



Agilent 1260 Infinity II High-Temperature ELSD

User Manual



Agilent Technologies

Notices

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In This Book

This manual contains information on:

- Agilent 1260 Infinity II HT-ELSD (G7826A)

1 Introduction to the Detector

This chapter gives an introduction to the module, instrument overview and internal connectors

2 Site Requirements and Specifications

This chapter provides information on environmental requirements, physical and performance specifications.

3 Installing the Module

This chapter gives information about the installation of your ELSD.

4 Using the Module

This chapter explains the operational parameters of the ELSD.

5 Optimizing Performance

This chapter gives hints on how to optimize the performance or use additional devices.

6 Troubleshooting and Diagnostics

This chapter gives an overview about the troubleshooting and diagnostic features.

7 Error Information

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

8 Maintenance and Repair

This chapter describes the maintenance of the ELSD.

9 Parts and Materials for Maintenance

This chapter provides information on parts for maintenance.

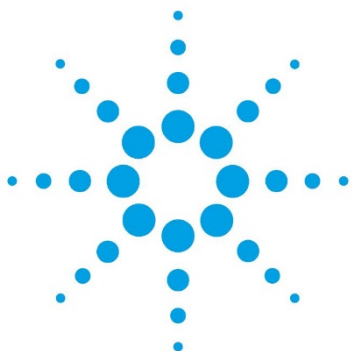
10 Appendix

This chapter provides addition information on safety, legal and web.

Contents

1	Introduction to the Detector	7
	Introduction to the ELSD	8
	System Overview	9
2	Site Requirements and Specifications	11
	Pre-installation Requirements	16
	Site Requirements	17
	Physical Specifications	20
	Performance Specifications	21
3	Installing the Module	24
	Unpacking the Module	24
	Installing the Module	26
4	Using the Module	31
	Before Using the Detector	32
	Instrument Controls	32
	Operational Parameters	38
	General Considerations	39

5	Optimizing Performance	43
	Do's and Don'ts of ELS Detection	44
	Location of the Detector Module	45
	Pumping systems	46
	Mobile phase priming	47
	Solvent recommendations	48
6	Troubleshooting and Diagnostics	49
	Troubleshooting	50
	Troubleshooting a GPC System	51
	General Problems	52
7	Error Information	59
	What Are Error Messages	60
	Module Specific Error Messages	61
8	Maintenance and Repair	73
	Introduction to Maintenance	74
	Cautions and Warnings	75
	Cleaning the Module	77
	Inspection of Cables	78
	Cleaning the Nebuliser	78
	Cleaning Evaporator Tube	79
	Putting the Instrument into Storage	80
9	Parts and Materials for Maintenance	81
	Identifying Parts and Materials	82
10	Appendix	83
	General Safety Information	84
	The Waste Electrical and Electronic Equipment Directive	87
	Radio Interference	88
	Agilent Technologies on Internet	89



1 Introduction to the Detector

Introduction to the ELSD	8
System Overview	9
Basic Principles of Operation	9
Operational Parameters	12
Overview of ELS Detector	13

This chapter gives an introduction to the module, instrument overview and internal connectors

Introduction to the ELSD

The Evaporative Light Scattering Detector is a unique and highly sensitive detector for semi-volatile and non-volatile solutes in a liquid stream. It is mainly used as a concentration detector for High Performance Liquid Chromatography (GPC). The solvent stream containing the solute material is nebulized and carried by a gas flow through an evaporation chamber. The solvent is volatilized, leaving a mist of solute particles that scatter light to a photosensitive device. The signal is amplified and a voltage output provides the concentration of the solute particles passing through the light.

The Agilent 1260 Infinity II HT-ELSD may be used alone, or as part of the Agilent High Temperature GPC system. As the solvent or eluent is evaporated in the course of the analysis, the Agilent 1260 Infinity ELSD must be the last in series if used in conjunction with other detectors.

This manual instructs the user in the installation and operation of the Agilent 1260 Infinity II HT-ELSD for operation with the Agilent High-Temperature GPC system (G7820B)

System Overview

Basic Principles of Operation

Nebulization

The eluent inlet is connected to the nebuliser via a heated transfer line, comprising an inner capillary tube. The incoming eluent stream is heated and passes through the heated nebuliser and is mixed with the incoming nebuliser gas stream. The mixed gas and eluent stream form an aerosol plume containing a uniform dispersion of droplets that then passes as a continuous flow into the evaporator section. Any larger droplets or the inefficiently nebulized droplets collect in the nebuliser chamber waste trap and then drain off via the waste outlet into a collection bottle.

Evaporation

After nebulization the atomized spray is propelled through the evaporation tube assisted by a carrier gas. In the evaporator section the solvent is removed leaving a stream of dry particles of the analyte. A diffuser located in the evaporator assists in the drying of the particles, acting as an efficient heat exchanger, prevents ballistic particles reaching the scattering chamber and randomizes the particle plume. The ELS Detectors use patented gas flow technology in the evaporation zone to aid evaporation at low temperatures. By adding a stream of dry nitrogen (evaporation gas) at the entrance of the evaporator tube high boiling point solvents (for example, TCB) can be evaporated at much lower temperatures.

Detection

Light in the optical chamber is passed through the instrument at right angles to the direction of particle flow. A light trap is located opposite the source of light to capture the transmitted incident beam eliminating internal reflections within the instrument body. When pure solvent is being evaporated, only its vapor passes through the light path and the amount of light scattered to the photomultiplier is small and gives a constant baseline response. When a non-volatile solute is present a particle cloud passes through the light path, causing light to be scattered. This scattered light enters the optical aperture of the detection system and generates a signal response from the photodiode in real time. The quantity of light detected is dependent on the solute concentration and solute particle size distribution.

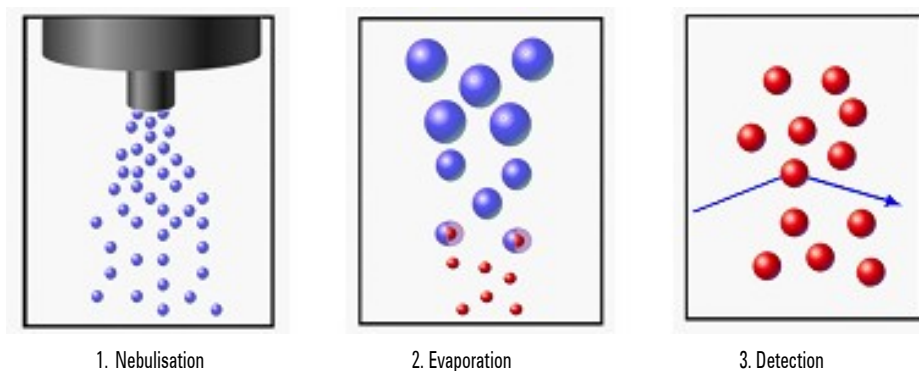


Figure 1 Principles of Operation

Theory

There are four main processes by which the path of electromagnetic radiation or light can change direction, when passing through a medium containing a suspended particulate phase, see [Figure 2](#) on page 13.

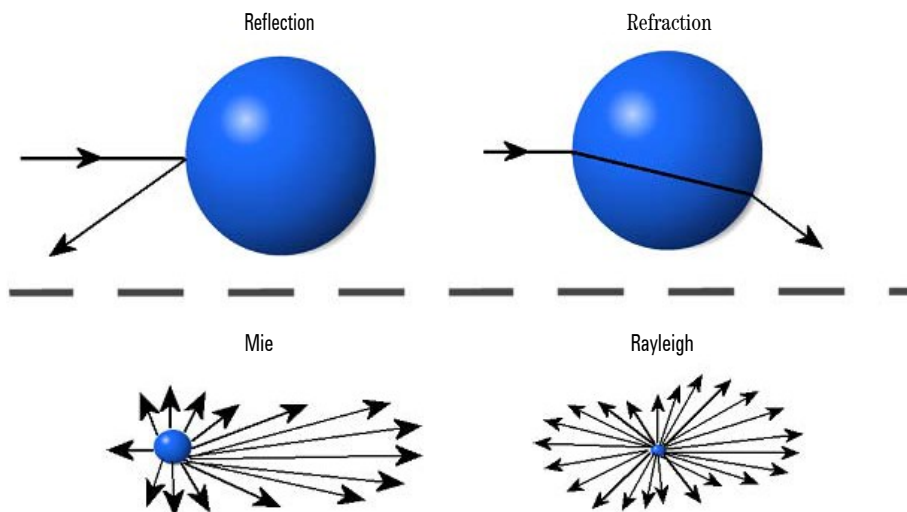


Figure 2 ELSD Scattering Mechanisms

The importance of each of these processes depends on the radius of the particle (r) compared to the wavelength (λ) of the incident light. Rayleigh scattering is predominant when r/λ is $< 5 \cdot 10^{-2}$. When particle dimensions are greater than $\lambda/20$ they no longer behave as point sources, and Mie scattering becomes predominant. Once particle size approaches the wavelength of incident light then reflection and refraction begin to prevail.

