



**VARIAN**

Varian, Inc.  
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Mulgrave, Victoria, 3170  
Australia

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# **ProStar 325 UV-Vis Detector**

## **Operation Manual**

**Overvoltage category II**

**Pollution degree 2**

**Safety class 1 (EN61010-1)**



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First published June 2003 in Australia. Updated August 2003, April 2004, November 2005. Comments about this manual should be directed to the Marketing Communications Manager, Varian Australia at the above address or by e-mail to [osi\\_webmaster@varianinc.com](mailto:osi_webmaster@varianinc.com).

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## Declaration of Conformity

We hereby declare that the equipment listed below complies with the requirements of:

The Low Voltage Directive 73/23/EEC (93/68/EEC)

The EMC Directive 89/336/EEC (92/31/EEC and 93/68/EEC)

### Applicable Standards

LVD	IEC 61010-1:1990		
EMC	EN 61326:1997 A2:2001	IEC/CISPR 11:1999	EN 61000-3-2:1995 A14:2000
	EN 61000-3-3:1995 A1:2001	BS EN 61000-4-2:1995	EN 61000-4-3:2002
	BS EN 61000-4-4:1995	EN 61000-4-5:1995 A1:2001	EN 61000-4-6:1996 A1:2001
	BS EN 61000-4-11:1994		

Equipment Model Number      ProStar 325 LC Detector Series

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# Safety information

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## Operating Instructions

This instruction manual is provided to help you establish operating conditions which will permit safe and efficient use of your equipment. Special considerations and precautions are also described in the manual, which appear in the form of NOTES, CAUTIONS, and WARNINGS as described below. It is important that you operate your equipment in accordance with this instruction manual and any additional information which may be provided by Varian. Address any questions regarding the safe and proper use of your equipment to your local Varian office.

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NOTE:	Information to aid you in obtaining optimal performance from your instrument.
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### CAUTION

**Alerts you to situations that may cause moderate injury and/or equipment damage, and how to avoid these situations.**

### WARNING

**Alerts you to potentially hazardous situations that could result in serious injury, and how to avoid these situations.**

Warnings are accompanied by a triangular symbol indicating the type of warning.

## Warning Symbol



**WARNING:**  
**SHOCK HAZARD**



**WARNING:**  
**CHEMICAL HAZARD**



**WARNING:**  
**BURN HAZARD**



**WARNING:**  
**EYE HAZARD**



**WARNING:**  
**FIRE HAZARD**



**WARNING:**  
**EXPLOSION HAZARD**



**WARNING:**  
**RADIATION SOURCE**



**WARNING:**  
**MOVING PARTS**



**WARNING:**  
**HEAVY WEIGHT**

## Warning Description

Hazardous voltages are present inside instrument. Disconnect from main power before removing screw-attached panels.

Hazardous chemicals may be present. Avoid contact, especially when replenishing reservoirs. Use proper eye and skin protection.

Very hot or cryogenically cold surfaces may be exposed. Use proper skin protection.

Eye damage could occur either from flying particles, chemicals, or UV radiation. Use proper eye and face protection.

The potential for fire may be present. Follow manual instructions for safe operation.

The potential for explosion may exist because of type of gas or liquid used.

Ionizing radiation source is present. Follow manual instructions for safe operation.

Keep hands and fingers away.

A heavy object is present. Avoid back strain or injury by following all precautions for lifting heavy objects.







The following symbol may be used on warning labels attached to the instrument. When you see this symbol you must refer to the relevant operation or service manual for the correct procedure referred to by that warning label.



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## Information symbols

The following symbols appear on the ProStar 325 to provide you with additional information:

- I Mains power on
- O Mains power off
-  Single phase alternating current
-  Fuse
-  Appears on the rear of the product to indicate that the product complies with the requirements of one or more EU Directives.
-  Appears on the rear of the product to indicate that the product has been certified (evaluated) to CSA 1010.1-92 and UL 61010A-1.

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## General Safety Precautions

Follow these safety practices to ensure safe equipment operation.

