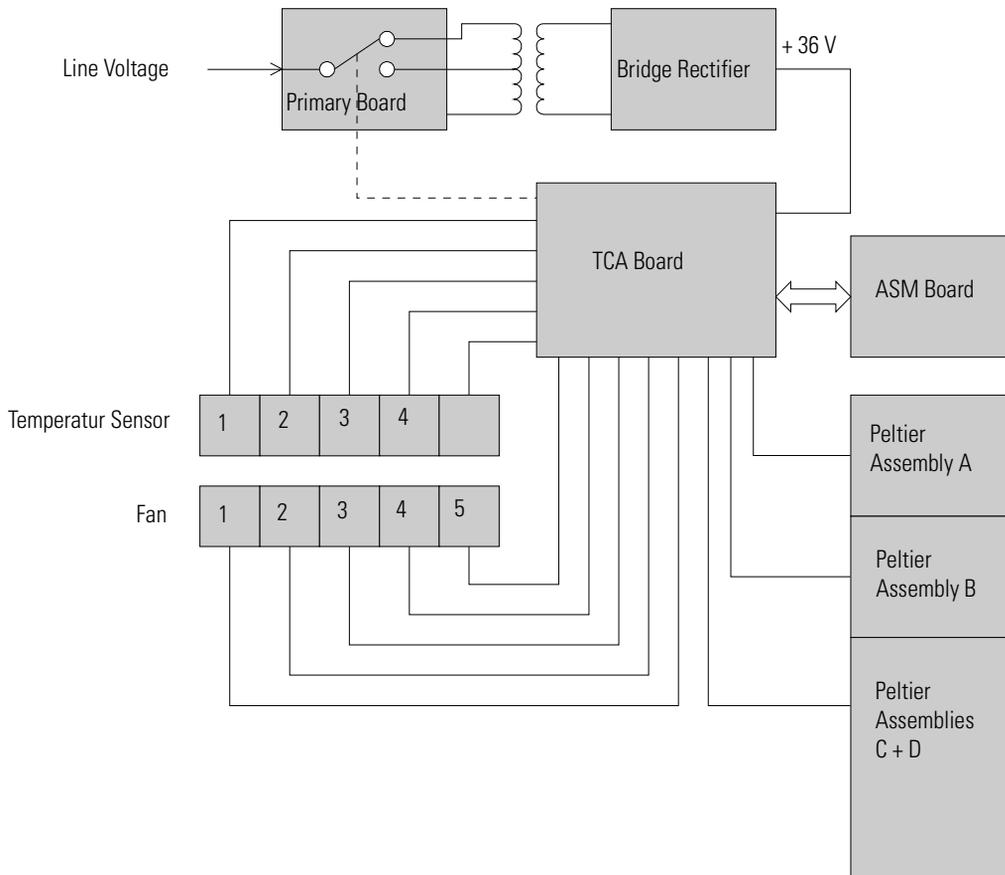
ALS Thermostat Control and Electronics

The ASM board of the autosampler module provides all control signals for the ALS thermostat (e.g., temperature setting) and receives the sensor signals from the temperature and fan sensors.

The TCA board controls the internal assemblies in the ALS thermostat. This chapter describes the electronics of the TCA board.

Figure 3

Block Diagram ALS Thermostat Electronics



Temperature Controlled Autosampler Board (TCA)

The board controls all information and activities of all assemblies within the ALS thermostat. The operator enters parameters, changes modes and controls the module through the control module or Agilent ChemStation, that is connected to the autosampler module. Autosampler and ALS thermostat are connected via a control cable for signal exchange.

Step Down Switcher

The four Peltier assemblies (A to D) are driven by synchronous step down switching regulators. Switcher 1 and 2 receive their power (+36V) from the ALS thermostat internal power supply. Switcher 3 receives its power (+24V) from the autosampler module via the interface cable. The maximum power consumption for all Peltier assemblies is approximately 180 Watts in cooling mode and 120 Watts in heating mode.

Regulators

The fans are equipped with hall sensors that allow to determination of the actual speed of the fans. The speed of the four heat sink fans is variable and will be set according to the actual temperature at the heat sink side of the Peltier assemblies. The heat exchanger fan is always running at highest speed. the speed will be reduced to a minimum when the sample tray is removed from the autosampler.

Auto Range

When the ALS thermostat power cable is connected to the module the auto range circuits checks the connected supply voltage. Default setting is a connection to a 220-240V supply. If the non-regulated 36V is below a certain limit the auto range circuit activates a switch on the primary board in the power supply and switches to 100-120V operation.

Multiplexer

The ALS thermostat is equipped with four digital temperature sensors for temperature control and diagnostics. Four are used to check the temperature on both sides of the Peltier elements. The temperature sensor signals and the signals from the hall sensors in the five fans are the input signals for the

Temperature Controlled Autosampler Board (TCA)

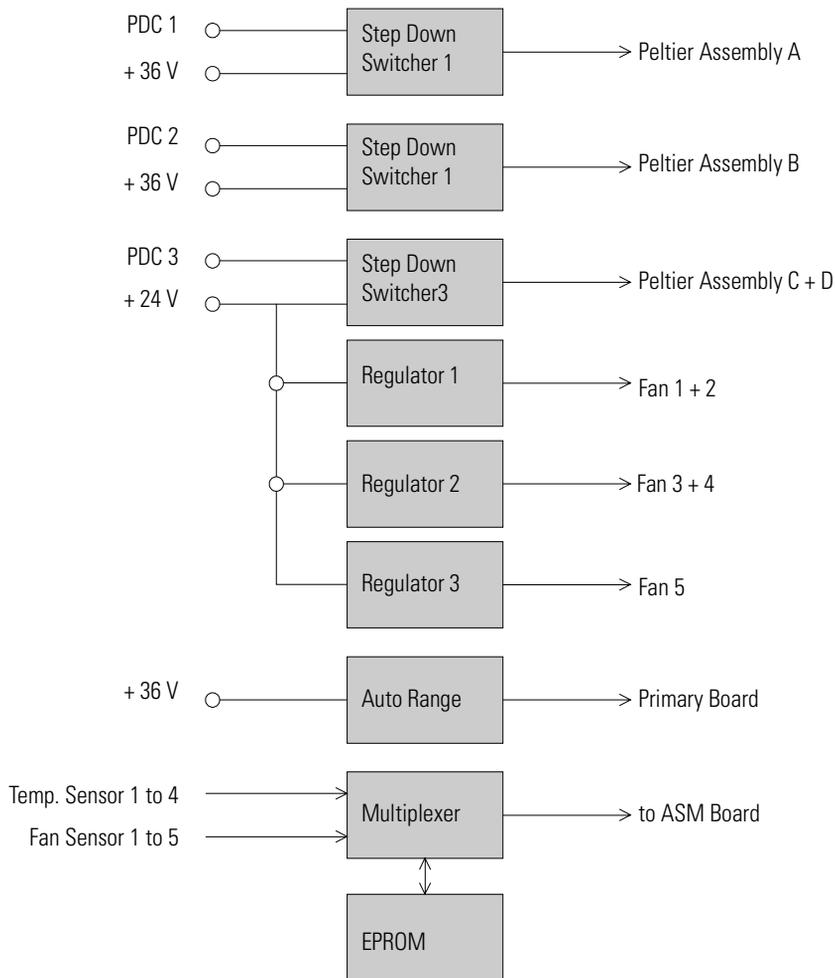
multiplexer. The output of the multiplexer is connected to the autosampler main board via the 26 pin autosampler to ALS thermostat cable. The autosampler firmware checks the signals for correctness and initiates all needed activities.

EPROM

The EPROM stores all relevant data for the ALS Thermostat (e.g., serial number, board revision, etc.). This data are pre-set at the factory.

Figure 4

Block Diagram TCA Board

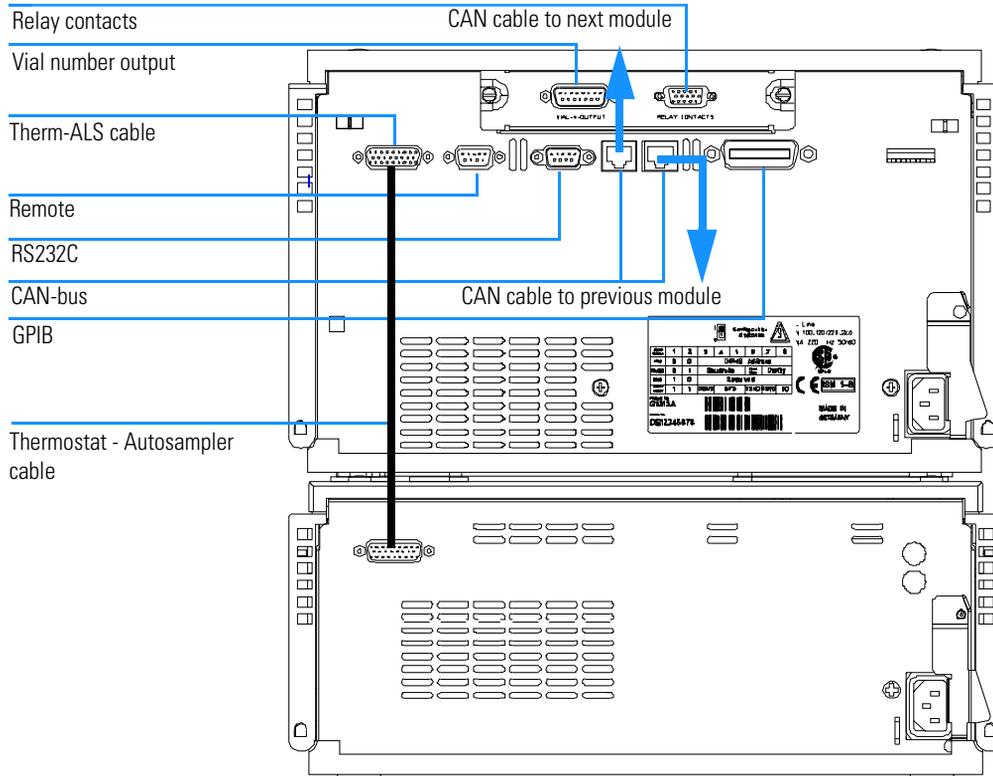


Electrical Connections

WARNING

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

Figure 5 Electrical Connections



- The GPIB connector is used to connect the thermostatted autosampler with a computer. The address and control switch module next to the GPIB connector determines the GPIB address of your thermostatted autosampler. The switches are preset to a default address (see Autosampler Reference Manual) and this is recognized immediately after power on.

Electrical Connections

- The CAN bus is a serial bus with high-speed data transfer. The two connectors for the CAN bus are used for internal Agilent 1100 Series module data transfer and synchronization.
- The REMOTE connector may be used in combination with other analytical instruments from Agilent Technologies if you want to use features such as common shut down, prepare, and so on.
- The RS-232 connector may be used to control the thermostatted autosampler from a computer through an RS-232 connection, using appropriate software. This connector needs to be activated by the configuration switch module next to the GPIB connector. The software needs the appropriate drivers to support this communication. See your software documentation for further information.
- The Thermostat-Autosampler connection is used for control signal transfer and synchronization of the two modules. The cable must be installed for operation of the ALS thermostat.

WARNING

DO NOT disconnect or reconnect the autosampler to ALS thermostat cable when the power cords are connected to either of the two modules. This will damage the electronics of the modules.

- The power input socket accepts a line voltage of 100–120 or 220–240 volts AC \pm 10 % with a line frequency of 50 or 60 Hz. Maximum power consumption of the autosampler module is 300 Watts (Volt-Amps). Maximum power consumption of the ALS thermostat module is 260 Watts (Volt-Amps). There are no voltage selectors on your thermostatted autosampler because the power supplies have automatic selection capability. The autosampler module has no externally accessible fuses, because automatic electronic fuses are implemented in the power supply. The power supply of the ALS thermostat has two externally accessible fuses. The security lever at the power input socket prevents removal of the thermostatted autosampler cover when line power is still connected.
- The interface board slot is used for external contacts, BCD output and for future use.

Installing the G1330B Thermostat

Site requirements and installation of the G1330B
thermostat

Installing the G1330B Thermostat

Site Requirements

A suitable site environment is important to ensure optimum performance of the thermostatted autosamplers.

Power Consideration

The thermostatted autosamplers comprises two modules, the autosampler module (G1329A, G1389A, G1367A, or G2260A) and the thermostat module (G1330B Therm). Both modules have a separate power supply and a power plug for the line connections. The two modules are connected by a control cable and both are turned on by the autosampler module.

The thermostatted autosampler power supplies have automatic voltage selectors (see Table 1). Consequently there are no voltage selectors in the rear of the two thermostatted autosampler modules. The autosampler module has no externally accessible fuses, because automatic electronic fuses are implemented in its power supply. The ALS thermostat power supply has two externally accessible fuses.

WARNING

To disconnect the thermostatted autosampler from line power, unplug the power cord from the autosampler and the thermostat. The power supplies still use some power, even if the power switch on the front panel is turned off. Please make sure that it is always possible to access the power plug.

WARNING

Shock hazard or damage of your instrumentation can result if the devices are connected to a line voltage higher than specified.

Power Cords

Your thermostatted autosampler modules are delivered with power cords which match the wall socket of your particular country or region. The plug

Site Requirements

on the power cords which connect to the rear of the two instrument is identical for all types of power cord.

WARNING

Never operate your instrumentation from a power outlet that has no ground connection. Never use a power cord other than the power cord designed for your region.

Bench Space

The thermostatted autosampler dimensions and weight (see Table 1) allow the instrument to be placed on almost any laboratory bench. The instrument requires an additional 25 cm (10 inches) of space on either side for the circulation of air, and approximately 8 cm (3.1 inches) at the rear for electrical connections. Ensure the thermostatted autosampler is installed in a level position.

If a complete Agilent 1100 Series system is to be installed on the bench, make sure that the bench is designed to carry the weight of all the modules. For a complete system including the thermostatted autosampler it is recommended to position the modules in two stacks, see “Optimizing the Stack Configuration” on page 25. Make sure that in this configuration there is 25 cm (10 inches) space on either side of the thermostatted autosampler for the circulation of air.

Environment

Your thermostatted autosampler modules will work at ambient temperatures and relative humidity as described in Table 1.

CAUTION

Do not store, ship or use your thermostatted autosampler under conditions where temperature fluctuations may cause condensation within the thermostatted autosampler electronics. Condensation will damage the system electronics. If your thermostatted autosampler was shipped in cold weather, leave it in its box, and allow it to warm up slowly to room temperature to avoid condensation.