The relative importance of refraction and reflection can be understood by examining the effects of the incident light on a single spherical particle whose equilateral axis lies in the same plane as the photodetector and light source. With this configuration, refraction is of greater significance than reflection. The majority of organic compounds have refractive indices between 1.3 and 1.5. Changes in the refractive index within this range will not greatly affect the quantity of light reaching the detector. This accounts for similarities in the sensitivity of the instrument to various compounds.

Operational Parameters

The ELS Detector responds to all compounds that are less volatile than the mobile phase and is independent of a compound's optical properties. It therefore provides advantages over other spectroscopic detectors for detecting compounds that are deficient in a UV chromophore or fluorophore.

The removal of the mobile phase within an ELSD is typically achieved by setting the evaporator temperature at, or close to, the eluent's boiling point (e.g. 100°C) in order to remove the solvent.

However, for GPC solvents, such as Trichlorobenzene (TCB) they have boiling points (e.g. 214°C) above the operating temperature of conventional ELS detectors.

The High- Temperature ELSD uses patented evaporation gas technology, to aid the evaporation of high-boiling point GPC solvents at temperatures within its typical operating range.

Therefore, unlike other ELS detectors, the Agilent HT-ELSD is able to evaporate TCB at an evaporation temperature of 120°C. This method of operation ensures that the ELSD sensitivity is maximized for low molecular weight polymers.

Overview of ELS Detector

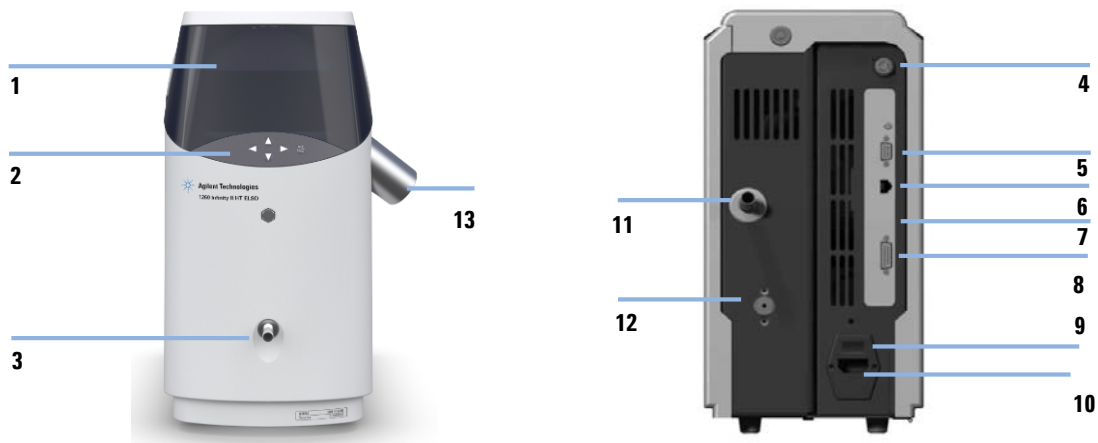


Figure 3 ELSD overview (front)

1	Front Screen Display
2	Keypad
3	Solvent Waste Outlet
4	Vapour Sensor vent
5	Serial RS232 port (not active)
6	LAN connector (not active)
7	Firmware button
8	I/O connector (Remote Start input)
9	Mains Switch
10	Power Inlet
11	Exhaust Port
12	Gas inlet Port
13	Transfer line

1 Introduction to the Detector

System Overview

Table 1 ELS Detector I/O connections

	I/O description	Pin number
Inputs	Injection Sync	13 & ground
	Remote A/Z	7 & ground
Output	Pump stop contact closure – normally open	3 & 10
	Ground (to case)	1, 5, 6, 11

NOTE

In order to make appropriate remote start and A/Z connections from a third party system, a Remote Start Cable can be purchased from Agilent Technologies



2 Site Requirements and Specifications

Pre-installation Requirements	16
Site Requirements	17
Physical Specifications	20
Performance Specifications	21
Specifications	21
Specification Conditions	22

This chapter provides information on environmental requirements, physical and performance specifications.

Pre-installation Requirements

For a detailed description of the environmental and operating requirements of the ELSD, please refer to the Site Preparation Checklist.

This manual will give you an overview of the ELS detector, and describe its operation in more detail.

Site Requirements

A suitable environment is important to ensure optimal performance of the instrument, please refer to the Site Preparation Checklist for more details.

Power Considerations

Check the operating voltage of your instrument on the IEC inlet fuse holder on rear of unit.

WARNING

Hazard of electrical shock or damage of your instrumentation can result, if the devices are connected to a line voltage higher than specified.

→ Connect your instrument to the specified line voltage only.

2 Site Requirements and Specifications

Site Requirements

CAUTION

Inaccessible power plug.

In case of emergency it must be possible to disconnect the instrument from the power line at any time.

- Make sure the power connector of the instrument can be easily reached and unplugged.
 - Provide sufficient space behind the power socket of the instrument to unplug the cable.
-

Power Cords

Your detector is delivered with a power cord which matches the wall socket of your particular country or region. The plug on the power cord which connects to the rear of the instrument is identical for all types of power cord.

WARNING

Absence of ground connection or use of unspecified power cord

The absence of ground connection or the use of unspecified power cord can lead to electric shock or short circuit.

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

WARNING

Use of unsupplied cables

Using cables not supplied by Agilent Technologies can lead to damage of the electronic components or personal injury.

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

WARNING

Unintended use of supplied power cords

Using power cords for unintended purposes can lead to personal injury or damage of electronic equipment.

- Never use the power cords that Agilent Technologies supplies with this instrument for any other equipment.
-

Physical Specifications

Table 2 Physical Specifications

Type	Specification	Comments
Weight	11 kg	
Dimensions (height × width × depth)	415 x 200 x 450 mm (16.3x 7.9 x 17.7 inches)	
Line voltage	100 – 240 VAC, ± 10 %	Wide-ranging capability
Line frequency	50 or 60 Hz, ± 5 %	
Power consumption	200 VA	
Ambient operating temperature	10–30°C (50–86 °F)	
Ambient non-operating temperature	-40 – 70 °C (-40 – 158 °F)	
Humidity	< 80 % r.h. at 40 °C (104 °F)	Non-condensing
Operating altitude	Up to 2000 m (6562 ft)	
Non-operating altitude	Up to 4600 m (15091 ft)	For storing the module
Safety standards: IEC, CSA, UL	Installation category II, Pollution degree 2	For indoor use only.