- Perform periodic leak checks on all supply lines and pneumatic plumbing.
- Do not allow gas lines to become kinked or punctured. Place lines away from foot traffic and extreme heat or cold.
- Store organic solvents in fireproof, vented and clearly labeled cabinets so they are easily identified as toxic and/or flammable materials.
- Do not accumulate waste solvents. Dispose of such materials through a regulated disposal program and not through municipal sewage lines.

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NOTE:	This instrument has been tested per applicable requirements of EMC Directive as required to carry the European Union CE Mark. This equipment may be susceptible to radiation/interference levels or frequencies which are not within the tested limits.
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### WARNING

This instrument is designed for chromatographic analysis of appropriately prepared samples. It must be operated using appropriate gases and/or solvents and within specified maximum ranges for pressure, flows, and temperatures as described in this manual. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

### WARNING

It is the responsibility of the Customer to inform Varian Customer Support Representatives if the instrument has been used for the analysis of hazardous biological, radioactive, or toxic samples, prior to any instrument service being performed or when an instrument is being returned to the Service Center for repair.

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## Electrical Hazards

- Disconnect the instrument from all power sources before removing protective panels to avoid exposure to potentially dangerous voltages. Panels or covers which are retained by screws on the detector may be opened ONLY by Varian-trained, Varian-qualified, or Varian-approved Customer Service Representatives. Consult the manuals or product labels supplied with your PC to determine which parts are operator-accessible.
- When it is necessary to use a non-original power cord plug, make sure the replacement cord adheres to the color coding and polarity described in the manual and all local building safety codes.
- Good grounding/earthing is essential to avoid a potentially serious electric shock hazard. Ensure that there is an integral ground connection between the metal base of the detector and the 3 pin earth-grounded receptacle. Consult the manuals or product labels supplied with your PC for the relevant grounding requirements.
- Replace blown fuses with fuses of the size and rating shown on the fuse panel or in the manual.
- Replace faulty or frayed power cords immediately with the same type and rating.
- Make sure that voltage sources and line voltage match the value for which the instrument is wired.
- Avoid using power supplies from a source that may be subject to electrical or RF interference from other services (for example, large electrical motors, elevators and welders).

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## Compressed Gas Cylinders

- Store and handle compressed gases carefully and in strict adherence to safety codes.
- Secure cylinders to an immovable structure or wall.
- Store and move cylinders in an upright, vertical position. Before transport, remove regulators and install cylinder cap.
- Store cylinders in a well ventilated area away from heat, direct sunshine, freezing temperatures, and ignition sources.

- Mark cylinders clearly so there is no doubt as to their contents.
- Use only approved regulators and connections.
- Use only connector tubing that is chromatographically clean (Varian part number 0391832600) and has a pressure rating significantly greater than the highest outlet pressure from the regulator.

---

## **GC Safety Practices**

### ***Exhaust System***

No special exhaust ducting is necessary for GC detectors installed in a well ventilated room except when the detectors are used to test hazardous chemicals. If you do install ducting:

- Use only fireproof ducting.
- Install a blower at the duct outlet.
- Locate duct intakes such that their vibration or air movement does not affect detector operation.
- Check periodically for proper operation of the duct.
- Ensure proper ventilation in lab area.

### ***Radioactive Source Detectors***

- Read carefully and comply with all NOTES, CAUTIONS, and WARNINGS in the Ni63 ECD manual.
- Perform the tests for removable radioactive contamination described in the Ni63 ECD manual.
- Comply with leak test schedules and procedures.

### ***Burn Hazard***

Heated or cryogenically cooled zones of gas chromatographs can remain hot or cold for a considerable time after instrument power is turned off. To prevent painful burns, ensure that all heated or cooled areas have returned to room temperature or wear adequate hand protection before you touch potentially hot or cold surfaces.

## LC Safety Practices

### ***High Pressure Hazard***

If a line ruptures, a relief device opens, or a valve opens accidentally under pressure, potentially hazardous high liquid pressures can be generated by the pump causing a high velocity stream of volatile and/or toxic liquids.

- Wear face protection when you inject samples or perform routine maintenance.
- Never open a solvent line or valve under pressure. Stop the pump first and let the pressure drop to zero.
- Use shatter-proof reservoirs capable of operating at 50/60 psi.
- Keep the reservoir enclosure closed when the reservoir is under pressure.
- Read and adhere to all NOTES, CAUTIONS, and WARNINGS in the manual.