Table 1 **Physical Specifications - Thermostatted Autosampler**

Type	Specification	Comments
Thermostat		
Weight	20.7 kg (45.6 lbs)	
Dimensions (height × width × depth)	140 × 345 × 435 mm (5.5 × 13.5 × 17 inches)	
Line voltage	100 – 120 or 220 – 240 VAC, ± 10 %	Automatic selection
Line frequency	50 or 60 Hz, ± 5 %	
Power consumption	Autosampler: 300 VA ALS Thermostat: 260 VA	Maximum Maximum
Ambient operating temperature	4 – 40 °C (41 – 131 °F)	see WARNING on page 22
Ambient non-operating temperature	-40 – 70 °C (-4 – 158 °F)	
Humidity	< 95 %, at 25 – 40 °C (77 – 104 °F)	Non-condensing;
Operating Altitude	Up to 2000 m (6500 ft)	
Non-operating altitude	Up to 4600 m (14950 ft)	For storing the thermostatted autosampler
Safety standards: IEC, CSA, UL, EN	Installation Category II, Pollution Degree 2	

WARNING

Using the thermostatted autosampler at environmental temperatures higher than 50 °C (122 °F) may cause the rear panel to become hot.

Unpacking the Autosampler

CAUTION

If you intend to ship or transport the thermostatted autosampler, always park the transport assembly of the autosampler module before shipment (see “Transporting the Autosampler” in the corresponding manual).

Damaged Packaging

The two modules of the thermostatted autosampler are shipped in separate boxes. Upon receipt of your thermostatted autosampler, inspect the shipping containers for any signs of damage. If the containers or cushioning material are damaged, save them until the contents have been checked for completeness and the thermostatted autosampler has been mechanically and electrically checked. If the shipping container or cushioning material is damaged, notify the carrier and save the shipping material for the carriers inspection.

CAUTION

If there are signs of damage to the thermostatted autosampler, please do not attempt to install the thermostatted autosampler.

Delivery Checklist

Unpack the two boxes of the thermostatted autosampler. Ensure all parts and materials have been delivered with the autosampler and the ALS thermostat. The delivery checklist are shown in Table 2. Please report missing or damaged parts to your local Agilent Technologies sales and service office.

If the thermostatted autosampler was ordered as an upgrade (G1395A) to an existing autosampler, the shipment will also contain the required software upgrades for your Agilent ChemStation.

Table 2**G1330B Thermostat Checklist**

Description	Quantity	Part Number
ALS Thermostat G1330B	1	
Power cable	1	as ordered
Accessory kit (Table 3)	1	G1330-68705

Table 3**ALS Thermostat Accessory Kit Contents G1330-68705**

Description	Part Number
Waste Tube	5063-6527
Waste Tube Assembly	G1330-67300

Optimizing the Stack Configuration

If your thermostatted autosampler is part of a system, you can ensure optimum performance by installing the thermostatted autosampler in the stack in the position shown in Figure 6 and Figure 7. This configuration optimizes the system flow path, ensuring minimum delay volume.

Figure 6 Recommended Stack Configuration (Front View)

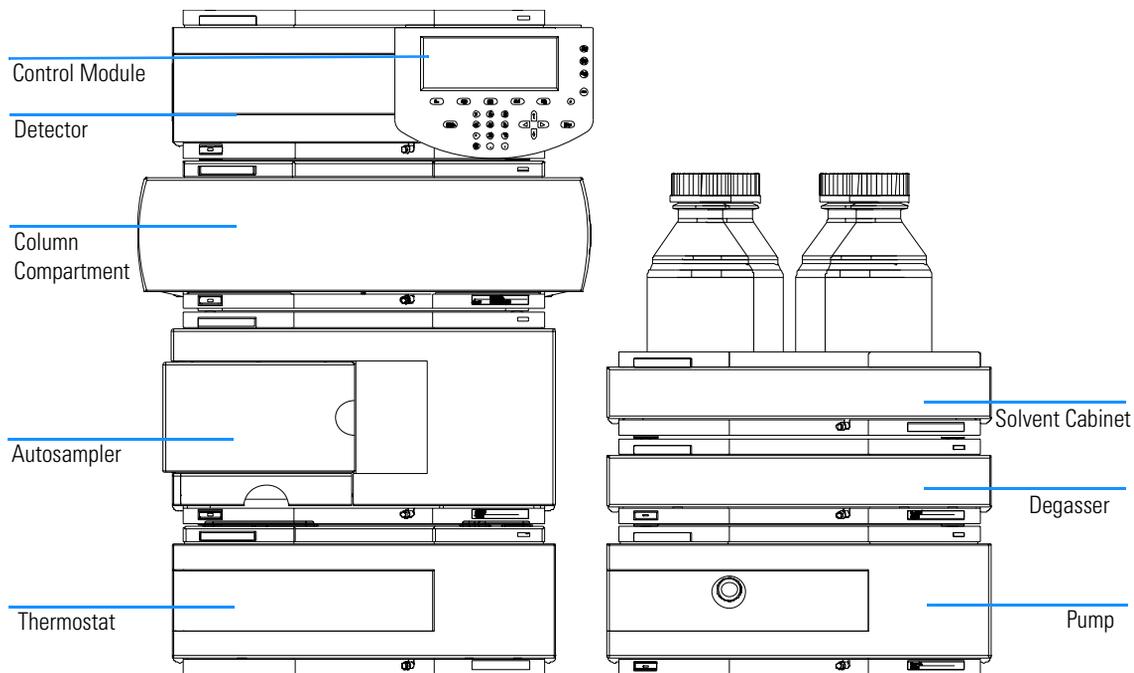
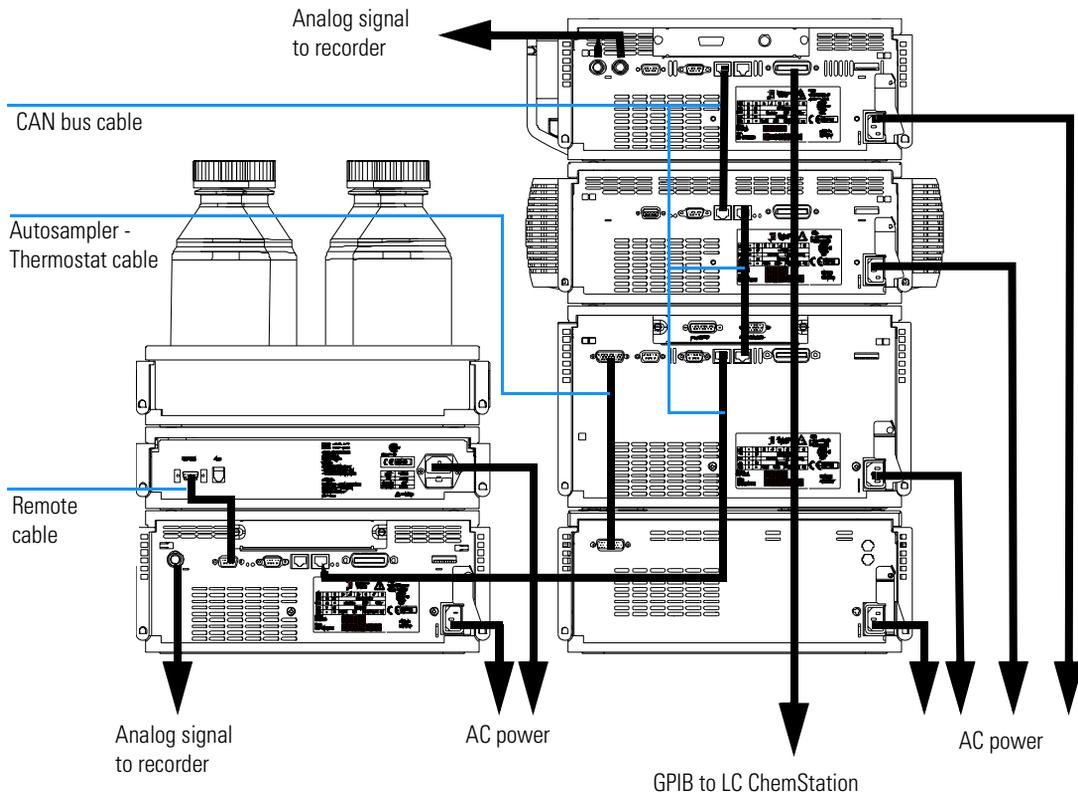


Figure 7 Recommended Stack Configuration (Rear View)



Controller Requirements

Agilent 1100 Series control module and Agilent ChemStation must have the latest revision firmware/software loaded to allow optimum operation with the thermostatable autosamplers. Older revisions might not recognize or have full functionality with the thermostatable autosampler.

Control Module Firmware requirements

The control module requires firmware revision A.01.30 or higher to control the thermostatted autosampler. Previous firmware revisions of the control module will not run with the thermostatted autosampler. If the control module was shipped together with the thermostatted autosampler the control module firmware does not require updating. The firmware update must be done with a PCMCIA card that has the newest revision loaded. The firmware is not part of the shipment of the thermostatted autosampler. Contact your local Agilent Technologies sales and service office for the firmware update of the control module. For the update procedure see “Stage 7: Update of Control Module Firmware” on page 37.

Agilent ChemStation Software requirements

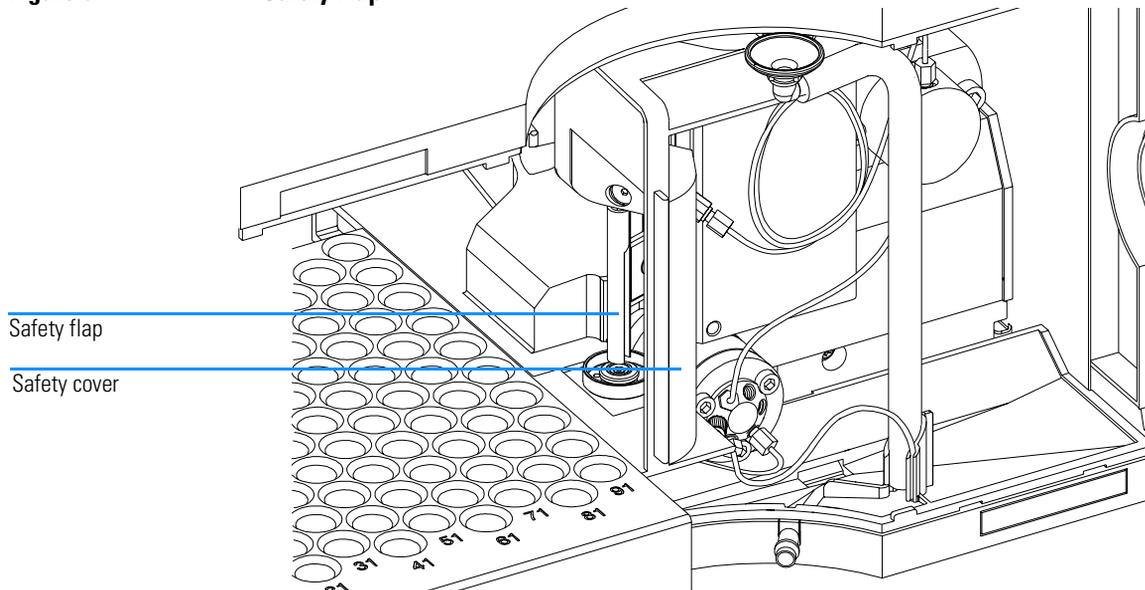
To control the thermostatted autosampler from a PC, the Agilent ChemStation software version A.04.03, or A.05.02beta, or A.05.02 or higher is required. These software revision might however not support all ALS modules. The thermostatted autosampler will not run with any previous version of the Agilent ChemStation software. The software updates are part of the thermostatted autosampler shipment. For the update procedure see “Stage 8: Update of the Agilent ChemStation Software” on page 38.

Installing the G1330B Thermostat

WARNING

To avoid personal injury, keep fingers away from the needle area during thermostatted autosampler operation. Do not bend the safety flap away from its position, or attempt to remove the safety cover (see Figure 8). Do not attempt to insert or remove a vial from the gripper when the gripper is positioned below the needle.

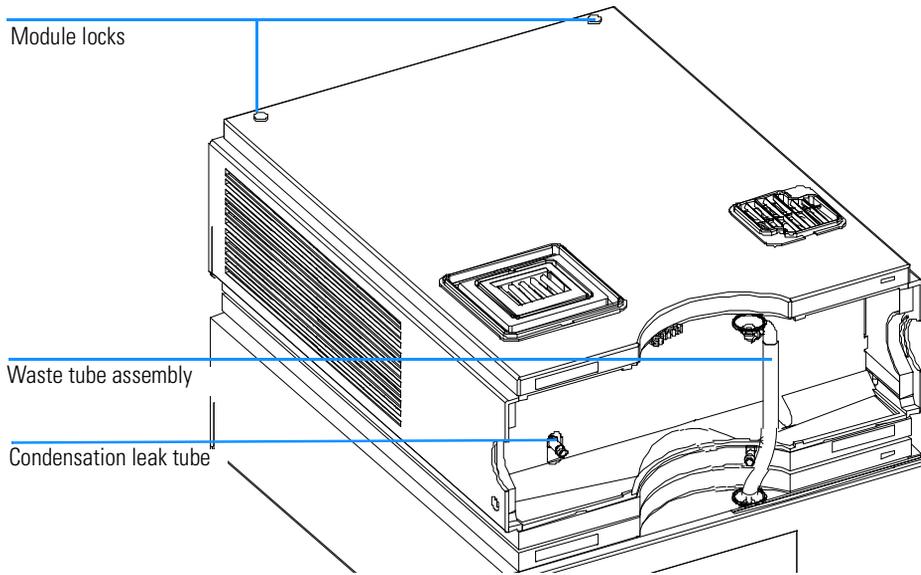
Figure 8 Safety Flap.



Stage 1: Preparing the ALS Thermostat and Autosampler

- 1 Place the ALS thermostat on the bench or in the stack.
- 2 Remove the front cover. Press the two snap fasteners on the sides of the cover and move it away.
- 3 If the ALS thermostat is located on top of another Agilent 1100 Series Module place the waste tube assembly into the top cover of the ALS thermostat and locate the other end in the waste funnel of the module beneath.

Figure 9 Preparation of the ALS Thermostat



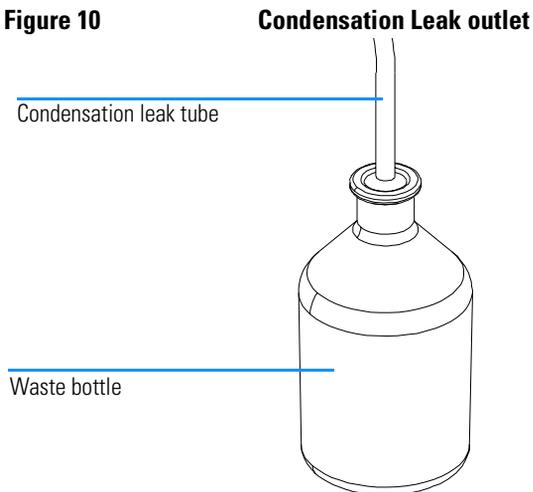
- 4 Connect the condensation leak tube to the main waste exit of the ALS thermostat and place into an appropriate vessel. It is possible to either let the condensation leak tubing exit the module at the front or at the left side of the module. Make sure that the leak tube is fully fixed on the outlet.