Performance Specifications

Specifications

The instrument is suitable for indoor use only and is classified suitable under the following categories (EN 61010-1):2010

- Installation category II
- Pollution degree 2
- Safety class 1

Table 3 Performance Specification of the ELS Detector

Type	Specification
Light Source	LED 480 nm (Class 1 LED Product)
Detector	PMT with digital signal processing
Nebuliser	OFF, 25 – 160 °C
Evaporator	OFF, 25 – 120 °C
Transfer Line	OFF, 25 – 160 °C
Neb Gas Flow	0.2 – 0.5 SLM
Short Term Noise	<0.2 mV under specified conditions. See “ Specification Conditions ” on page 26.
Drift	<1 mV/h under specified conditions. See “ Specification Conditions ” on page 26.
Operating Pressure	65 – 100 psi (4.2 – 6.9 bar) (80 psi recommended)
Eluent Flow range	0.5 – 5.0 mL/min
Analogue Output	10Hz

2 Site Requirements and Specifications

Performance Specifications

Table 3 Performance Specification of the ELS Detector

Type	Specification
Communication	Analogue Output
Remote operation	Remote Start Input
Safety features	Gas shut off Valve, Leak Detection, Over-temperature protection

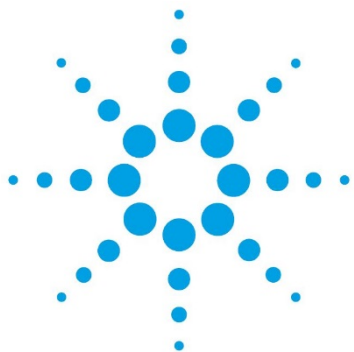
Specification Conditions

Table 4 Reference conditions

Mobile phase	Trichlorobenzene
Flow rate	1ml/min
Transfer line temperature	160°C
Nebuliser Gas flow	0.2 SLM
Nebuliser Temperature	160°C
Evaporator Temperature	120°C
PMT Gain	1
Smoothing	50

NOTE

Drift & noise test requires a stabilization period of 60mins. Our published drift specification is based on these conditions. Larger ambient temperature changes or insufficient equilibration will result in larger drift & noise.



3 Installing the Module

Unpacking the Module	24
Installing the Module	26
Connecting the Detector to your LC System	26
Checking Operation of the ELS Detector	29

This chapter gives information about the installation of your ELSD.

Unpacking the Module

Damaged Packaging

If the delivery packaging shows signs of external damage, please call your Agilent Technologies sales and service office immediately. Inform your service representative that the instrument may have been damaged during shipment.

CAUTION

"Defective on arrival" problems

If there are signs of damage, please do not attempt to install the module. Inspection by Agilent is required to evaluate if the instrument is in good condition or damaged.

- Notify your Agilent sales and service office about the damage.
 - An Agilent service representative will inspect the instrument at your site and initiate appropriate actions.
-

Delivery Checklist

Unpack the ELSD and accessories, and ensure that all parts and materials shown in the table below have been delivered with your module. Report any missing or damaged parts to your local Agilent Technologies sales and service office.

p/n	Description
G7826A	Agilent 1260 Infinity II High-Temperature ELSD
G7826-60500	Agilent ELSD Heated Transfer Line Assy (pre-installed)
PL0890-0300	Analogue Output cable
G4260-63001	1260 Infinity II Trigger Cable
PL0890-0305	Gas inlet tube (2 m)
PL0890-0310	Rear exhaust hose (PVC-2 m)
IN2-25388	Solvent waste tube (1.9 m)
N/A	One power cord (region dependent)

Installing the Module

Connecting the Detector to your GPC System

The ELS detector must be installed by an Agilent service representative.

Your Agilent service representative will:

- Unpack the ELSD.
 - Remove all packing list items that are shipped with the instrument and present them to you for review.
 - Unpack the accessories supplied with the instrument and check that you have received everything on the packing lists.
 - Install your ELS detector.
- 1** Place the module on the bench in a vertical position.
 - 2** Connect the power cord to the IEC inlet at the rear of the unit.
 - 3** Ensure the power switch of the module is OFF (switch stands out).
 - 4** Attach the 4 mm OD gas tube into the gas inlet port at the rear of the instrument. The gas connection is a push-in fitting.
 - 5** Connect the solvent waste tube to the waste outlet at the front of the detector and position the other end into a waste collection bottle.
 - 6** Connect the front outlet tube to the waste bottle using the supplied tubing.
 - 7** Ensure that the end of the waste tube is below the height of the waste outlet from the instrument.

NOTE

Though it will not cause any damage, if the solvent waste tube becomes submerged below the solvent level inside the waste container positive pressure will be exerted on the nebuliser chamber leading to excessive baseline noise

WARNING

Risk of intoxication and contamination of detector

Toxic evaporation and accumulation of condensing solvent

- The exhaust must be extracted to a suitable fume extraction system.
 - Attach one end of the exhaust hose to the rear of the unit.
 - Ensure the exhaust hose has an upward slope from the detector so that any condensed solvent is collected in the waste bottle at the front of the unit and to prevent it accumulating in the tubing.
 - Make sure the other end of the exhaust hose is vented to a fume hood or other disposal unit.
-

CAUTION

Negative or positive backpressure at the exhaust

Baseline noise and reduced performance of the detector

- Do not connect the exhaust tubing directly to the extraction unit.
-

- 8** Connect the exhaust hose between the exhaust outlet and a fume hood.
- 9** Connect the analogue cable to an Agilent DataStream (G7825A) or Agilent Universal interface box (G1390B)
- 10** Connect the I/O cable to the Agilent HT-GPC System or pump.
- 11** Connect the heated transfer line to the HT-GPC system
- 12** Turn on the source gas to a pressure of about 4.2 – 6.9 bar.

3 Installing the Module

Installing the Module

NOTE

The ELS detector is equipped with 2 contact closures (normally-open) for stopping the operation of a pump if the unit reports an error condition. Pump stop facility must be connected

NOTE

The eluent from the chromatography system is connected to the side port of the ELS Detector via a heated transfer line.

Avoid pulling or stressing the heated transfer line as this could detach the inner nebulizer and lead to internal leaks or poor performance

NOTE

For further information on how to connect the HT-ELSD to the Agilent HT-GPC system, please refer to Agilent HT-GPC User Manual

Checking Operation of the ELS Detector

- 1 Switch on the ELS Detector.
- 2 Set operational parameters (i.e. nebuliser and evaporator temperature), via the front panel. Then set the ELS detector status to **RUN** mode.

NOTE

When the unit has reached temperature, the baseline noise should be checked to ensure that it is < 0.2 mV peak-peak. This verifies that the gas supply is clean and dry.

- 3 If the baseline noise is within the limits, autozero the detector. However, if the baseline noise is outside the limits, refer to the Troubleshooting section for steps to rectify this.
- 4 Turn on the eluent flow and allow the system to stabilize for at least 15 mins.
- 5 Again, check the baseline noise.
Where noise and all other conditions are acceptable, the instrument is ready to begin work.

NOTE

Baseline noise should not have increased significantly and should be ≤ 0.5 mV. Typically, filtered trichlorobenzene should give no more than 1.0 mV peak-peak

NOTE

Some GPC solvents contain additives or stabilizers that can generate increased noise levels.

3 **Installing the Module** Installing the Module



4 Using the Module

Before Using the Detector	32
Instrument Controls	32
Display Screen	32
Keypad	33
Main menu bar	33
Sub-Menu Screen	33
Status Mode	34
Error conditions	35
Clearing an Error	35
Operational Parameters	36
Transfer Line Temperature	36
Evaporator Temperature	36
Nebuliser Temperature	36
Nebuliser Gas Flow	37
Detector Gain (PMT)	37
Response Time (Smoothing)	37
Light Source Intensity (LED)	38
Power Mode	38
Data Output Rate (Hz)	38
General Considerations	39
Solvent Recommendations	40
Sample Preparation	41
Column Considerations	41
Transferring ELSD Temperature Methods	41

This chapter explains the operational parameters of the ELSD.

Before Using the Detector

Before using the detector, make sure solvent flow to the detector is off and all communication, waste and exhaust tubes are fitted.

Ensure the trigger cable is attached to the remote port of the solvent delivery module

Instrument Controls

The ELS Detector is used as a standalone detector via the front keypad and screen, as shown in [Figure 7](#) on page 54

Display Screen

The graphical interface on the front of the instrument displays the current method, status, evaporator temperature, nebuliser temperature, gas flow and output of the instrument. Operating parameters can be altered via the interactive menu bar at the bottom of the display.



Figure 7 ELSD Display Screen

Keypad


The four arrows on the front of the instrument are used to navigate within the interactive menu bar. The detector can be auto-zeroed by pressing the AZ/Stop key.