### ***Flash Chromatography***

The operator should be familiar with the physico-chemical properties of the components of the mobile phase.

Keep solvents from direct contact with the polyurethane supply tubing as certain solvents will cause weakening and leaks with possible bursting.

All components of the system should be connected to a common power supply and common ground. This ground must be a true ground rather than a floating ground.

Non-polar solvents can develop a static charge when pumped through the system. All vessels that contain mobile phase (including tubing and collection vessels) must be grounded to dissipate static electricity.

Employ static measuring and static discharge devices (e.g., air ionizers) to safeguard against the buildup of static electricity.

## ***Ultraviolet Radiation***

Liquid chromatograph detectors that use an ultraviolet light source have shielding to prevent radiation exposure to personnel.

For continued protection:

- Ensure that protective lamp covers of variable and fixed wavelength detectors are in place during operation.
- Do not look directly into detector fluid cells or at the UV light source. When inspecting the light source or fluid cell, always use protective eye covering such as borosilicate glass or polystyrene.
- Ozone can be generated by radiation from the source lamps. Exposure to ozone can result in severe irritation to the skin, eyes, and upper respiratory system. The maximum permissible exposure level is 0.1 ppm (0.2 mg/m<sup>3</sup>). ALWAYS ventilate the area surrounding the detector such that the concentration of ozone does not exceed the maximum permissible level. All venting must be to outside air, never within the building.

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## **Federal Communications Commission advisory**

The following is a Federal Communications Commission advisory:

### **CAUTION**

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

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## CE compliant products

Your ProStar 325 UV-Vis detector has been designed to comply with the requirements of the Electromagnetic Compatibility (EMC) Directive and the Low Voltage (electrical safety) Directive (commonly referred to as the LVD) of the European Union.

Varian has confirmed that the product complies with the relevant Directives by testing a prototype against the prescribed EN (European Norm), IEC or CISPR standards.

Proof that the product complies with the Directives is indicated by:

- The CE marking appearing on the rear of the product.
- The documentation package that accompanies the product containing a copy of the Declaration of Conformity. This Declaration is the legal declaration by Varian that the product complies with the Directives, and also shows the standards to which the product was tested to demonstrate compliance. It is also signed by Varian's Authorized Representative in the EU, and by the representative of the manufacturing plant.

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## Spare Parts Availability

It is the policy of Varian to provide operational spare parts for any instrument and major accessory for a period of five (5) years after shipment of the final production run of that instrument. Spare parts will be available after this five (5) year period but on an as available basis. Operational spare parts are defined as those individual electrical or mechanical parts that are susceptible to failure during their normal operation. Examples include relays, lamps, temperature probes, detector elements, motors, etc. Sheet metal parts, structural members or assemblies and castings, printed circuit boards, and functional modules are normally capable of being rebuilt to like-new condition throughout their useful life and therefore will be supplied only on an as available basis after the final production run of the instrument.

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## Service Availability

Varian provides a variety of services to support its customers after warranty expiration. Repair service can be provided by attractively priced service contracts or on a time and material basis. Technical support and training can be provided by qualified personnel on both a contractual or as-needed basis.

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## Varian, Inc. Analytical Instruments Sales Offices

For Sales or Service assistance and to order Parts and Supplies, contact your local Varian office.

**Argentina**

Buenos Aires  
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Tel. +61.3.9566.1134

**Austria**

Vösendorf bei Wien  
Tel. +43.1.699.9669

**Benelux**

Bergen Op Zoom  
Tel. +31.164.282.800

**Brazil and****Latin America (S)**

São Paulo  
Tel. +55.11.820.0444

**Canada**

Mississauga, Ontario  
Tel. 800.387.2216

**China**

Beijing  
Tel. +86.106209.1727

**Europe**

Middelburg, The Netherlands  
Tel. +31.118.671.000

**France**

Les Ulis Cédex  
Tel. +33.1.6986.3838

**Germany**

Darmstadt  
Tel. +49.6151.7030

**India**

Mumbai  
Tel. +91.22.857.0787/88/89

**Italy**

Torino  
Tel. +39.011.997.9111

**Japan**

Tokyo  
Tel. +81.3.5232.1211

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Mexico City  
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**Russian Federation**