WARNING

Make sure that the condensation tube is always above the liquid level in the vessel. If the tube is located in liquid the condensed water cannot flow out of the tube and the outlet is blocked. Any further condensation will then remain in the instrument. This may damage the instruments electronics.

Installing the G1330B Thermostat
Installing the G1330B Thermostat

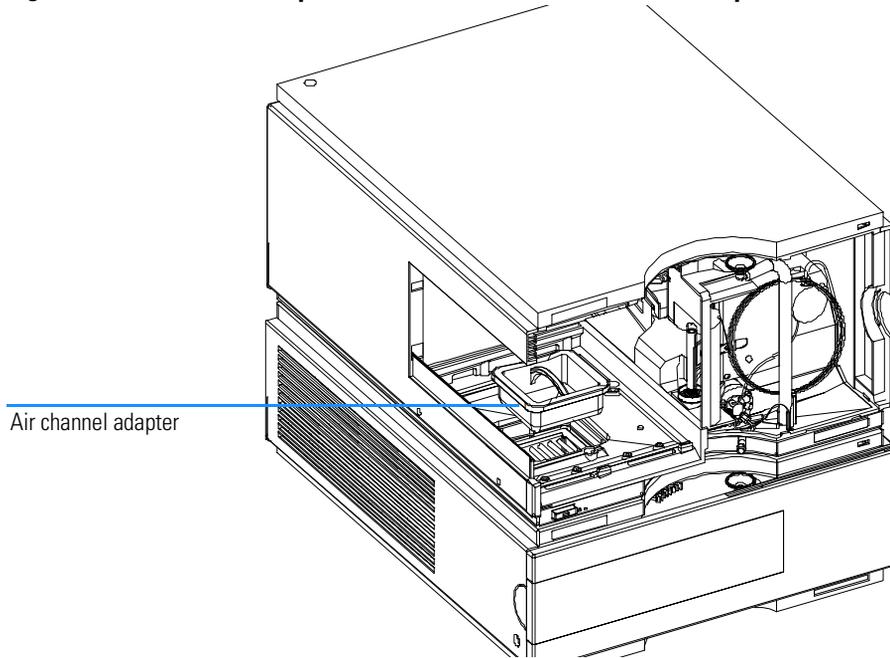
Figure 10



- 5** Install the front cover of the ALS thermostat.
- 6** Place the autosampler module on top of the ALS thermostat. Make sure that the autosampler is correctly engaged in the ALS thermostat locks.
- 7** Place the air channel adapter into the autosampler tray base. Make sure the adapter is fully pressed down. This assures that the cold airstream from the ALS thermostat is correctly guided to the tray area of the autosampler.
- 8** If there is no Agilent 1100 Series module located beneath the ALS thermostat connect the waste tube to the central waste exit of the autosampler and place in a waste vessel.

Figure 11

Preparation of ALS Thermostat and Autosampler



Stage 2: Power Cable and Interface Cable Connection

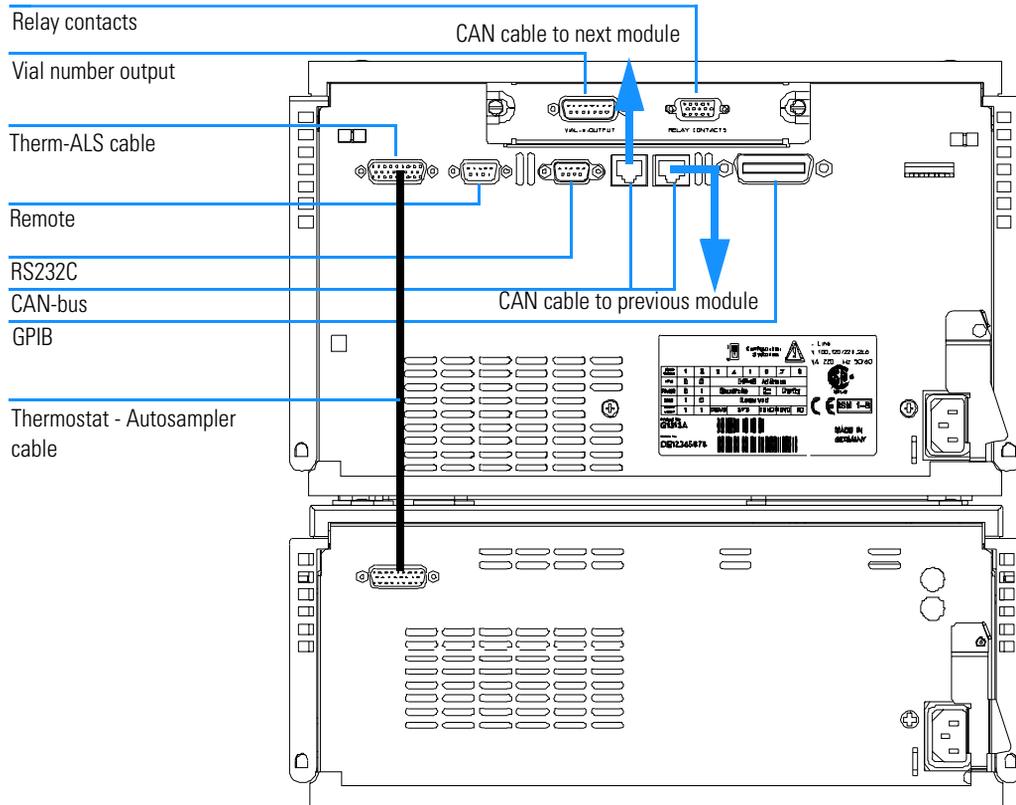
- 1 Ensure the power switch on the front of the autosampler is OFF and the power cables are disconnected.
- 2 Connect the cable between the autosampler and the ALS thermostat, see Figure 5.

WARNING

Do not disconnect or reconnect the autosampler to ALS thermostat cable when the power cords are connected to either of the two modules. This will damage the electronics of the modules.

- 3 Move the safety lever at the rear of the two modules to the right position, see Figure 5.
- 4 Connect the power cables to the power connectors.
- 5 Connect the CAN interface cables to other modules in the system (see Figure 7 and Figure 13).

Figure 13 Cable Connections.



Stage 3: Flow Connections

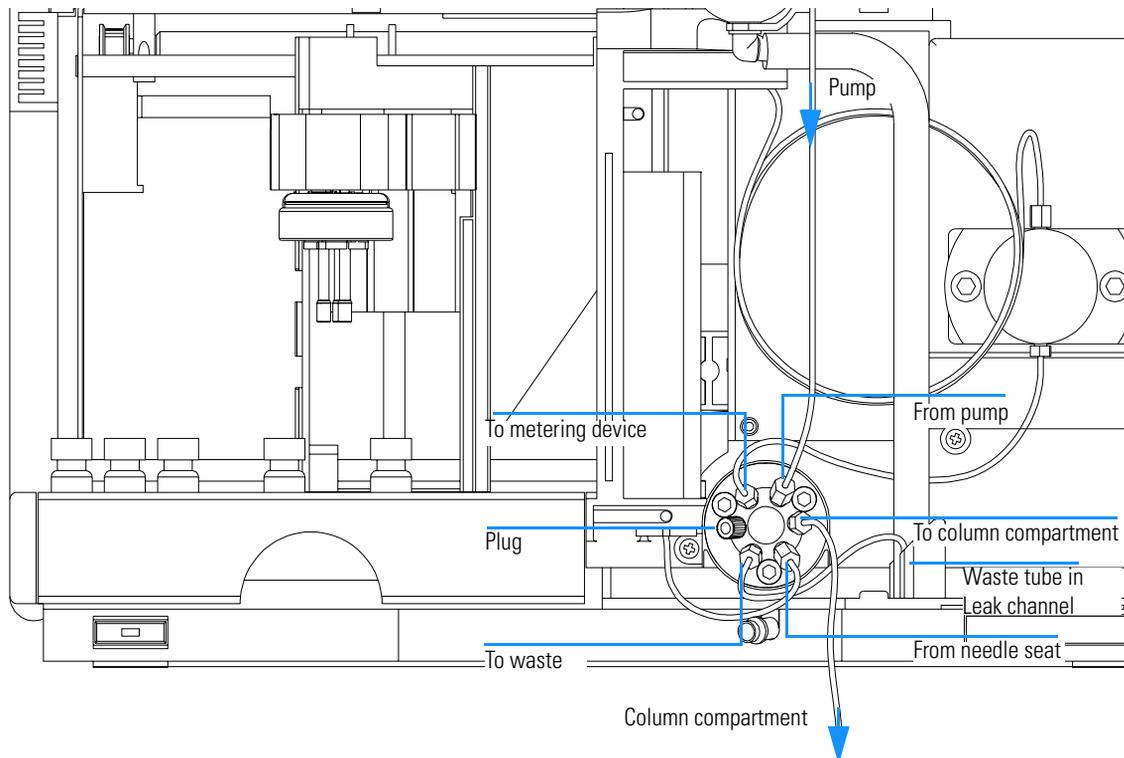
WARNING

When opening capillary or tube fittings, solvents may leak out. Please observe appropriate safety procedures (for example, goggles, safety gloves and protective clothing) as described in the material handling and safety data sheet supplied by the solvent vendor, especially when toxic or hazardous solvents are used.

Installing the G1330B Thermostat
Installing the G1330B Thermostat

- 1 Connect the pump outlet capillary to port 1 of the injection valve.
- 2 Connect column-compartment inlet capillary to port 6 of the injection valve.
- 3 Ensure that the waste tube is positioned inside the leak channel.

Figure 14 **Hydraulic Connections**

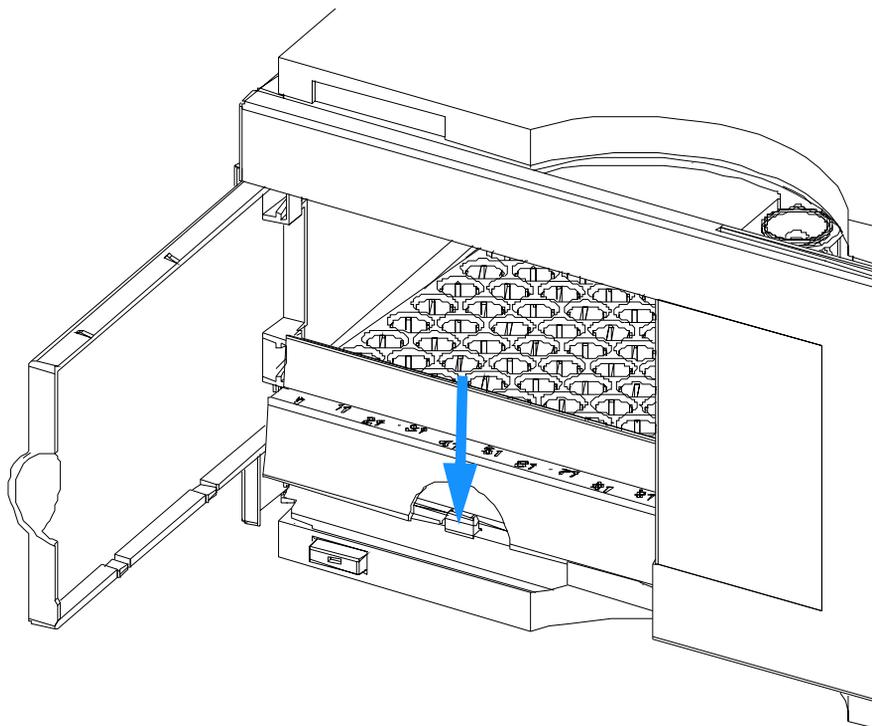


Stage 4: Installing the Sample Tray

- 1 Load the sample tray with sample vials as required.
- 2 Slide the sample tray into the thermostatted autosampler so that the rear of the sample tray is seated firmly against the rear of the sample-tray area.
- 3 Press the front of the sample tray down to secure the tray in the autosampler. If the tray pops out of its position the air channel adapter is not inserted correctly.

Figure 15

Installing the Sample Tray



Half-Tray Combinations

NOTE

In the thermostatted autosampler only the 100 vial tray is supported for temperature control of the vials. Nevertheless the half trays of the standard autosampler (G1313A) can be used in the thermostatted autosampler as well. However when these trays are installed cooling or heating of the vials in the tray will not work.

Half-trays can be installed in any combination enabling both 1.8 ml-and 6 ml-vials to be used simultaneously.