Main menu bar

To change the current settings, use the arrow keys to navigate across the interactive menu bar until the desired option is flashing. Using the up/down arrow keys alter the parameter to the desired setting. In order to action any changes, the cursor must be returned to the “Home” position



Sub-Menu Screen

The sub-menu screen is accessed from the front screen by selecting the  key: This screen allows changes to the following electronic parameters:

PMT	Set Signal Gain
SMTH	Set Time Constant
LED	Set Light source Intensity
PWR	Set Mode of ELSD when powered up

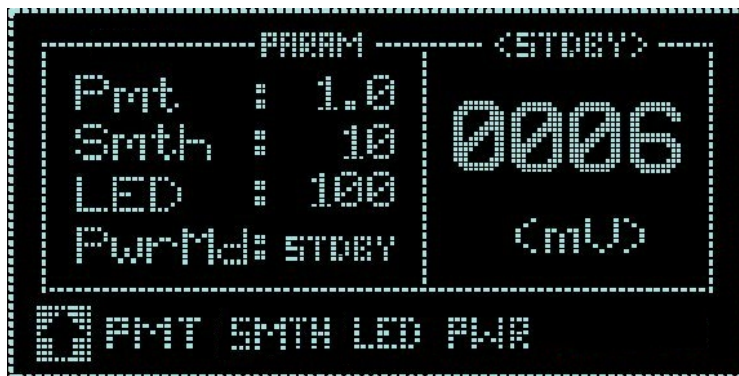


Figure 8 G7826A sub menu screen

Status Mode

The ELS Detector can be operated in two modes; *STANDBY* or *RUN*, both of which are described over page.

To display the current mode and/or select a new mode, highlight the *MODE* function on the instrument display. The current mode will now be displayed on the screen. Using the arrow keys, scroll up or down until the desired option is displayed. The instrument acknowledges the command by displaying the mode of operation in the top right hand corner of the screen.

Standby

The *STANDBY* mode is the “ground state” of the ELS detector, which is by default initiated automatically after power on (default can be changed using Power Mode, “Power Mode” on page 40). In *STANDBY* mode the heaters and light source are switched off, and the gas manifold valve is closed at power on. The *STANDBY* mode gives the user a control platform in which to set-up the operational parameters (gas flow, nebuliser and evaporator temperatures) before switching the unit into *RUN* mode. The instrument will default to *STANDBY* mode should an error occur on the instrument.

When the instrument is switched from *RUN* mode to *STANDBY* mode, following a command or error, then the gas management system is invoked and the gas flow set to a minimum flow of 1.2 SLM for 15 min before the gas manifold valve is closed. This minimum “blanket” gas is enough to nebulise and evacuate solvent should the instrument default to *STANDBY* mode with solvent still flowing.

CAUTION

Flooding the detector

If the instrument is left in Standby mode for longer than 15 minutes, gas flow to the unit is stopped to minimize gas usage.

→ The solvent pump must be turned off if the ELSD is going to be left in Standby mode longer than 15 minutes to prevent solvent flooding the detector.

RUN

The RUN mode is the detector's operational mode. In this mode, the instrument is controlled at the set temperatures and gas flow, and the system is fully operational. During heating or cooling the instrument will display NOT READY to show the system has not reached the set conditions. When the instrument has equilibrated READY will be displayed and the instrument is ready for use.

Error conditions

The ELS Detector is equipped with a number of sensors and error checking facilities to ensure safe operation. If an error is detected the instrument gives an audible warning and a visible description of the error condition. In event of any error condition, the unit defaults into the STANDBY mode in which the heaters, light source and gas are turned off. A complete list of instrument errors and remedial actions are given in the troubleshooting section of this manual.

Clearing an Error

Once the source of the problem has been corrected, select RUN mode to put the ELSD back into its operational state. If the problem has not been rectified the ELSD will repeatedly error when RUN mode is selected.

Operational Parameters

Transfer Line Temperature

The transfer line (xfer) temperature must be set at the correct value for optimum performance. This should be set at, or close to, the HT-GPC system temperature. For trichlorobenzene the recommended temperature for the transfer line is 160°C.

Evaporator Temperature

The evaporator temperature must be set at the correct value for optimum performance. This should be set close to the boiling point of the mobile phase, or as high as possible if the boiling point exceeds the temperature range of the ELSD.

For example, the evaporator temperature for TCB should be 120°C, whilst for Tetrahydrofuran it should be set to 40°C

An insufficient evaporator temperature can lead to high baseline noise and damage to the optics.

Nebuliser Temperature

The nebuliser temperature can be used to optimize signal response in addition to evaporator temperature. Higher nebuliser temperatures increase peak response, but high baseline noise can occur if the temperature exceeds the boiling point of the mobile phase.

To prevent blockages, it is critical that the nebulizer temperature is higher enough to maintain solubility of the sample within the mobile phase.

For example, it is recommended to operate the nebulizer temperature at 160°C when analyzing polyethylene samples in trichlorobenzene.

Nebuliser Gas Flow

The nebuliser gas flow is used to control the detector's nebulisation process. The gas value is set per the mobile phase composition or viscosity. It is recommended to use higher gas flows (e.g. 0.4 SLM) if the eluents has a high viscosity at the set nebulizer temperature.

The nebulizer gas has a major influence on the detector's sensitivity. Small changes in nebulizer gas flow can have a significant impact on the detectors performance,

Detector Gain (PMT)

This parameter sets the factor by which the detector output signal is amplified. The gain setting does not change the sensitivity of the detector, but merely amplifies the captured signal by the inputted factor. The gain can be adjusted from 1 to 10 in increments of 0.1.

When setting the PMT (or Gain), both the signal and noise are simply amplified by the value set, so S/N values are unaffected. The raw signal output displayed on the parameter screen will reflect this increase or decrease in signal amplification.

Please note that the instrument output displayed on the main operating screen does not alter following a PMT change, thus the recorded baseline position will remain unchanged. Confirmation of a PMT change will be obvious by the change in baseline noise.

Response Time (Smoothing)

The data outputted from the detector can be averaged to produce a smoother response. The smoothing width is set to the number of data points over which the data is averaged and can be regarded as a digital time constant. The smoothing range is settable from 1 – 70 , (in increments of 1) which translates to 0.1 – 7.0 s.

For most GPC applications, a value of 50 (5 s) is satisfactory. However, for broader peaks higher values maybe required of

Light Source Intensity (LED)

The ELS detector's LED intensity can be adjusted depending on the sample concentration or loading. The intensity can be adjusted between 1-100% and the value is retained even after a power cycle.

This feature is extremely useful when analyzing samples that are prepared at a high concentration required for a refractive index detector and would otherwise exceed the dynamic range of the other ELS detectors. Reducing the LED intensity eliminates the need to prepare samples at different concentrations.

Power Mode

The instrument can be configured from the front panel sub-menu (see “[Sub-Menu Screen](#)” on page 55), to start in either RUN or STANDBY mode when the unit is switched on via the rear power button.

To configure the Power Mode, select the required Status Mode (i.e. STANDBY or RUN) you wish the unit to start-up in from the sub menu screen (see “[Sub-Menu Screen](#)” on page 55). The selected option will take effect the next time the power is cycled. If RUN mode is selected as the desired Power mode, then the instrument will use the operating parameters stored in memory. In the unlikely event that the instrument encounters a fault during power-up the unit will automatically switch to STANDBY mode.

NOTE

All ELSD conditions are retained on power cycling of the ELSD detector.

General Considerations

The ELS Detector should be thought of as a detector like any other designed for liquid chromatography. The main distinguishing feature is the ability to evaporate the solvent from the column eluent. Therefore, normal system set-up precautions should be remembered when starting to use the instrument. Any solvent intended for use with the ELSD should be fully miscible with any previously used in the liquid chromatograph; if there is any uncertainty, then a mutually miscible solvent should be run through the system as an intermediate liquid. The sample loop should also be flushed with miscible solvent where necessary. The intended eluent should be thoroughly degassed, contain no non-volatile salts or material and should be fully compatible with the column(s). All connections should be made with zero dead volume fittings and tubing with an I.D. ϕ 0.254 mm (ϕ 0.010 in).

The ELSD requires nitrogen of purity >98 %, at an inlet pressure of 4.2 – 6.7 bar. If in-house nitrogen is not available, then we recommend the use of a nitrogen generator for a constant uninterrupted supply of high purity gas. Air can be used with non-flammable solvent systems. The eluent of choice should be fully volatile under the chosen detector parameters – any non-volatilized eluent will increase baseline noise and reduce sensitivity.

The ELS Detector is a destructive technique and must be placed last when used in series with other detectors.

Solvent Recommendations

Any solvent intended for use with the ELS Detector should be thoroughly degassed, filtered and fully compatible with the column(s). Solvents that are not properly degassed may cause problems at nebulization leading to a poor reproducibility.

Non-Volatile buffers are not compatible with the ELS Detector and should not be used.

Tetrahydrofuran (THF) stabilized with BHT, may increase the baseline noise level. Where possible unstabilized THF should be used with the ELS detector.

WARNING

Solvents with auto-ignition temperatures <190°C must not be used with the ELSD

Table 7 Auto-ignition temperatures of common GPC solvents with ELS detection

Solvent	Auto-ignition Temperature (°C)
Dibutoxymethane	220
Tetrahydrofuran	321
Dimethylsulphoxide	215
Toluene	530
Acetone	540
1,2,4 Trichlorobenzene (TCB)	570
m-Cresol	575
Chloronaphthelene	558

Sample Preparation

Samples containing particulate matter should be filtered through a 0.45 μm filter prior to injection.

Column Considerations

The ELS detector will detect all non-volatile components in the mobile phase, which includes column-packing material. Column packing material will become chemically and mechanically broken down over the lifetime of the column, causing particles to enter the ELSD. This column “shedding” will lead to extremely high baseline.

Transferring ELSD Temperature Methods

The direct transfer of ELSD operating conditions from the PL-ELS 1000 ELSD will not provide equivalent performance.

The HT-ELSD settings should be optimized according to the guidelines outlined in [“Operational Parameters”](#) on page 12.

4 Using the Module

General Considerations



5 Optimizing Performance

Do's and Don'ts of ELS Detection [44](#)

Location of the Detector Module [45](#)

Pumping systems [46](#)

Mobile phase priming [46](#)

Solvent recommendations [47](#)

This chapter gives hints on how to optimize the performance or use additional devices.



Do's and Don'ts of ELS Detection

CAUTION

Decreased performance

High pressures on the internal chamber will lead to increased baseline noise and low sensitivity.

- NEVER block the exhaust outlet.
 - NEVER allow the solvent waste outlet tube to become immersed in the waste solvent.
 - When placing more than one GPC detector in series, always place the ELS detector last.
 - Avoid excessive nebuliser gas flow rates as it can empty the nebulizer solvent trap
 - Only use volatile mobile phase additives.
-

Location of the Detector Module

Place the detector alongside your GPC system. The ELSD must be placed to the left-hand side of your GPC system due to the location and length of the heated transfer line.

Provide approximately four inches (10 cm) of space behind the unit so that the cooling fan intake is not impeded, and to allow easy access to the rear panel.

The ELS detector can be placed within 2 meters of an extraction unit, using the exhaust tube provided.

Pumping systems

It is recommended to use service and maintain your solvent delivery system to ensure minimize flow pulsation that would otherwise lead to nebulization problems. Inconsistent solvent flow will result in poor reproducibility.

A backpressure regulator maybe necessary on certain pumps with certain solvents in order to minimize pulsation. This can be achieved by the column itself or a coil of 0.127 mm (0.005 in) ID tubing placed between the pump and the column.

Mobile phase priming

The ELS detector does not require any mobile phase priming, other than that required to prime the solvent through the pump, damper, injector, column, etc. It is recommended that priming of the GPC system be performed without the ELS detector attached, to prevent non-volatile impurities contaminating the ELS detector.

Solvent recommendations

The thermal cut-off temperature of the detector and the auto-ignition temperature of the solvent will determine the type of solvents compatible with the HT-ELS detector (see table 7). GPC solvent shown below must not be used.

- Dimethylsulphoxide (DMSO)

Greater care and attention to instrument cleaning procedures should be exercised with these high boiling GPC solvents. It is recommended that any solvent be flushed from the detector for overnight and weekend storage.

5 **Optimizing Performance** Solvent recommendations



6 Troubleshooting and Diagnostics

Troubleshooting	50
Troubleshooting an GPC System	51
General Problems	52
Baseline noise	52
Baseline spikes	53
Low sensitivity	53
Spiky peak tops but flat baseline	54
Large Baseline offset	54
Peak tailing	54
Instrument Fails to zero	55
No power	55
No response (completely flat baseline)	56
Temperature error as soon as instrument powered on	56
Display not on, but power connected	57
Evaporator Temperature reads zero at start-up and cannot be changed	57
Vapor sensor error occurs, but there is no solvent or vapor leak inside unit	57
High back-pressure from detector	58

This chapter gives an overview about the troubleshooting and diagnostic features.

Troubleshooting

If a problem is encountered Agilent Technologies advises that the troubleshooting section should be followed first to resolve the problem. If there is an error or fault and you follow the recommended course of action and the result is not satisfactory, then please direct the matter to Agilent Technologies or your local distributor.

Malfunctions within the ELS Detector can arise from three general sources:

- The ELS Detector itself can be dirty or operating outside specification.
- The GPC system can have a broken, dirty, or non-optimally operating component, but the problem is manifesting itself in the ELS Detector.
- A mobile phase and/or column problem, which by its very nature is spread throughout the GPC system but appears as a malfunction of the ELS Detector.

To troubleshoot the ELS Detector, you must be able to separate the performance of the ELS Detector within the GPC system from its performance outside the GPC system. This section begins with guidelines for testing the ELS Detector as a stand-alone. See [“Module Specific Error Messages”](#) on page 91 for possible cause and suggested solution.

Troubleshooting a GPC System

Standard practice is to add one component at a time back into the GPC system so that the component causing the problem is easily identified if/when the condition reoccurs.

Begin troubleshooting by adding the pump to the ELS Detector first and finish by adding the column last. If another type of detector is available, use it before the ELS Detector to aid in troubleshooting.

General Problems

Baseline noise

Probable cause

- 1 Poor nebulisation
- 2 Insufficient evaporation
- 3 Non-volatile additive in mobile phase
- 4 Pressure difference created inside nebuliser chamber
- 5 Pump pulsations, especially in microbore applications where low flow rates are used

Suggested actions

Increase the temperature or gas flow of the nebulizer until the baseline noise decreases

- Decrease the nebulisation temperature
- Decrease the nebuliser gas flow rate

Use a volatile mobile phase as shown

- Ensure that the end of the liquid waste tube is not immersed in liquid
- Ensure that the exhaust tube at rear of unit is not blocked, or extraction is too strong
- Use a pulse free pump
- Increase the back pressure on the pump by fitting a back pressure column between the pump and the injection valve
- Use a pulse dampener directly after the pump in the system

Baseline spikes

Probable cause

- 1 Particulate matter in the gas supply
- 2 Column shedding
- 3 Poor nebulisation
- 4 Insufficient evaporation
- 5 Non-volatile additive in mobile phase

Suggested actions

Filter the incoming gas, or change the supply

Replace column or fit an inline filter with a 0.2 µm membrane filter directly after the column

- Check solvent flow rate into ELSD is constant
- Check inlet gas flow is >65 psi and stable

Decrease the nebulisation temperature

- Decrease the nebuliser gas flow rate

Replace additive in mobile phase with volatile buffer

Low sensitivity

Probable cause

- 1 Partial blockage in nebuliser or nebulizer inlet tube
- 2 Internal solvent trap is empty
- 3 Gas pressure too low
- 4 LED power too low
- 5 Optical chamber is contaminated
- 6 Light source power has decayed
- 7 Diffuser saturated with solvent

Suggested actions

Pump 1 ml/min TCB into ELSD at highest nebulizer temperature for several hours

Fill the front solvent trap with liquid until any excess flows out through front drain tube

Ensure inlet gas pressure >65 psi

Ensure LED power is set to 100 %

Clean or replace optical chamber

Replace light source

Stop the eluent flow and increase the evaporator temperature to maximum. Increase the Neb flow rate to maximum and wait 3 hours