Numbering of Vial Positions

The standard 100-vial tray has vial positions 1 to 100. However, when using two half-trays, the numbering convention is slightly different. The vial positions of the right-hand half tray begin at position 101 as follows:

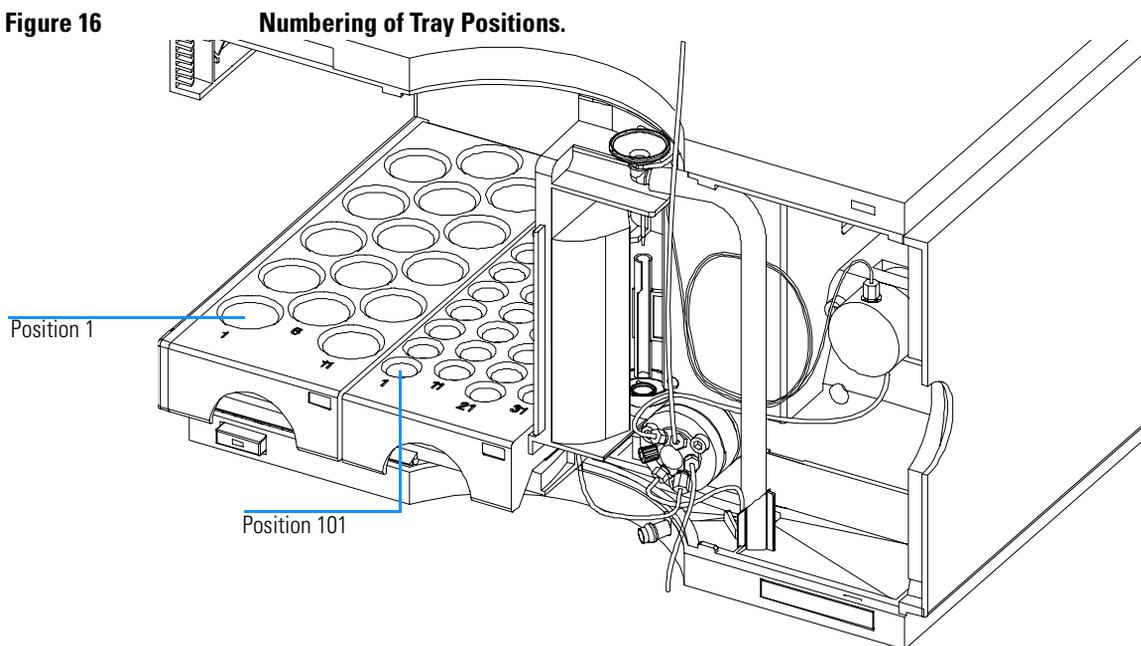
Left-hand 40-position tray: 1–40

Left-hand 15-position tray: 1–15

Right-hand 40-position tray: 101–140

Right-hand 15-position tray: 101–115

Figure 16

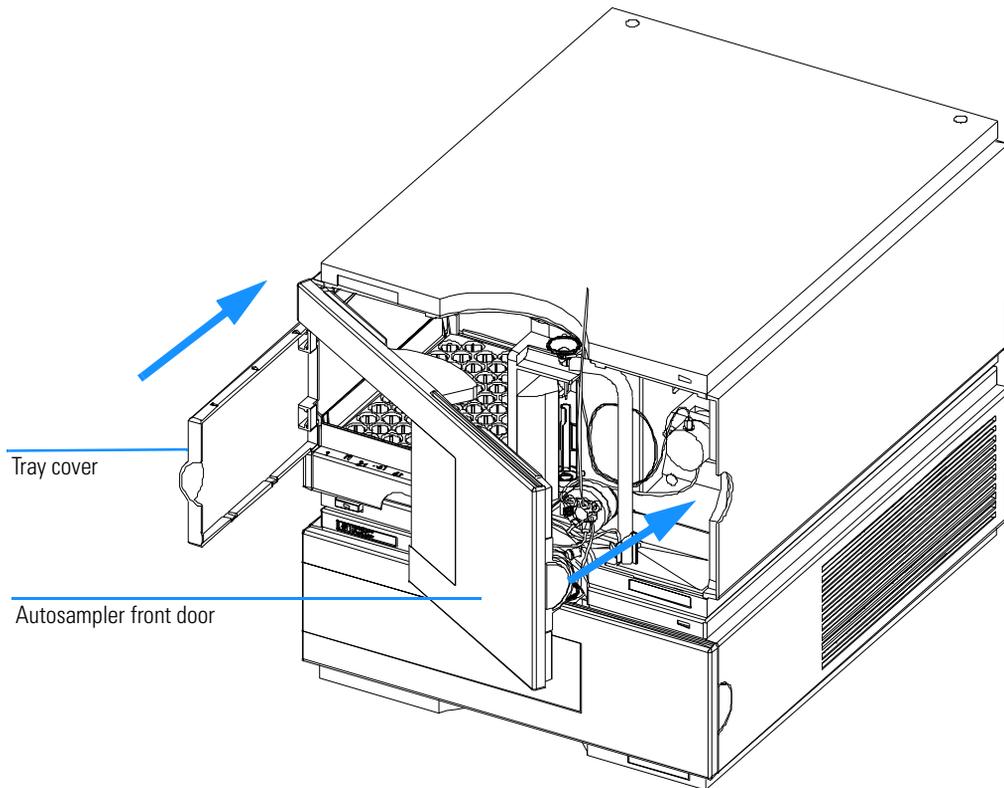


Stage 5: Installing Tray Cover and Front Cover

- 1 Fix the tray cover in the clips of the left autosampler cover side by sliding it in position. Do not close the tray cover.
- 2 Position the front cover in the top left corner of the autosampler and turn it towards the instrument. Press the stop fastener to secure it in the right side cover of the autosampler.
- 3 Close the tray cover.

Figure 17

Installation of Tray Cover and Front Cover of the Autosampler



Stage 6: Turning on the Thermostatted Autosampler

- 1 Depress the power switch to turn on the two modules of the thermostatted autosampler.

NOTE

The power switch stays depressed (1) and a green indicator lamp in the power switch is on when the thermostatted autosampler is turned on. When the line power switch stands out (Ø) and the green light is off, the thermostatted autosampler is turned off.

Stage 7: Update of Control Module Firmware

If the control module has a firmware revision A.01.30 or higher, you do not need to update the control module firmware.

Installing the G1330B Thermostat

If you have a control module version A.01.30 or lower, update the firmware as described.

- 1 Disconnect the control module before inserting the PC card.
- 2 Insert the PC card into the card slot of the control module.
- 3 Reconnect the control module for restarting it.
- 4 Press “System” (F5) - “Records” (F4). Highlight the LC-System line in the display using the up-down arrows.
- 5 Press “FW-Update” (F5).
- 6 Select the file for the firmware update (LCB202en.BIN).
- 7 Press “Execute” and select “Yes” to confirm loading of the new firmware. The control module reboots and loads the firmware indicated by (.) and (*) on the display. When finished with the update the control module reboots again.
- 8 Check that the correct firmware was loaded by pressing “System” (F5) - “Records” (F4).
- 9 Disconnect the control module and remove the PC card by pressing the card-eject button.

Stage 8: Update of the Agilent ChemStation Software

If you have a Agilent ChemStation software version A.05.02 or higher, you do not need to update your Agilent ChemStation software.

If you have a Agilent ChemStation software version A.05.01 or lower, please update your software as described.

Starting from revision A.04.01 or A.04.02 of the Agilent ChemStation

If you have ordered the G1395A Upgrade kit you will be provided with a A.04.02 and a A.05.01 update CD ROM, which gives you the choice of keeping your old major software version or updating to A.05.01 release.

CAUTION

If you decide to update to A.05.01, ensure that your PC hard- and software meets the requirements for A.05.01. A.05.01 requires Windows 95 or Windows NT 4.0 as operating system and a Pentium PC with a minimum of 24 MB (NT - systems require also GPIB board Agilent 82341C). Publication 12-5965-6805E gives detailed information about the PC requirements. The application note

can be obtained from the Internet (<http://www.chem.agilent.com/cag/literature/apglit.html>) or your local Agilent Technologies sales office.

- 1 If you decide to update your A.04.01 Agilent ChemStation to A.05.01, use the provided A.05.01 CD-ROM and follow the steps described in the Installing your ChemStation manual, provided as portable document format (PDF) file on the A.05.01 CD-ROM in the directory `MANUALS\INSTALL\LC`. If you do not already have the Adobe Acrobat reader installed, use the file `MANUALS\READER\AR32e30.EXE` to install the reader.
- 2 After you have updated your system, insert the 3.5" floppy labeled 'Driver update Disk (A.05.02 Beta)' and open a DOS prompt by selecting Start->RUN and typing `command`. At the DOS prompt type `A :` and press Enter and then `HPUPDATE` and press Enter only if your Agilent ChemStation is installed in the directory `C:\HPCHEM`. If your Agilent ChemStation is installed in a different directory, e.g. `D:\HPCHEM`, you need to type `HPUPDATE D:\HPCHEM` and press Enter.
- 1 If you decide to update to A.04.02, insert the A.04.02 CD-ROM and select `SETUP` on the CD-ROM using File Manager or Explorer. Select Yes to continue with the update.
- 2 After you have updated your system, insert the 3.5 inch floppy labeled Driver update Disk (A.04.03) and open a DOS prompt by selecting Start->RUN and typing `command`. At the DOS prompt type `A :` and press Enter and then `HPUPDATE` and press Enter only if your Agilent ChemStation is installed in the directory `C:\HPCHEM`. If your Agilent ChemStation is installed in a different directory, e.g. `D:\HPCHEM`, you need to type `HPUPDATE D:\HPCHEM` and press Enter.

Starting from revision A.05.01 of the Agilent ChemStation

If you already have the Agilent ChemStation A.05.01 installed, you only need to install the update to A.05.02 Beta. This update comprises only the driver for the thermostatted autosampler, no other changes are made.

- 1 Insert the 3.5" floppy labeled Driver update Disk (A.05.02 Beta) and open a DOS prompt by selecting Start->RUN and typing `command`. At the DOS prompt type `A :` and press Enter and then `HPUPDATE` and press Enter only if your Agilent ChemStation is installed in the directory `C:\HPCHEM`. If your Agilent ChemStation is installed in a different directory, e.g. `D:\HPCHEM`, you need to type `HPUPDATE D:\HPCHEM` and press Enter.

Transporting the Thermostatted Autosampler

When moving the thermostatted autosampler around the laboratory, make sure that any condensed water inside the thermostat is removed. Tilt the module to the front, so that the water inside the thermostat can safely flow into the leak funnel. Otherwise no special precautions are needed for the modules.

NOTE

The ALS thermostat is heavy (20.7 Kg, 45.6 lbs). Carry the module, by putting your hands under the side covers in a central position of the unit.

If the thermostatted autosampler needs to be shipped to another location via carrier, ensure:

- The two modules are shipped in separate boxes.
- The transport assembly of the autosampler is parked, see “Park Arm (Park Gripper)” in your respective *Reference Manual*.
- The vial tray is secured.

If the thermostatted autosampler is to be shipped to another location, the transport assembly of the autosampler must be moved to the park position to prevent mechanical damage should the shipping container be subjected to excessive shock. Also, ensure the vial tray is secured in place with suitable packaging, otherwise the tray may become loose and damage internal components.

Troubleshooting and Test Functions

The thermostatted autosampler's built-in troubleshooting and test functions

Troubleshooting and Test Functions

Status Indicators

The thermostatted autosampler is provided with two status indicators which indicate the operational state (prerun, run, and error states) of the instrument. Both are located on the autosampler module. The status indicators provide a quick visual check of the operation of the thermostatted autosampler (see “Status Indicators” on page 43).

Error Messages

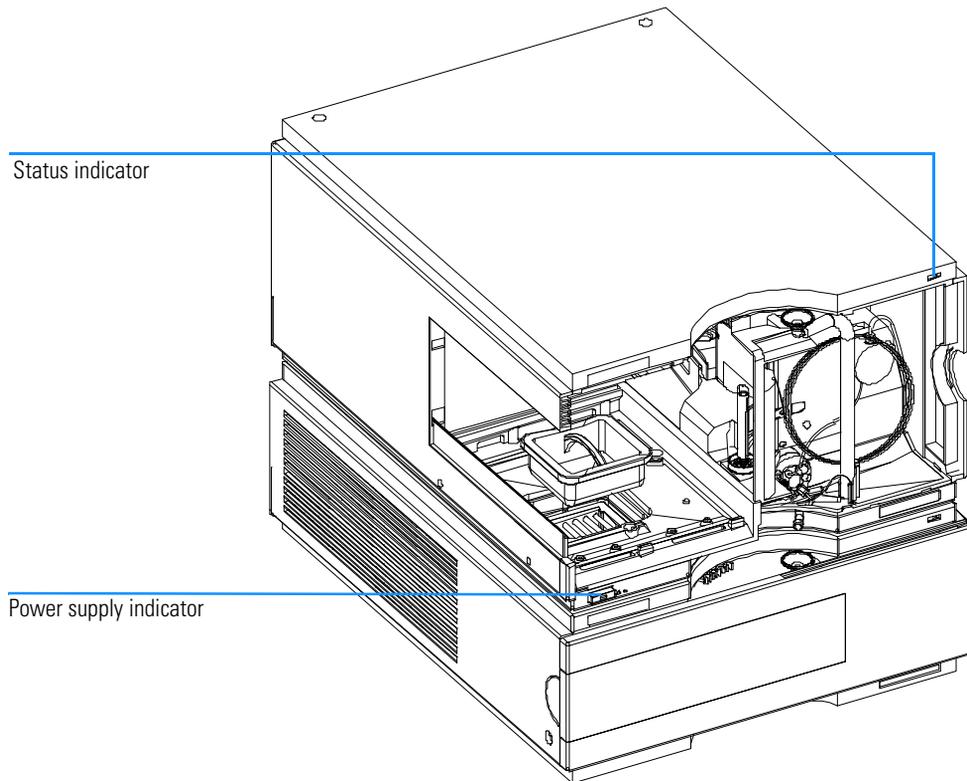
In the event of an electronic, mechanical or hydraulic failure, the thermostatted autosampler modules generate an error message in the user interface. For each message, a short description of the failure, a list of probable causes of the problem, and a list of suggested actions to fix the problem are provided. This chapter shows only the error messages that are generated for the ALS thermostat. For detailed description of the autosampler error messages see “Autosampler Error Messages” in your *corresponding Reference Manual*.

Status Indicators

Two status indicators are located on the front of the autosampler. The lower left indicates the power supply status, the upper right indicates the thermostatted autosampler status.

Figure 18

Location of Status Indicators



Power Supply Indicator

The power supply indicator is integrated into the main power switch. When the indicator is illuminated (*green*) the power is ON.

Instrument Status Indicator

The instrument status indicator indicates one of four possible instrument conditions:

- When the status indicator is *OFF* (and power switch light is on), the instrument is in a *prerun* condition, and is ready to begin an analysis.
- A *green* status indicator, indicates the instrument is performing an analysis (*run* mode).
- A *yellow* indicator indicates a *not-ready* condition. The instrument is in a not-ready state when it is waiting for a specific condition to be reached or completed (for example, front cover not installed), or while a self-test procedure is running.
- An *error* condition is indicated when the status indicator is *red*. An error condition indicates the instrument has detected an internal problem which affects correct operation of the instrument. Usually, an error condition requires attention (for example, leak, defective internal components). An error condition always interrupts the analysis.

ALS Thermostat Error Messages

Error messages are displayed in the user interface when an electronic failure occurs with the ALS thermostat module which requires attention. In the event of such a failure, the red status indicator at the front of the thermostatted autosampler is switched on, and an entry is written into the instrument log book.

This section describes the meaning of ALS thermostat module error messages, and provides information on probable causes and suggested actions how to recover from error conditions.

Fan Failed

Each fan in the ALS thermostat is equipped with a speed sensor, that allows monitoring and control the speed of the fans. If the sensor shows no signal, when the fan is activated, it is very likely that the fan is defective. The number in brackets indicates the fan position. Position numbers of the fans are as follows (seen from front of the ALS thermostat)

fan failed 1 - left side, fan in front position

fan failed 2 - left side, fan in back position

fan failed 3 - right side, fan in back position

fan failed 4 - right side, fan in front position

fan failed 5 - small cooler fan on top of cooling / heating module

Probable Causes:

- One of the 4 heat-sink fans is defective.
- The cooling heating module fan is defective

Suggested Actions:

- See Exchange ““Exchanging the Heatsink Fans” on page 65 or ““Exchanging Heat Exchanger Fan” on page 63.

Temperature Control Failed (1 - 4)

There are four Peltier elements build into the ALS thermostat for efficient cooling / heating. The electronics monitor the current through the Peltier elements. If the Peltier current is out of a specified limit the Peltier element is defective.