Spiky peak tops but flat baseline

Probable cause	Suggested actions
1 Inconsistent nebulization	Check pump flow
2 Incorrect gas being used	Change gas to nitrogen or evaluate different nitrogen sources
3 Poor regulation of inlet gases	If using bottled gas, check that gas regulator is functioning correctly and giving consistent flow
4 Insufficient smoothing	The broader the peaks, the higher the smoothing value is required. Increase smoothing value.
5 Sample precipitation during nebulization	<ul style="list-style-type: none">• Reduce sample concentration• Increase transfer line and nebulizer temperature
6 Inconsistent pump flow rates	Check pump manual for troubleshooting

Large Baseline offset

Probable cause	Suggested actions
1 Inefficient evaporation	Increase the evaporator temperature and/or nebulizer gas flow
2 High concentration of non-volatile buffer or stabiliser	Use a lower concentration of stabiliser, unstabilised solvent or a more volatile buffer
3 Contaminated diffuser	Perform cleaning procedure
4 Optics Heater failed	Exchange optics heater

Peak tailing

Probable cause

- 1 Eluent particles lingering in the optical chamber
- 2 Poor chromatography

Suggested actions

- Increase evap gas flow rate
- Optimize GPC separation

Instrument Fails to zero

Probable cause

- 1 Offset too high or output unstable due to impurity in mobile phase

Suggested actions

- Stop pump flow and switch off unit. Restart unit and A/Z without liquid flowing
- If problem persists, please follow cleaning instructions
- Optical section contaminated and requires cleaning

No power

Probable cause

- 1 Mains lead not connected
- 2 Fuse failure
- 3 Power supply failure

Suggested actions

- Attach mains lead to socket and inlet on rear of instrument
- Replace fuse
- Call Agilent Service representative

No response (completely flat baseline)

Probable cause	Suggested actions
1 Data acquisition leads not connected	Ensure connectors to computer or integrator are sound
2 Light source inactive	Check LED is functioning correctly, by stopping solvent flow, cycling the power. Then reading the offset value in RUN mode
3 Output below 0 mV	Stop pump flow and A/Z without liquid Flowing
4 Instrument in STANDBY mode	Select RUN mode
5 Nebuliser or nebuliser inlet tube blocked	Manually syringe solvent into ELSD front Inlet port to remove obstruction

Temperature error as soon as instrument powered on

Probable cause	Suggested actions
1 Temperature probe fault or disconnected	<ul style="list-style-type: none">• Check RTD connections• If RTD connections are ok, check resistance across heater and thermal fuse. Replace if either are open circuit.

Display not on, but power connected

Probable cause

- 1 Instrument Power Supply
- 2 Faulty display

Suggested actions

- The power supply is faulty and needs replacing.
- Replace display

Evaporator Temperature reads zero at start-up and cannot be changed

Probable cause

- 1 Faulty Evaporator assembly

Suggested actions

- Replace evaporator assy

Vapor sensor error occurs, but there is no solvent or vapor leak inside unit

Probable cause

- 1 Solvent vapor near the front of unit is being drawn into the unit
- 2 Faulty Vapor sensor

Suggested actions

- Remove any solvent bottle or solvent leak that is directly in front of the detector
- Check the rear vapor sensor is not damaged/bent

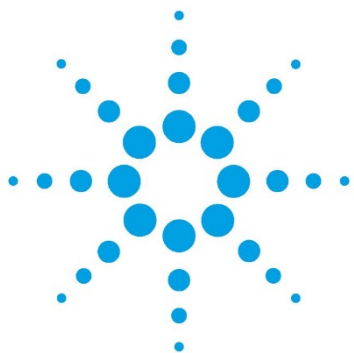
High back-pressure from detector

Probable cause

- 1 Nebuliser or nebuliser inlet tube blocked

Suggested actions

Replace inner nebulizer capillary



7 Error Information

What Are Error Messages	60
Module Specific Error Messages	61
Internal temperature exceeded lower limit	61
Internal temperature exceeded upper limit	61
On-board Vapor sensor failed	62
Rear Vapor sensor failed	62
Vapor detected	62
Leak detected	63
Fan Failed	63
Fan Stopped	64
Nebulizer temperature limit exceeded	64
Evaporator temperature limit exceeded	64
LED light source error	64
Nebuliser gas flow rate limit exceeded	65
Invalid Nebulizer temperature	65
Invalid Evaporator temperature	66
Nebuliser Under Current	66
Nebuliser Over Current	67
Leak Sensor failed	67
Transfer Line Limit Exceeded	67
Invalid Transfer Line Temperature	68
Evaporator Failed to Reach Temperature	68
Nebuliser Failed to Reach Temperature	6-
Transfer Line Failed to Reach Temperature	+\$
Transfer Line Under Current	70
Transfer Line Over Current	7%
Transfer Line Readout Error	71

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



What Are Error Messages

Error messages are displayed on the front panel of the detector when an electronic, mechanical, or hydraulic (flow path) failure occurs which requires attention before the analysis can be continued (for example, repair, or exchange of consumables is necessary).

Module Specific Error Messages

The following errors are detector specific.

Internal temperature exceeded lower limit

Error ID: 10

Air temperature inside the instrument is $d10\text{ }^{\circ}\text{C}$

Probable cause

- 1 The environmental temperature is outside the specified operating limits of the instrument

Suggested actions

- Increase ambient temperature where detector is located
- Move the detector to a warmer location

Internal temperature exceeded upper limit

Error ID: 11

Air temperature inside the instrument is $>40\text{ }^{\circ}\text{C}$

Probable cause

- 1 The environmental temperature is outside the specified operating limits of the instrument

Suggested actions

- Decrease ambient temperature where detector is located
- Move the detector to a cooler location

On-board Vapor sensor failed

Error ID: 12

The vapor sensor located on the main control board has failed.

Probable cause

Suggested actions

- | | |
|--|--|
| 1 Vapor sensor not connected to the main board | Ensure the vapor sensor is connected correctly |
| 2 Defective vapor sensor | Exchange the vapor sensor |

Rear Vapor sensor failed

Error ID: 13

The vapor sensor located on the rear panel of the module has failed.

Probable cause

Suggested actions

- | | |
|--|--|
| 1 Vapor sensor not connected to the main board | Ensure the vapor sensor is connected correctly |
| 2 Defective vapor sensor | Exchange the vapor sensor |

Vapor detected

Error ID: 14

Solvent vapor threshold exceeded inside module.

Probable cause

Suggested actions

- | | |
|--|---|
| 1 External vapor being drawn into unit | Remove any source of solvent vapors close to the module |
| 2 Solvent leak inside unit | Clean or exchange the nebuliser |
| 3 Exhaust tube not fitted | Fit black exhaust tube |

Leak detected

Error ID: 15

A leak was detected inside the module.

Probable cause

- 1 Loose nebuliser fittings
- 2 Blocked nebuliser causing leak at capillary fittings

Suggested actions

- Ensure all nebuliser fittings are tight
- Clean or exchange the nebuliser

Fan Failed

Error ID: 16

Thermal shut-down of the main cooling fan

Probable cause

- 1 Fan cable disconnected.
- 2 Defective fan.
- 3 Defective main board.

Suggested actions

- Ensure the fan is connected correctly.
- Exchange fan.
- Exchange the main board.

Fan Stopped

Error ID: 17

A main cooling fan in the module has stopped

Probable cause

- 1 Obstruction of fan blades
- 2 Defective fan.
- 3 Defective main board.

Suggested actions

- Ensure the fan is not mechanically blocked
- Exchange fan.
- Exchange the main board.

Nebulizer temperature limit exceeded

Error ID: 18

Nebuliser temperature exceeded threshold after stabilizing

Probable cause

- 1 Defective thermocouple
- 2 Defective nebuliser heater
- 3 Defective heater board.

Suggested actions

- Exchange the nebuliser heater assembly
- Exchange the nebuliser heater assembly
- Exchange the heater board.

Evaporator temperature limit exceeded

Error ID: 19

Evaporator temperature exceeded threshold after stabilizing

Probable cause

- 1 Defective thermocouple
- 2 Defective evaporator heater assembly
- 3 Defective main board.

Suggested actions

- Exchange the evaporator heater assembly
- Exchange the evaporator heater assembly
- Exchange the main board.

LED light source error

Error ID: 20

The LED light source has failed

Probable cause

- 1 Light source not connected to mainboard
- 2 Defective LED light source

Suggested actions

- Ensure the light source is connected correctly
- Exchange the light source assembly

Nebuliser gas flow rate limit exceeded

Error ID: 21

Evaporator gas flow rate exceeded threshold after stabilizing

Probable cause

- 3 Insufficient gas inlet pressure
- 4 Defective mass flow controller

Suggested actions

- Ensure the gas inlet pressure is above 60 psi
- Exchange the mass flow controller

Invalid Nebulizer temperature

Error ID: 22

Invalid nebulizer temperature reading

Probable cause

- 1 Nebulizer heater not connected to the main board
- 2 Defective nebuliser heater

Suggested actions

- Ensure the nebuliser heater is connected correctly
- Exchange the nebuliser heater assembly

Invalid Evaporator temperature

Error ID: 23

Invalid evaporator temperature reading

Probable cause

- 1 Evaporator heater not connected to the main board
- 2 Defective evaporator heater

Suggested actions

- Ensure the evaporator heater is connected correctly
- Exchange the evaporator heater assembly

Nebuliser Under Current

Error ID: 24

Nebuliser under current

Probable cause

- 1 Nebuliser heater no connected to heater PCA
- 2 Defective nebuliser heater assembly
- 3 Defective heater PCA

Suggested actions

- Ensure the nebuliser is connected correctly
- Exchange nebuliser assembly
- Exchange heater PCA

COMMENT

(24V rail).

Could be caused by open-circuit heater, open thermal fuse or open fuse on heater board

Nebuliser Over Current

Error ID: 25

Nebuliser over current

Probable cause

- 1 Defective nebuliser heater
- 2 Defective heater PCA

Suggested actions

- Exchange nebuliser assembly
- Exchange heater PCA

COMMENT

Could be caused by short-circuit heater or heater too low resistance. Nebuliser uses small 24V cartridge heater in nebuliser assembly.

Leak Sensor failed

Error ID: 30

The leak sensor in the module has failed.

Probable cause

- 1 Leak sensor not connected to the main board.
- 2 Defective leak sensor.
- 3 Defective main board.

Suggested actions

- Ensure the leak sensor is connected correctly.
- Exchange the leak sensor.
- Exchange the main board.

Transfer Line limit exceeded

Error ID: 31

Transfer line exceeded threshold after stabilizing

Probable cause

- 1 Defective thermocouple
- 2 Defective nebuliser heater

Suggested actions

- Exchange the transfer line assembly
- Exchange the transfer line assembly

7 Error Information

Module Specific Errors Messages

- | | |
|---------------------------|---------------------------|
| 3 Defective heater board. | Exchange the heater board |
|---------------------------|---------------------------|

Invalid Transfer Line Temperature

Error ID: 32

Invalid transfer line reading

Probable cause

- 1 Transfer line not connected to the heater board
- 2 Defective transfer line assembly

Suggested actions

- Ensure the nebuliser heater is connected correctly
- Exchange the nebuliser heater assembly

Evaporator Failed to Reach Temperature

Error ID: 33

Evaporator failed to reach temperature within allotted time

Probable cause

- 1 Evaporator heater not connected to main PCA
- 2 Defective evaporator heater assembly

Suggested actions

- Ensure the evaporator heater is connected correctly
- Exchange the evaporator heater assembly

COMMENT

evaporator heater.

Could be caused by open-circuit heater or open thermal fuse. Standard mains powered

Nebuliser Failed to Reach Temperature

Error ID: 34

Nebuliser failed to reach temperature within allotted time

Probable cause

- 1 Nebuliser heater not connected to heater PCA.
- 2 Defective nebuliser assembly
- 3 Defective heater PCA

Suggested actions

Ensure the nebuliser heater is connected correctly
Exchange nebuliser assembly
Exchange heater PCA

COMMENT

In the case of open-circuit heater or open thermal fuse, you would most likely get an under-current error before this.

Perhaps only scenarios to get this error is if there is bad thermal coupling between heater and nebuliser RTD, or wrong heater resistance (doesn't get hot enough), or something wrong with the heater PCA.

Transfer Line Failed to Reach Temperature

Error ID: 35

Transfer line failed to reach temperature within allotted time

Probable cause

- 1 Transfer line not connected to the heater PCA
- 2 Defective transfer line
- 3 Defective heater PCA

Suggested actions

- Ensure the transfer line is connected correctly
- Exchange transfer line
- Exchange heater PCA

COMMENT

In the case of open-circuit heater or open thermal fuse, you would most likely get an under-current error before this. Perhaps only scenarios to get this error is if there is bad thermal coupling between transfer line heater and RTD, or wrong heater resistance (doesn't get hot enough), or something wrong with the heater PCA.

Transfer Line Under Current

Error ID: 36

Transfer line failed to reach temperature within allotted time

Probable cause

- 1 Transfer line not connected to heater PCA
- 2 Defective transfer line
- 3 Defective heater PCA

Suggested actions

- Ensure the transfer line is connected correctly
- Exchange transfer line
- Exchange heater PCA

COMMENT

Could be caused by open-circuit heater, open thermal fuse or open fuse on heater board (24V rail).

Transfer Line Over Current

Error ID: 37

Transfer line over current

Probable cause

- 1 Defective transfer line
- 2 Defective heater PCA

Suggested actions

- Exchange transfer line
- Exchange heater PCA

COMMENT

Could be caused by short-circuit heater or heater too low resistance.

Heater PCA (for Transfer Line and Neb heater) communications

Error ID: 38

Unable to get a readout from the transfer line or neb heater assembly.

Probable cause

- 1 Transfer line not connected
- 2 Defective transfer line
- 3 Defective Heater Board

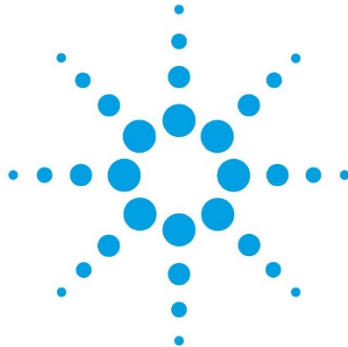
Suggested actions

- Ensure the transfer line is connected correctly
- Exchange the transfer line assembly
- Exchange the heater board

COMMENT

Caused by SPI communications failure between main PCA and heater PCA. Could be caused if heater PCA does not have all power supply rails present to function properly. Could be caused by heater PCA firmware not running.

7 Error Information
Module Specific Errors Messages



8 Maintenance and Repair

Introduction to Maintenance	74
Cautions and Warnings	75
Cleaning the Module	77
Inspection of Cables	78
Cleaning the Nebuliser	78
Cleaning Evaporator Tube	79
Putting the Instrument into Storage	80

This chapter describes the maintenance of the ELSD.



Introduction to Maintenance

Trained personnel only should carry out maintenance inside the unit. There are no user serviceable parts inside the instrument. Unauthorized access to the instrument will invalidate the instrument warranty.

Information for Service Personnel

Please note that this instrument is double fused.

The following fuses are fitted:

- 2x T2A H 250 V

Cautions and Warnings

WARNING

The module is partially energized when switched off, as long as the power cord is plugged in.

Repair work at the module can lead to personal injuries, e.g. electrical shock, when the cover is opened and the module is connected to power.

- Always unplug the power cable before opening the cover.
 - Do not connect the power cable to the instrument while the covers are removed.
-

WARNING

Solvents with auto-ignition temperatures <190°C must not be used with the ELSD

- Always use solvents with auto-ignition temperatures above 190°C
-

WARNING

Toxic, flammable and hazardous solvents, samples and reagents

The handling of solvents, samples and reagents can hold health and safety risks.

- When working with these substances observe appropriate safety procedures (for example by wearing goggles, safety gloves and protective clothing) as described in the material handling and safety data sheet supplied by the vendor, and follow good laboratory practice.
 - The volume of substances should be reduced to the minimum required for the analysis.
 - Do not operate the instrument in an explosive atmosphere.
-

WARNING

Eye discomfort

The light source in the G7826A ELSD is a Class 1 LED product. Temporary discomfort may result from directly viewing the light produced by this source.

- Do not look direct into the beam.
-

WARNING

Fire and damage to the module

Wrong fuses

- Make sure that only fuses with the required rated current and of the specified type (super-fast, fast, time delay etc) are used for replacement.
 - The use of repaired fuses and the short-circuiting of fuse-holders must be avoided.
-

CAUTION

Electronic boards and components are sensitive to electrostatic discharge (ESD). ESD can damage electronic boards and components.