Probable Causes:

- One of the four peltier elements is defective.

Suggested Action:

- ❑ contact the Technologies service organization

Temperature Sensor Failed (1 - 4)

The ALS thermostat is equipped with four sensors to monitor the performance of the instrument. The sensors are connected to both sides of the Peltier elements for control of the cooling / heating efficiency. As the positioning of the sensor is critical to meet the performance requirements of the ALS thermostat the single sensors cannot be replaced separately.

Probable Causes:

- Temperature sensor is defective

Suggested Action:

- See ““Exchanging the Sensors” on page 67”.

Lost Contact to ALS Thermostat

The autosampler control electronics continuously checks whether the ALS thermostat is active or not.

Probable Causes:

- Bad cable connection between autosampler and ALS thermostat
- Cable between autosampler and thermostat module not connected
- Defective electronic board in autosampler or ALS thermostat

Suggested Actions:

- Check cable connection between autosampler and ALS thermostat
- Connect cable between autosampler and ALS thermostat
- Exchange ASM board in the autosampler
- Exchange TCA board in the thermostat
- contact the Agilent Technologies service organization

Power Fail for ALS Thermostat Module

The +36V that is generated in the ALS thermostat power supply is checked by the autosampler electronics. If this voltage is missing the error message will be generated.

Probable Causes:

- ALS thermostat module not connected to line power
- ALS thermostat module fuse(s) defective
- ALS Thermostat power supply defective

Suggested Actions:

- Check correct power line connection
- Check fuse(s) and replace if defective
- contact the Agilent Technologies service organization

Temperature out of Range

To protect the Peltier elements for damage their working range is limited to -3°C to 65°C. The error message is generated when at least one of the three Peltier elements exceeds this limit.

Probable Causes:

- The four main heat exchanger fans are not able to blow enough air through the ALS thermostat
- Ambient temperature too high / low

Suggested Actions:

- Clean the air filters and heat exchanger fins in the ALS thermostat. Switch off the thermostat and wait 10 min for the peltier elements to equilibrate
- Make sure that there is enough space on left and right side of the ALS thermostat and that the air channel inlets and outlets are not blocked
- Make sure that the ambient air temperature is within its specified limits (4°C to 55°C)

Bad Cooling / Heating Performance

When turned on the ALS thermostat Peltier elements are activated according to the given setpoint or to given setpoint change. The electronics check whether there actual temperature is moving in the correct direction (e.g., decreasing when cooled down).

Probable Causes:

- Peltier element(s) defective
- Peltier element(s) not connected or incorrectly connected (e.g., after repair or maintenance)
- The four main heat exchanger fans are not able to blow enough air through the ALS thermostat

Suggested Actions:

- Check connections of the Peltier elements
- Clean the air filters and heat exchanger fins in the ALS thermostat. Switch off the thermostat and wait 10 min for the peltier elements to equilibrate
- Make sure that there is enough space on left and right side of the ALS thermostat and that the air channel inlets and outlets are not blocked
- contact the Agilent Technologies service organization

Troubleshooting and Test Functions
Bad Cooling / Heating Performance

Repairing the ALS Thermostat Module

Instructions on repair procedures of the ALS
thermostat

Repairing the ALS Thermostat Module

Simple Repairs

The ALS thermostat is designed for easy repair.

Exchanging Internal Parts

Some repairs may require exchange of defective internal parts. Exchange of these parts requires removing the ALS thermostat from the stack, removing the covers, and disassembling the ALS thermostat. The security lever at the power input socket prevents that the Thermostat cover is taken off when line power is still connected.

WARNING

To prevent personal injury, the power cable must be removed from the ALS thermostat before opening the Thermostat cover. Do not connect the power cable to the ALS thermostat while the covers are removed.

CAUTION

Electronic boards and components are sensitive to electrostatic discharge (ESD). In order to prevent damage always use an ESD protection (for example, the ESD wrist strap from the accessory kit) when handling electronic boards and components.

WARNING

Do not disconnect or reconnect the autosampler to ALS thermostat cable when the power cords are connected to either of the two modules. This will damage the electronics of the modules.

Cleaning the Thermostat

The thermostat covers should be kept clean. Cleaning should be done with a soft cloth slightly dampened with water or a solution of water and a mild detergent. Do not use an excessively damp cloth that liquid can drip into the autosampler.

Using the ESD Strap

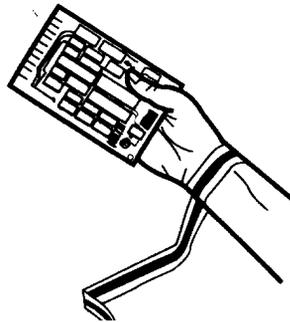
Electronic boards are sensitive to electrostatic discharge (ESD). In order to prevent damage, always use an ESD strap supplied in the autosampler accessory kit, when handling electronic boards and components.

Using the ESD Strap

- 1 Unwrap the first two folds of the band and wrap the exposed adhesive side firmly around your wrist.
- 2 Unroll the rest of the band and peel the liner from the copper foil at the opposite end.
- 3 Attach the copper foil to a convenient and exposed electrical ground.

Figure 19

Using the ESD Strap



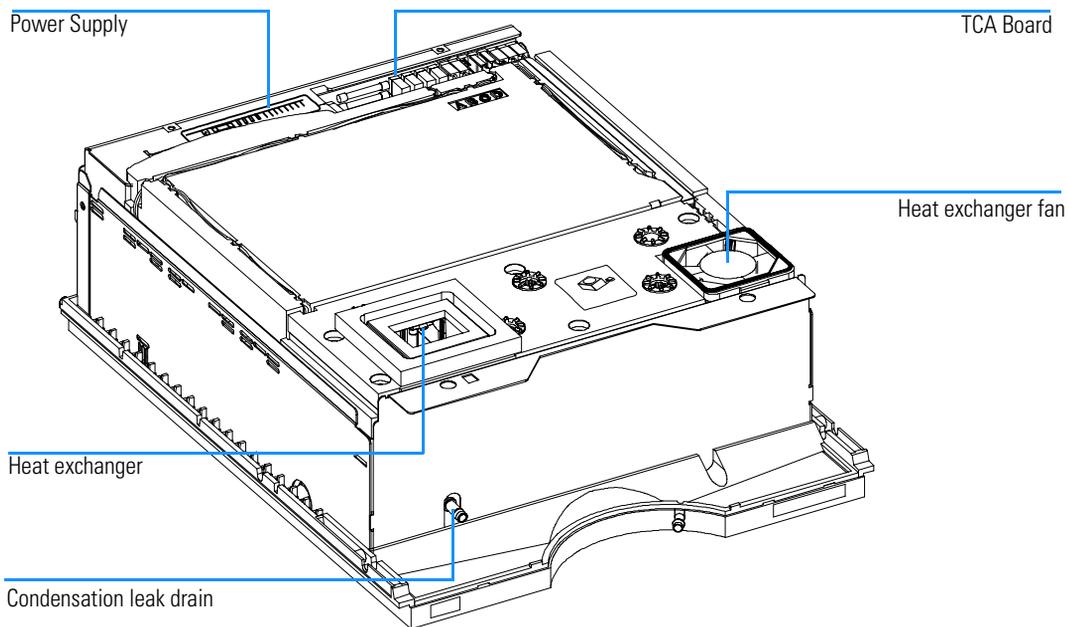
Overview

Overview

Figure 19 shows the main assemblies and their locations which can be repaired.

Figure 19

Main assemblies



Exchanging the Power Supply Fuses

Frequency	When defective
Tools required	Flat head screwdriver
Parts required	Fuses T2.5 A/250V (CSA, UL listed), 2110-0015

The fuse holders are located on the rear panel of the ALS thermostat.

- 1** Switch off the power switch at the front of the thermostatted autosampler.
- 2** Remove the power cable from the two modules.
- 3** Insert the flat head screwdriver in the fuse holder, slightly press and turn counter clockwise to release the fuse holder from the socket.
- 4** Pull the fuse holder out of the socket.
- 5** Remove the fuse from the fuse holder.
- 6** Insert a new fuse in the fuse holder.
- 7** Reinsert the fuse holder and fix with the screwdriver.
- 8** Reinsert the power cables.
- 9** Switch on the power switch.

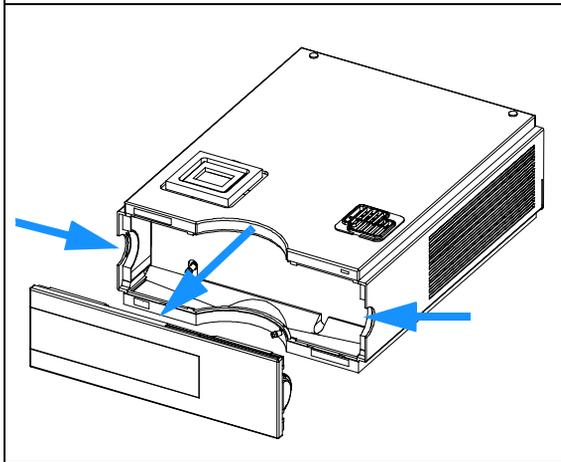
Removing the Top Cover and Foam

Tools required Screwdriver Pozidriv #1

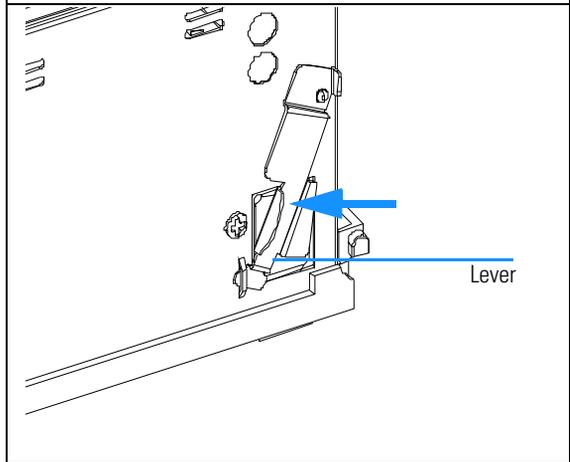
Preparations for this procedure Switch off ALS at the main power switch. Disconnect ALS and ALS thermostat power cords. Remove ALS to ALS thermostat cable, and remove thermostat from stack.

WARNING Do not disconnect or reconnect the autosampler to ALS thermostat cable when the power cords are connected to either of the two modules. This will damage the electronics of the modules.

1 Remove the front cover by pressing the both clip fasteners on both sides of the cover.



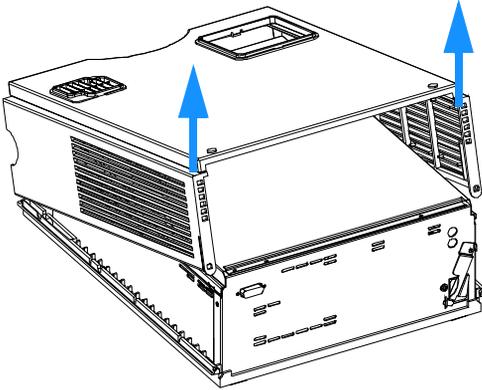
2 Move the lever towards the power socket.



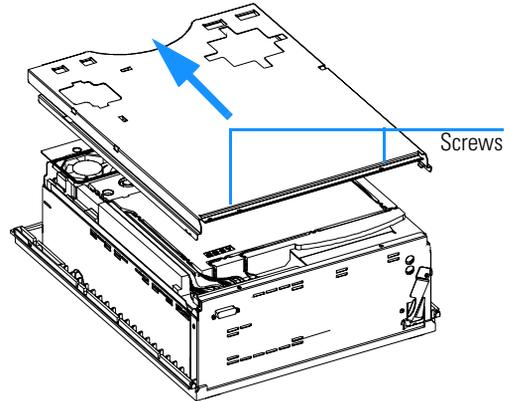
Repairing the ALS Thermostat Module

Removing the Top Cover and Foam

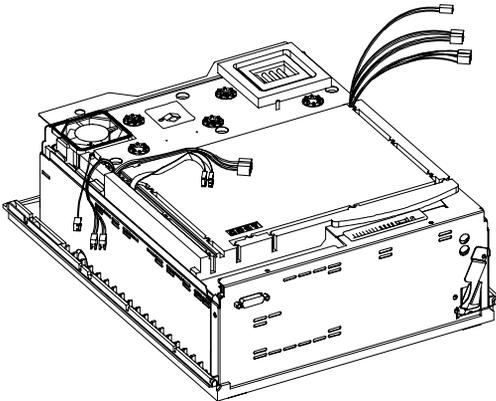
3 Lift the clips on both sides of the top cover (1). Remove the top cover (2).



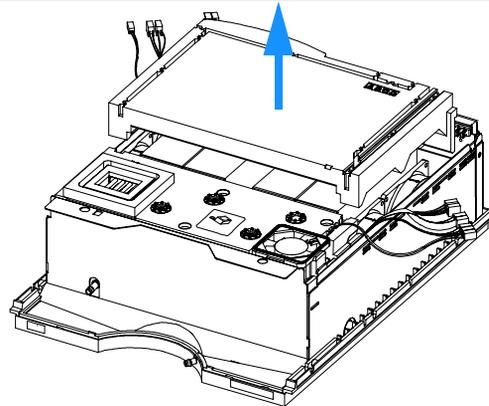
4 Unscrew the screws on the top plate and remove the plate by lifting its back first and then sliding to the front.



5 Unplug all wires at the TCA Board and remove them from top foam.



6 Remove the top foam.



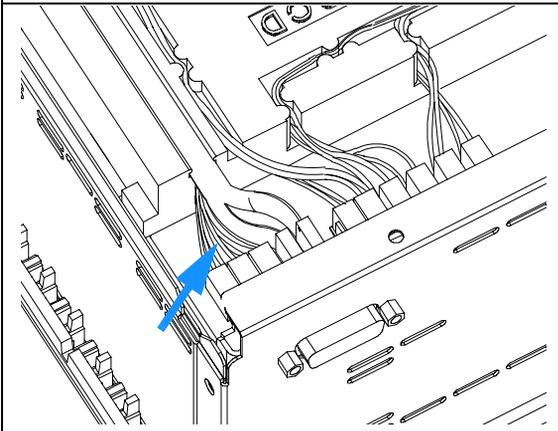
Exchanging Heat Exchanger Fan

When required When defective

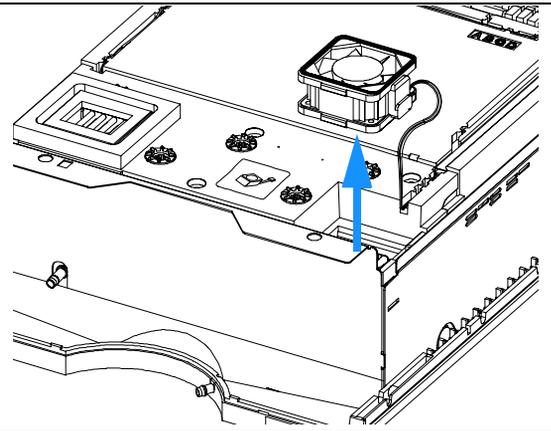
Preparations for this procedure Removing the Top Cover and Foam (see “Removing the Top Cover and Foam” on page 61) item 1 to 4.