- Be sure to hold the board by the edges, and do not touch the electrical components. Always use ESD protection (for example, an ESD wrist strap) when handling electronic boards and components.
-

Cleaning the Module

The exterior of the instrument should be cleaned by wiping down with a soft cloth moistened with dilute detergent solution, followed by wiping down with a cloth moistened with deionized water. Ensure that no moisture enters the instrument.

WARNING

Electrical shock and burns

Liquid in the module electronics can cause shock hazard and damage the module.

- Switch off and disconnect power cord from instrument before cleaning.
 - Do not use an excessively damp cloth during cleaning.
 - Drain all solvent lines before opening any fittings.
 - Allow the instrument to dry off completely before reconnecting power.
-

Inspection of Cables

Periodically inspect the connecting cables for signs of physical damage caused by abrasion, solvent spillage, impact etc.

Replace damaged cables, particularly the power cord, if any damage is observed.

Cleaning the Nebuliser

A loss of sensitivity is a common indicator that the nebuliser requires cleaning. Flushing can remove partial blockages. Therefore, it is recommended to initially flush the instrument with a suitable solvent (for example trichlorobenzene).

The most common cause of nebuliser blockage is precipitation of sample. This blockage occurs either at the nebuliser tip or the inlet capillary within the nebuliser.

To clean the nebuliser, the following procedure is recommended.

- 1** Put the ELSD into RUN mode.
- 2** Set the transfer line and nebuliser temperatures to 160 °C and the gas flow to 0.4 SLM.
- 3** Set pump flow rate to 1.0 mL/min.
- 4** Remove the column, select a suitable solvent (for example Trichlorobenzene) and pump for 3 h or set pump flow rate to 0.2 mL/min and run overnight.

NOTE

To prevent a sudden increase in pressure, slowly ramp up the flow rate as high as possible.

NOTE

If it is not possible to pump solvent into the ELSD to clear the blockage, then the inner nebulizer capillary must be exchanged.

Cleaning Evaporator Tube

If the evaporator tube becomes contaminated with non-volatile material resulting in poor chromatography, it is recommended that the instrument is initially washed with a solvent suitable for the contamination (e.g. TCB)

Depending on usage, it is recommended to clean the evaporator tube once a week or every 40 h of use as a preventative routine. It is also recommended to clean the unit following the use of buffers. If cleaning the unit does not cure the problems then consult Agilent Technologies for further assistance.

NOTE

Do not use solvents that contain additives when performing the cleaning procedure.

NOTE

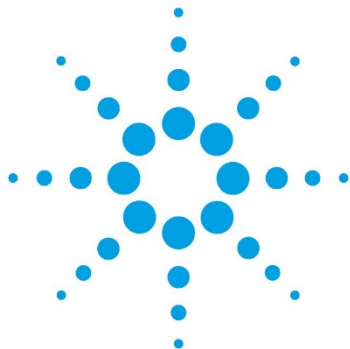
Ensure that the instrument is at equilibrium under the above conditions before leaving the instrument unattended.

- 1 Set the evaporator temperature to 120 °C, the nebuliser temperatures at 160 °C and the gas flow to 0.2 SLM.
- 2 Pump the “cleaning” solvent into the instrument at 1 – 2 mL/min, (whilst in the RUN mode) overnight or for a minimum of 4 h if overnight operation is not possible.

Putting the Instrument into Storage

If the instrument is to be stored or not used for an extended period of time it is recommended to follow the procedure outlined below:

- 1** Flush the detector with Acetone at 1 mL/min for 15 min.
- 2** Allow the instrument to cool to ambient temperature in STANDBY mode with the gas supply still connected.
- 3** Tip the instrument forwards to try and empty the solvent within the nebulization chamber through the front waste tube (i.e. into the bottle).
- 4** Pour 10 – 20 mL of acetone into the rear exhaust tube to flush out the internal solvent trap, collecting any overflow of acetone at the front solvent pipe.
- 5** Repeat step 3 to drain the acetone.
- 6** Disconnect the waste bottle.
- 7** Using the gas supply, blow nitrogen gas through the exhaust to evaporate any remaining acetone in the solvent trap. Cover the waste tube with tissue paper to collect any acetone residue.
- 8** Plug the exhaust, waste tubes and solvent inlet with the plastic caps provided.



9

Parts and Materials for Maintenance

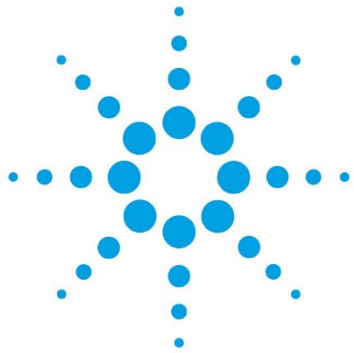
Identifying Parts and Materials 84

This chapter provides information on parts for maintenance.



Identifying Parts and Materials

p/n	Description
PL0890-0300	Analogue Output Cable
PL0890-0305	Gas Inlet Tube (2m)
PL0890-0310	Rear exhaust Hose (PVC-2.0m)
PL0890-0315	Solvent waste Hose (Tygon) 7cm
PL0890-0325	RS232 Communication Cable
PL0890-0350	Remote Start Cable (3rd party for Dimension)
G4261-63000	Solvent Waste Tube
PL0890-0425	Gas Inlet Assembly
PL0890-0435	Front Outlet Tube
PL0890-0495	Exhaust Tube
PL0890-0500	Exhaust Waste tube
PL0890-0555	Nebuliser Waste Tube
PL0890-0635	Mains Inlet Fuses (pk 5)
PL0890-0640	ELSD Air Adapter Kit
G4260-63001	ELSD Inject Synch cable
G7826-60300	Power Cable Extension



10 Appendix

General Safety Information	84
The Waste Electrical and Electronic Equipment Directive	87
Radio Interference	88
Agilent Technologies on Internet	89








This chapter provides addition information on safety, legal and web.



General Safety Information

Safety Symbols

Table 10 Safety Symbols

Symbol	Description
	The apparatus is marked with this symbol when the user should refer to the instruction manual in order to protect risk of harm to the operator and to protect the apparatus against damage.
	Indicates dangerous voltages.
	Indicates a protected ground terminal.
	The apparatus is marked with this symbol when hot surfaces are available and the user should not touch it when heated up.
	External Laser warning label located on rear of detector
	Internal Laser warning label located on light source
	Internal Laser beam label located on light source

WARNING

A WARNING

alerts you to situations that could cause physical injury or death.

→ 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 loss of data, or damage of equipment.

→ Do not proceed beyond a caution until you have fully understood and met the indicated conditions.

General 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.

WARNING

Ensure the proper usage of the equipment.

The protection provided by the equipment may be impaired.

→ The operator of this instrument is advised to use the equipment in a manner as specified in this manual.

Safety Standards

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 fuse holders 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 whenever possible. When inevitable, this has to 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.

When working with solvents, observe appropriate safety procedures (for example, 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.

The Waste Electrical and Electronic Equipment Directive

Abstract

The Waste Electrical and Electronic Equipment (WEEE) Directive (2002/96/EC), adopted by EU Commission on 13 February 2003, is introducing producer responsibility on all electric and electronic appliances starting with 13 August 2005.

NOTE

This product complies with the WEEE Directive (2002/96/EC) marking requirements. The affixed label indicates that you must not discard this electrical/electronic product in domestic household waste.

Product Category:

With reference to the equipment types in the WEEE Directive Annex I, this product is classed as a Monitoring and Control Instrumentation product.



NOTE

Do not dispose off in domestic household waste

To return unwanted products, contact your local Agilent office, or see www.agilent.com for more information.

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 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.

Agilent Technologies on Internet

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<http://www.agilent.com>

www.agilent.com

In This Book

This manual contains information on the Agilent 1260 Infinity II High Temperature Evaporative Light Scattering Detector (G7826A)

The manual describes the following:

- Introduction
- Site Requirements and Specifications
- Installation
- Using
- Optimizing
- Troubleshooting and Diagnostics
- Error Information
- Maintenance
- Parts
- Safety

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