Parts required Fan, PN 3160-1079

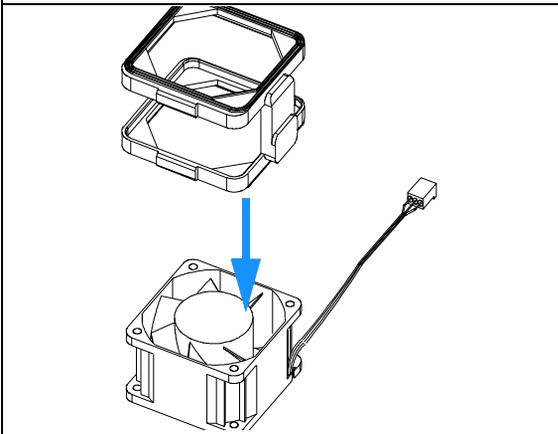
1 Unplug the connector at the TCA board and remove the wire from the Top Foam.



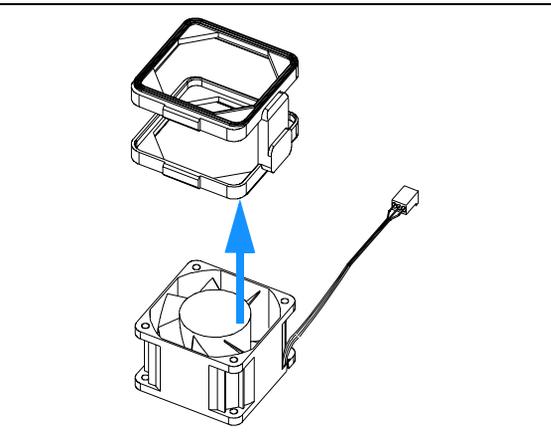
2 Carefully lift the Fan upwards.



3 Remove the Fan from the Fan Gasket.



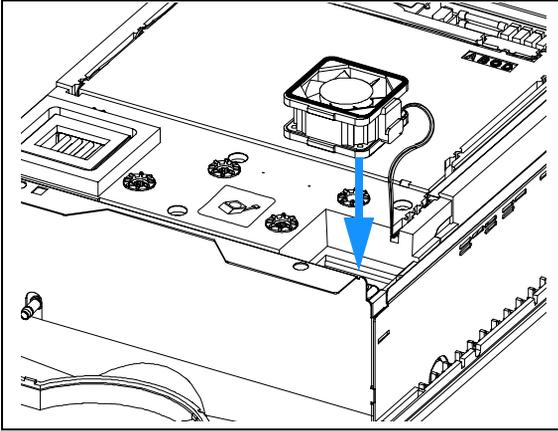
4 Insert the new Fan in the Fan Gasket. See arrow at the side of Fan for correct airflow direction.



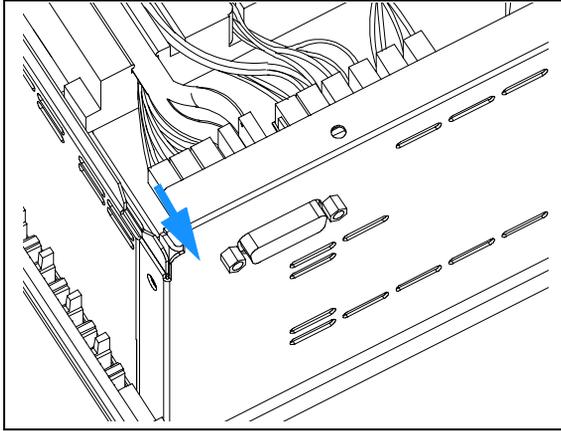
Repairing the ALS Thermostat Module

Exchanging Heat Exchanger Fan

5 Reinstall the fan and route the wire in the appropriate guide channel.



6 Reconnect the wire to the connector.



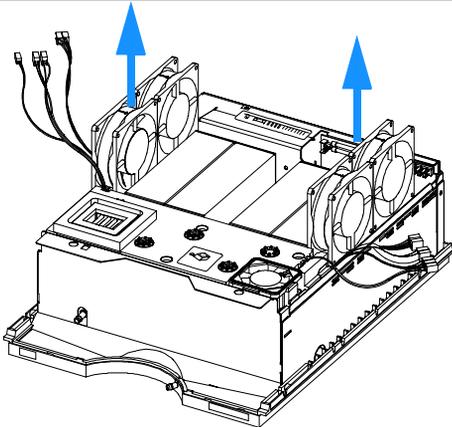
Exchanging the Heatsink Fans

When required Fan not running

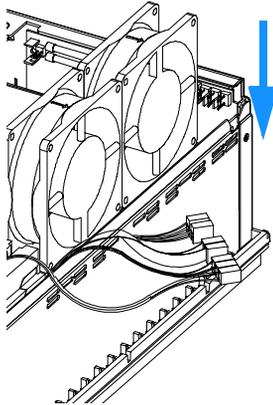
Preparations for this procedure Removing the Top Cover and Foam (see "Removing the Top Cover and Foam" on page 61).

Parts required Fan, part number 3160-0884

1 Carefully lift the pair of Fans upwards.



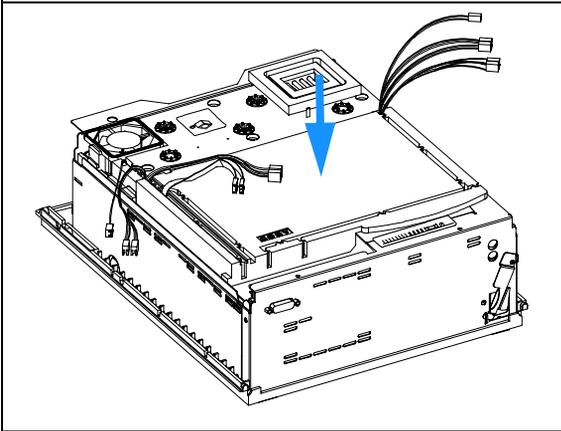
2 Replace the defective fan, and reinsert the pair of Fans. Note the orientation of the fans.



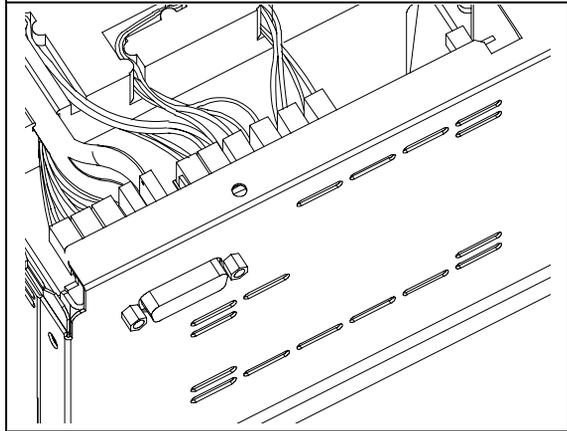
Repairing the ALS Thermostat Module

Exchanging the Heatsink Fans

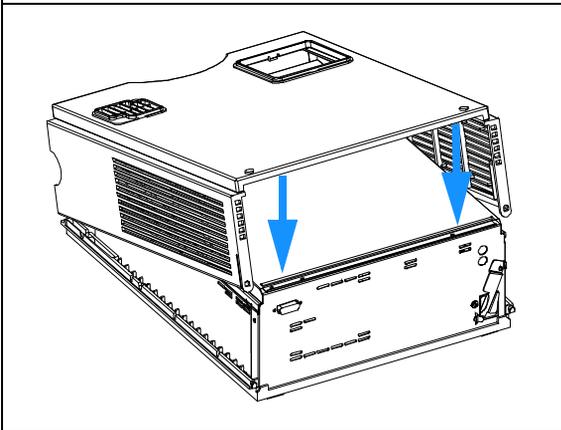
3 Reinsert the Top Foam and route the cables in the guide channels in the Top Foam.



4 Reconnect the connectors in the correct order (See label on top of Power Supply).



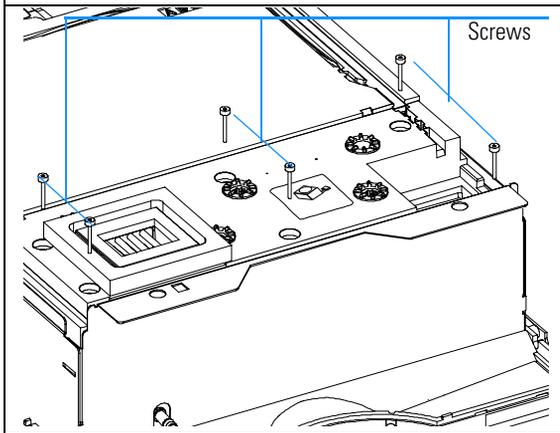
5 Replace the metal cover and top cover.



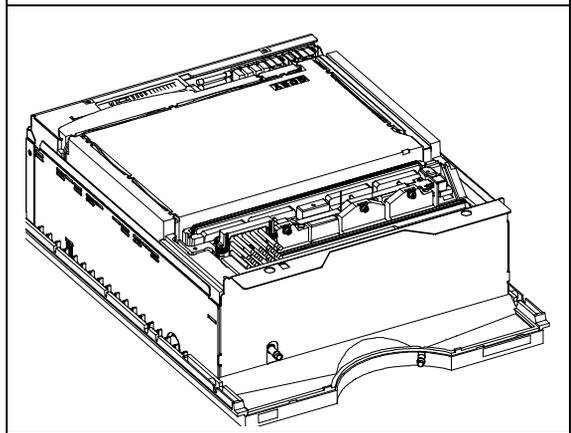
Exchanging the Sensors

When required	Sensors defective
Preparations for this procedure	Removing the Top Cover and Foam (see "Removing the Top Cover and Foam" on page 61).
Parts required	Sensor flexboard, PN G1330-66504 Heatsink Compound, PN 6040-0454

1 Unscrew the six holding screws on top of the hardfoam encapsulation.

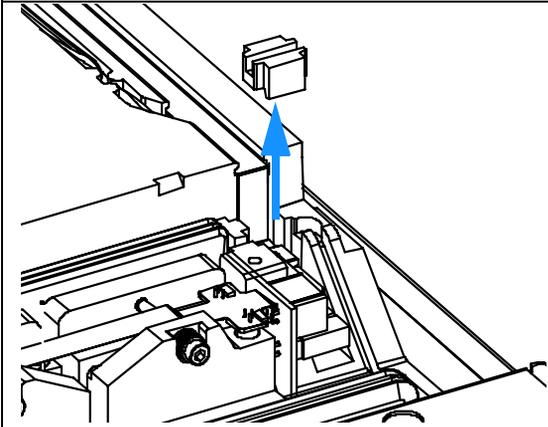


2 Carefully lift the upper part of hardfoam encapsulation away.

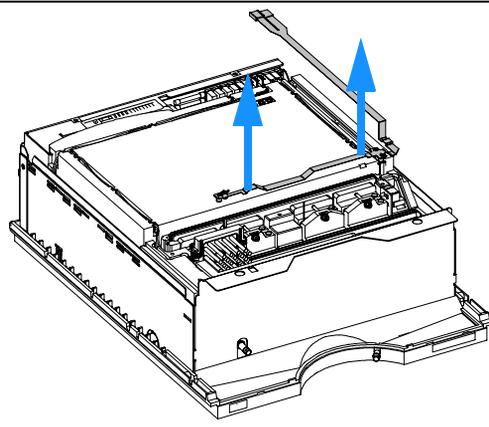


Exchanging the Sensors

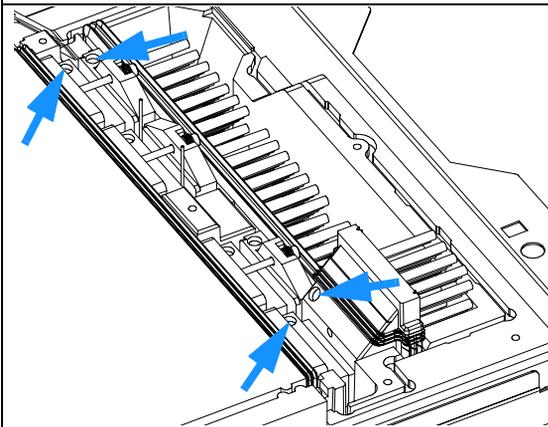
3 Remove the sealing adapter by carefully sliding it out of the seat.



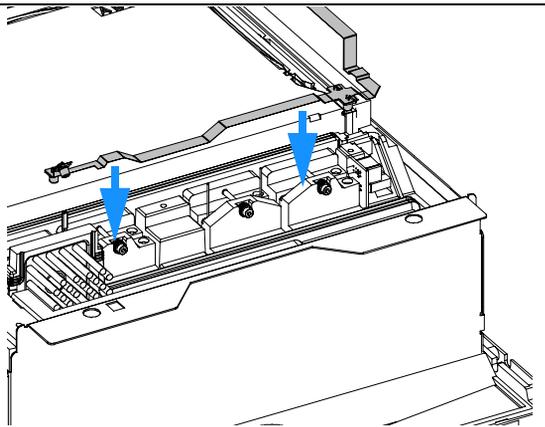
4 Unplug the connectors at the TCA Board, careful lift the sensors out of their seat and remove the sensor flexboard.



5 Insert some Heatsink Compound into the four sensor seats, to assure good contact.



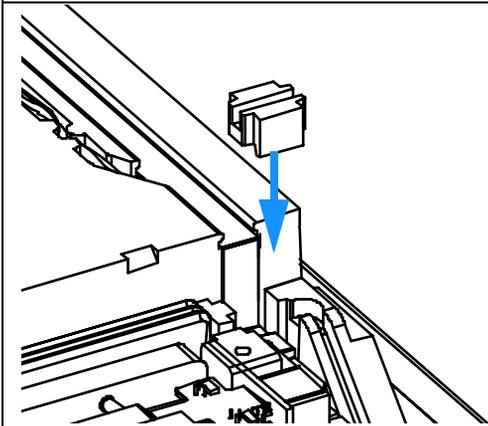
6 Install the new sensor flexboard carefully by pressing each sensor individually into the seats, and then route the flexboard through the sealing adapter channel.



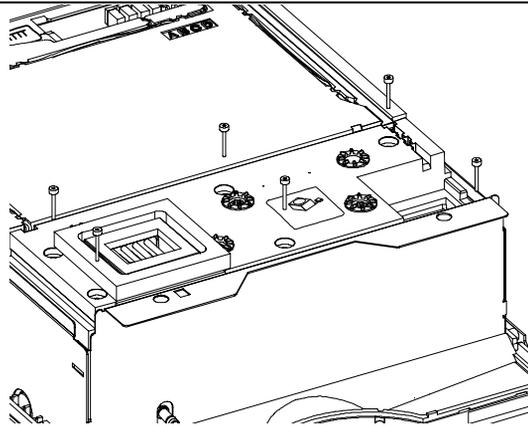
Repairing the ALS Thermostat Module

Exchanging the Sensors

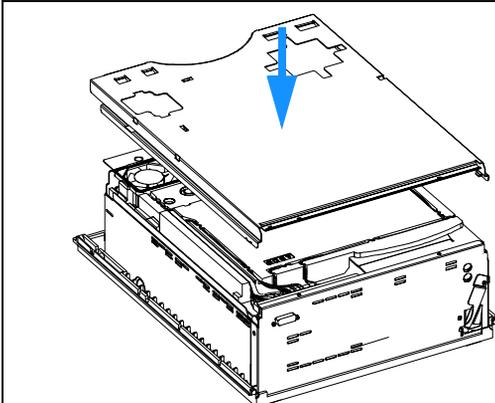
7 Reinsert the sealing adapter by carefully sliding it in to the seat.



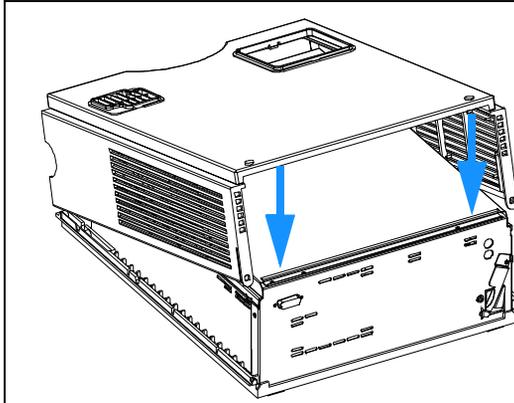
8 Reinstall the hardfoam encapsulation.



9 Route the cables in the guide channels and reconnect the connectors in the correct order (See label on Power Supply).



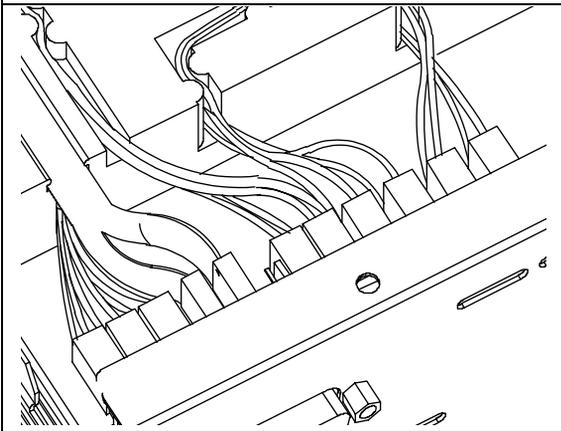
10 Reinstall the Top Plate and the Top Cover.



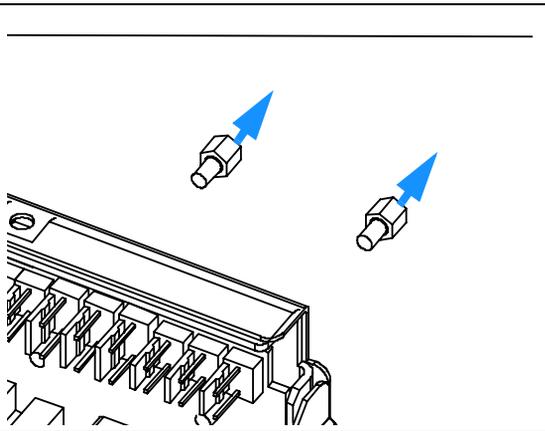
Exchanging the TCA board

When required	TCA Board defective
Preparations for this procedure	Removing the Top Cover and Foam (see "Removing the Top Cover and Foam" on page 61), item 1 to 4.
Parts required	TCA board, part number G1330-66500

1 Remove all connectors on the TCA Board.



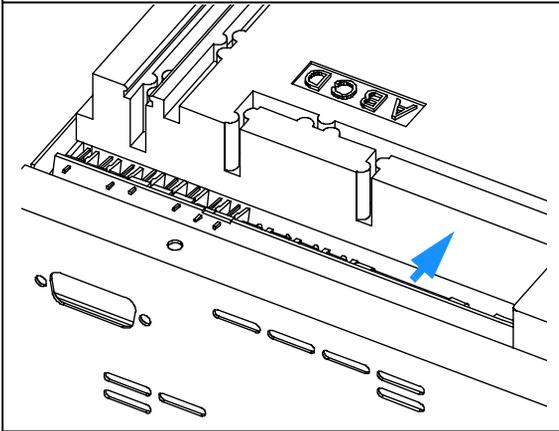
2 Unscrew the connector screws for the Autosampler to Thermostat cable.



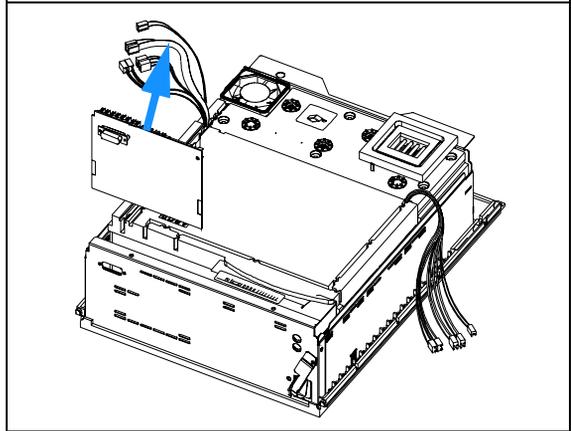
Repairing the ALS Thermostat Module

Exchanging the TCA board

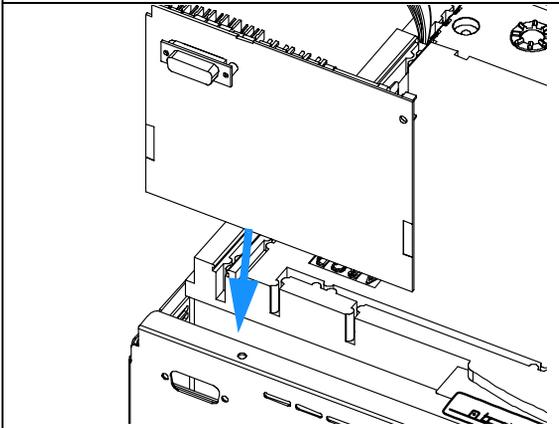
3 By carefully pulling back on the upper part of the TCA board unsnatch it from the holder.



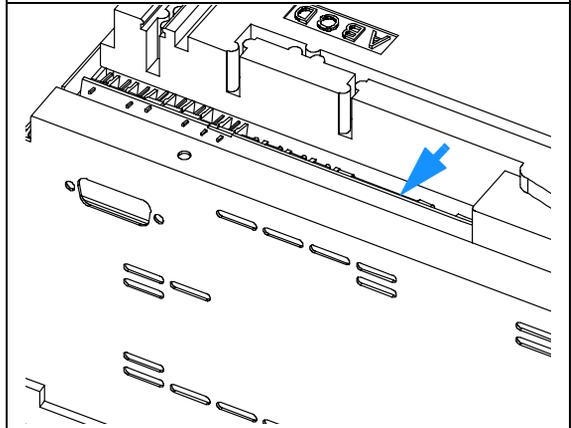
4 Remove the TCA board.



5 Reinsert the new TCA board.



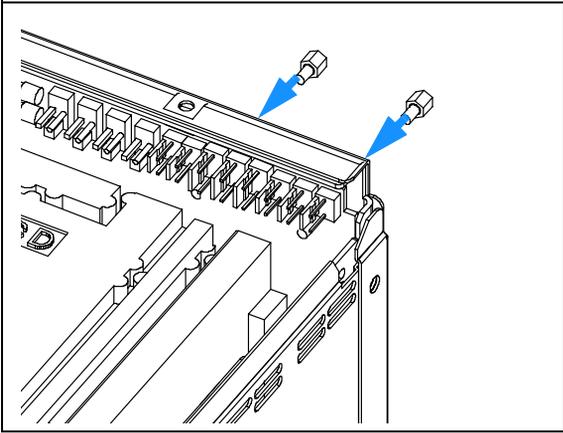
6 Gently push forward on the upper part of the board, until it snatches into place.



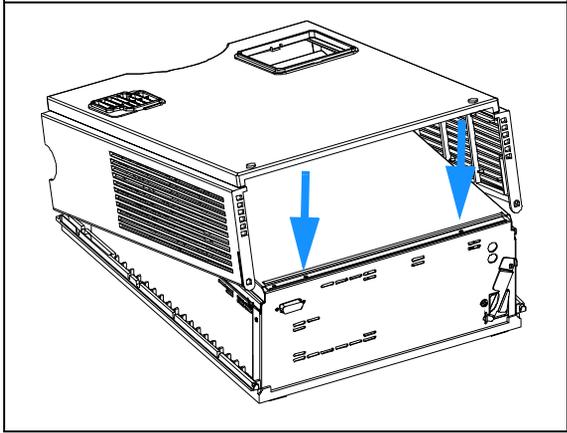
Repairing the ALS Thermostat Module

Exchanging the TCA board

7 Refit the connector screws and reconnect all connectors.



8 Replace the top foam section, metal cover and top cover.



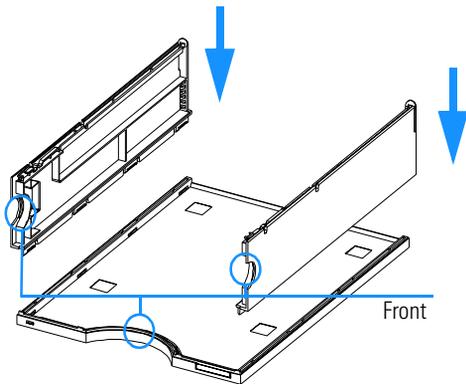
Assembling the Main Cover

When required	If cover is broken
Tools required	None
Parts required	Cover kit G1330-68703 (includes base, top, left and right)

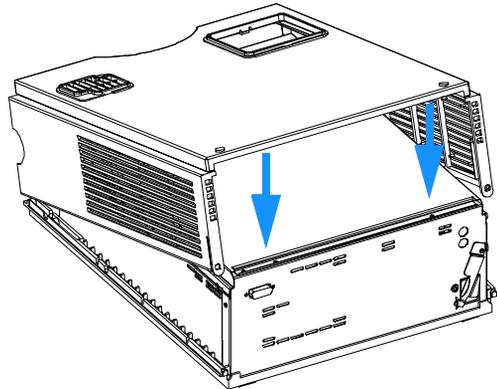
NOTE The cover kit contains all parts, but it is not assembled.

WARNING In case you insert the left or right side in the opposite position, you may not be able to remove the side from the top part.

1 Place the top part on the bench and insert the left and right side into the top part.



2 Replace the cover.



3 Replace the ALS thermostat into the stack and reconnect the cables and capillaries.

4 Turn on the ALS thermostat.

Repairing the ALS Thermostat Module

Assembling the Main Cover

ALS Thermostat Parts and Materials

Lists for identification of parts and materials

Main Assemblies

Figure 20

Main Assemblies

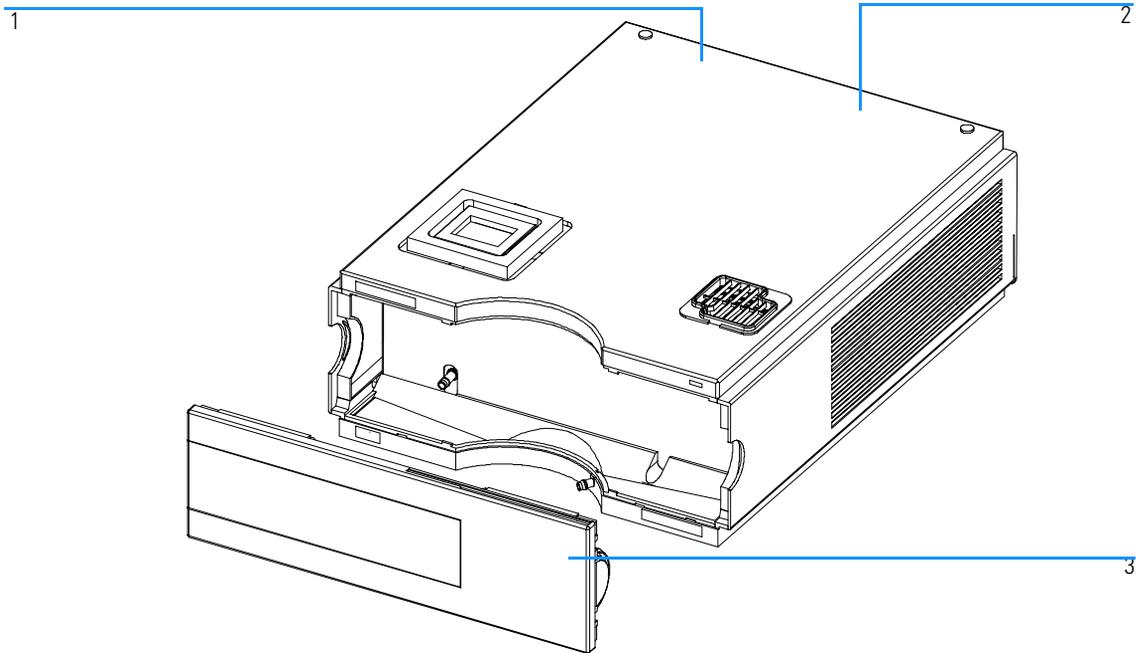


Table 4

Main Assemblies

Item	Description	Part Number
1	Fuse - Power Supply (T2.5A/250V; CSA, UL listed)	2110-0015
2	Fuse TCA - Board (T3A/250V; CSA, UL listed)	2110-0029
3	Front Cover	5062-8582
	Cable, autosampler - ALS thermostat	G1330-81600

Accessory Kit G1330-68705

Table 5

Accessory Kit

Item	Description	Part Number
1	Waste Tube*	5062-2463
2	Waste Tube Assembly	G1330-67300

* Reorder Number (5 m)

Main Assemblies

Figure 21

Main Assemblies

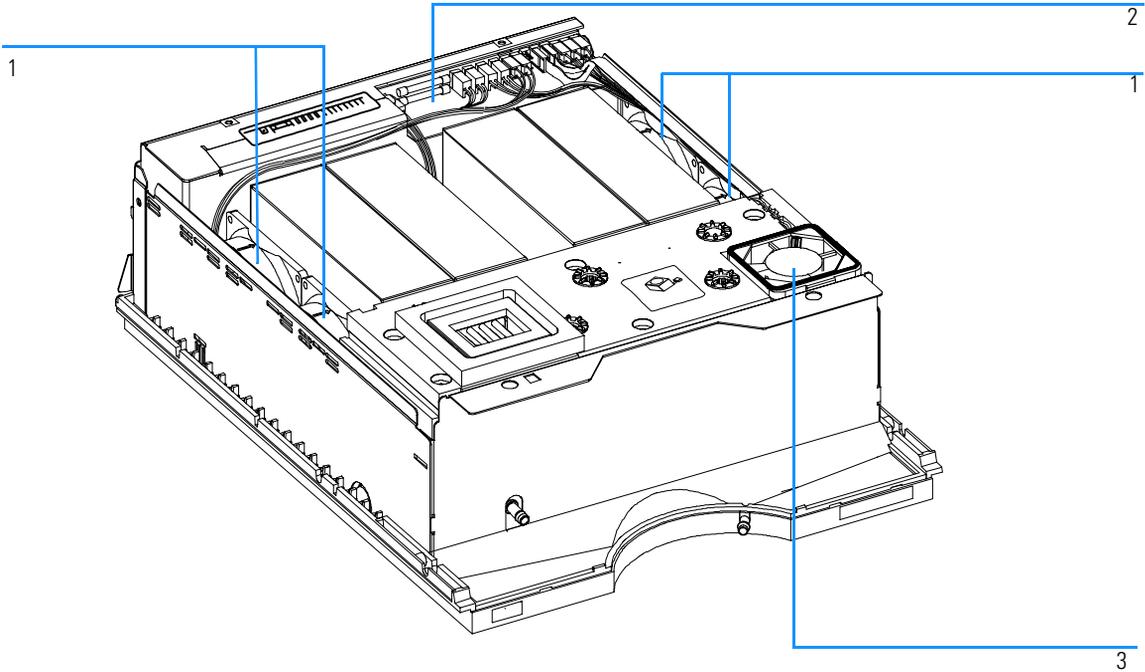


Table 6

Main Assemblies

Item	Description	Part Number
1	Heat sink fans	3160-0884
2	TCA Board	G1330-66500
3	Heat exchanger fan	3160-1079

Foam Parts

Foam Parts

Figure 22

Foam Parts

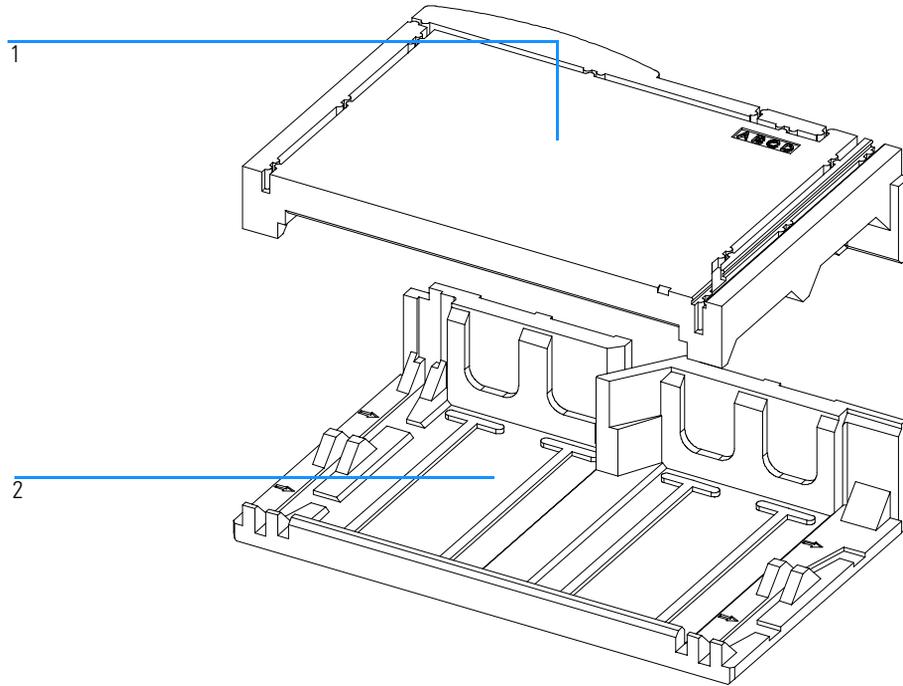


Table 7

Main Assemblies

Item	Description	Part Number
1	Top Foam	G1330-40102
2	Bottom Foam	G1330-40103

Plastic Parts

Figure 23

Plastic Parts

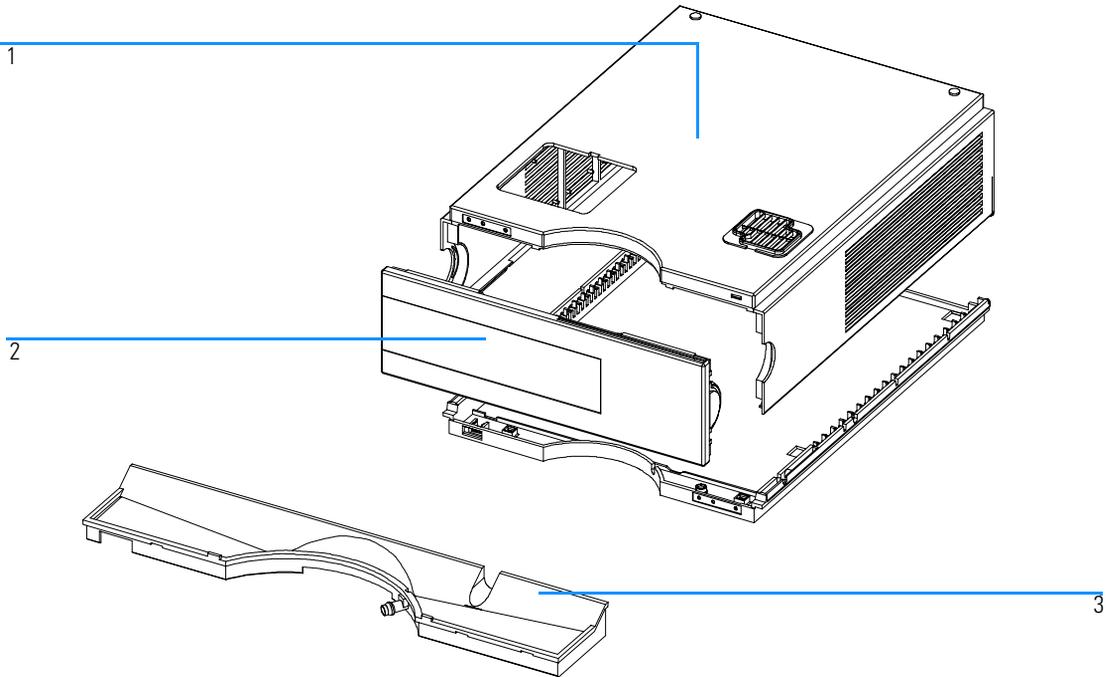


Table 8

Main Assemblies

Item	Description	Part Number
1	Cabinet Kit, includes base, top and sides	G1330-68703
2	Front Cover	5062-8582
3	Leak Pan	5042-1307

Heat Exchanger Fan Parts

Figure 24

Heat Exchanger Fan Parts

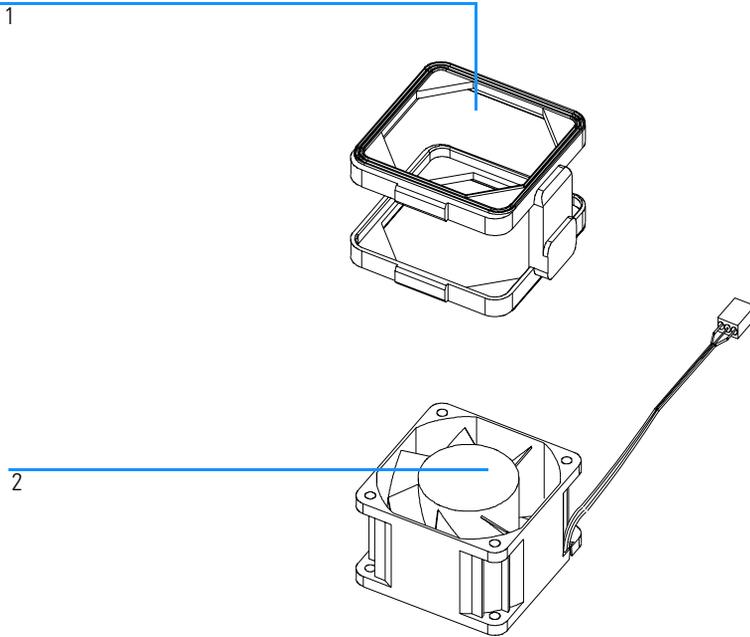


Table 9

Main Assemblies

Item	Description	Part Number
1	Fan Gasket	G1330-44104
2	Heat Exchanger Fan	3160-1079

ALS Thermostat Parts and Materials

Heat Exchanger Fan Parts

Specifications

Performance specifications of the ALS
thermostat

Performance Specifications

Table 10

Performance Specifications Agilent 1100 Series thermostatted autosampler

Type	Specification
Temperature range:	setable from 4°C to 40°C in 1° increments

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 ALS thermostat accessory kit contents 24
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-

Warranty Statement

All Chemical Analysis Products

Agilent Technologies warrants its chemical analysis products against defects in materials and workmanship. For details of the warranty period in your country, call Agilent. During the warranty period, Agilent will, at its option, repair or replace products which prove to be defective. Products that are installed by Agilent are warranted from the installation date, all others from the ship date.

If buyer schedules or delays installation more than 30 days after delivery, then warranty period starts on 31st day from date of shipment (60 and 61 days, respectively for products shipped internationally).

Agilent warrants that its software and firmware designed by Agilent for use with a CPU will execute its programming instructions when properly installed on that CPU. Agilent does not warrant that the operation of the CPU, or software, or firmware will be uninterrupted or error-free.

Limitation of Warranty

Onsite warranty services are provided at the initial installation point. Installation and onsite warranty services are available only in Agilent service travel areas, and only in the country of initial purchase unless buyer pays Agilent international prices for the product and services. Warranties requiring return to Agilent are not limited to the country of purchase.

For installation and warranty services outside of Agilent's service travel area, Agilent will provide a quotation for the applicable additional services.

If products eligible for installation and onsite warranty services are moved from the initial installation point, the warranty will remain in effect only if the customer purchases additional inspection or installation services, at the new site.

The foregoing warranty shall not apply to defects resulting from:

- 1 improper or inadequate maintenance, adjustment, calibration, or operation by buyer,
- 2 buyer-supplied software, hardware, interfacing or consumables,
- 3 unauthorized modification or misuse,
- 4 operation outside of the environmental and electrical specifications for the product,
- 5 improper site preparation and maintenance, or
- 6 customer induced contamination or leaks.

Warranty Statement

THE WARRANTY SET FORTH IS EXCLUSIVE AND NO OTHER WARRANTY, WHETHER WRITTEN OR ORAL, IS EXPRESSED OR IMPLIED. AGILENT SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

Limitation of Remedies and Liability

THE REMEDIES PROVIDED HEREIN ARE BUYER'S SOLE AND EXCLUSIVE REMEDIES. IN NO EVENT SHALL AGILENT BE LIABLE FOR DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES (INCLUDING LOSS OF PROFITS) WHETHER BASED ON CONTRACT, TORT OR ANY OTHER LEGAL THEORY.

Responsibilities of the Customer

The customer shall provide:

- 1** access to the products during the specified periods of coverage to perform maintenance,
- 2** adequate working space around the products for servicing by Agilent personnel,
- 3** access to and use of all information and facilities determined necessary by Agilent to service and/or maintain the products (insofar as these items may contain proprietary or classified information, the customer shall assume full responsibility for safeguarding and protection from wrongful use),
- 4** routine operator maintenance and cleaning as specified in the Agilent operating and service manuals, and
- 5** consumables such as paper, disks, magnetic tapes, ribbons, inks, pens, gases, solvents, columns, syringes, lamps, septa, needles, filters, frits, fuses, seals, detector flow cell windows, and so on.

Responsibilities of Agilent Technologies

Agilent Technologies will provide warranty services as described in Table 1.

Table 1

Warranty Services

Services During Warranty*	Warranty Period**	Type
Agilent 1100 Series of Modules	1 Year	Onsite
GC, LC, UV-Visible, and LAS supplies and accessories	90 Days	Onsite
Columns and Consumables***	90 Days	Return to Agilent
Gas Discharge and Tungsten Lamps	30 Days	Return to Agilent
Repairs performed on-site by Agilent****	90 Days	Onsite

* This warranty may be modified in accordance with the law of your country. Please consult your local Agilent office for the period of the warranty, for shipping instructions and for the applicable wording of the local warranty.

** Warranty services are included as specified for Analytical products and options purchased concurrently provided customer is located within a Agilent defined travel area. Agilent warranty service provides for 8 a.m. to 5 p.m. on-site coverage Monday through Friday, exclusive of Agilent holidays.

*** Columns and Consumables are warranted to be free from defects for a period of 90 days after shipment and will be replaced on a return-to-Agilent basis if unused.

**** Agilent repair warranty is limited to only the item repaired or replaced.

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.

Safety Information

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.

When working with solvents please observe appropriate safety procedures (e.g. goggles, safety gloves and protective clothing) as described in the material handling and safety data sheet by the solvent vendor, especially when toxic or hazardous solvents are used.

Safety Symbols

Table 2 shows safety symbols used on the instrument and in the manuals.

Table 2

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.

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

Manufacturer's Declaration

This is to certify that this equipment is in accordance with the Radio Interference Requirements of Directive FTZ 1046/1984. The German Bundespost was notified that this equipment was put into circulation, the right to check the series for compliance with the requirements was granted.

Test and Measurement

If test and measurement equipment is operated with equipment unshielded 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.

Sound Emission

Manufacturer's Declaration

This statement is provided to comply with the requirements of the German Sound Emission Directive of 18 January 1991.

This product has a sound pressure emission (at the operator position) < 70 dB.

- Sound Pressure $L_p < 70$ dB (A)
- At Operator Position
- Normal Operation
- According to ISO 7779:1988/EN 27779/1991 (Type Test)

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/go/chem>



In This Book

This manual contains information about the Agilent 1100 Series thermostatted for autosamplers. Information for the individual autosamplers can be obtained from the corresponding autosampler reference manual. This supplemental manual describes the following:

- installing the thermostat,
- theory of operation,
- troubleshooting the thermostat,
- repair procedures for the thermostat,
- parts and materials for the thermostat.