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# Instrucciones de Seguridad

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## Instrucciones de Operación

Este Manual de Instrucciones está diseñado para ayudarle a establecer las condiciones de operación que le permitan operar su instrumento de forma segura y eficaz. Así mismo, se describen consideraciones especiales ó precauciones, que aparecen en forma de NOTA, PRECAUCION, y ATENCION como se indica más abajo. Es importante que utilice el instrumento de acuerdo con este Manual de Operación y cualquier otra información que le proporcione Varian. Remita a la Oficina Local de Varian cualquier cuestión que tenga respecto al correcto uso de su equipo.

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NOTA: Información para ayudarle a obtener unas prestaciones óptimas de su instrumento.

---

### **PRECAUCION!**

**Le alerta de situaciones que pueden causar daños moderados a la salud ó al equipo, y cómo evitar esas situaciones.**

### **ATENCION**

**Le alerta de potenciales situaciones peligrosas que pueden causar serios daños, y cómo evitar esas situaciones.**

## **Símbolo**



**ATENCIÓN**  
**PELIGRO DE**  
**DESCARGA ELÉCTRICA**



**ATENCIÓN**  
**PELIGRO QUÍMICO**



**ATENCIÓN**  
**PELIGRO DE**  
**QUEMADURAS**



**ATENCIÓN**  
**PELIGRO PARA LOS OJOS**



**ATENCIÓN**  
**PELIGRO DE FUEGO**



**ATENCIÓN**  
**PELIGRO DE EXPLOSIÓN**



**ATENCIÓN**  
**PELIGRO DE RADIACIÓN**



**ATENCIÓN**  
**PARTES EN MOVIMIENTO**

## **Descripción**

El instrumento utiliza voltajes peligrosos. Desconecte el interruptor general antes de retirar los paneles atornillados.

Peligro de productos químicos. Evite el contacto, especialmente cuando rellene los depósitos. Utilice protección de ojos y piel.

Superficies posiblemente calientes ó frías (criogénico). Utilice protección para la piel.

Las partículas volátiles, productos químicos o radiación UV pueden causar daños en los ojos. Usar las debidas protecciones para la cara y los ojos.

Peligro potencial de fuego. Siga las instrucciones del Manual de Operación para su seguro funcionamiento.

Peligro potencial de explosión debido al tipo de gas ó líquido empleado.

Peligro por Fuente de radiación. Siga las instrucciones del Manual de Operación para su seguro funcionamiento.

Mantenga alejados los dedos y las manos.

---

## Precauciones Generales de Seguridad

Siga estas indicaciones de seguridad para una correcta operación del equipo.

- Realice verificaciones periódicas de fugas en todas las líneas de suministro y tuberías.
- No permita que las líneas de gas se doblen ó pinchen. Manténgalas alejadas de zonas de paso y del calor ó frío excesivo.
- Guarde los disolventes orgánicos en cabinas ventiladas, a prueba de fuego, y etiquetadas para que puedan ser fácilmente identificadas como material tóxico y/ó inflamable.
- No acumule disolventes inservibles. Deseche todo el material inservible a través de un programa especial de desechos y no a través del sistema convencional.

**NOTA:** Este instrumento ha sido testado bajo las normas de la Directiva EMC según requerimientos de la Marca CE de la Unión Europea. Por lo tanto, este equipo puede ser sensible a niveles de radiaciones / interferencias ó frecuencias que no estén incluidas dentro de los límites testados.

**ATENCION** Este instrumento está diseñado para análisis cromatográfico de muestras preparadas apropiadamente. Debe ser operado usando gases y/ó disolventes apropiados y con unos niveles máximos de presión, flujos y temperaturas, según se describe en este manual.

**ATENCION** El Usuario tiene la obligación de informar al Servicio Técnico de Varian cuando el instrumento vaya a ser empleado para análisis de muestras peligrosas de origen biológico, radioactivo ó tóxico, antes de comenzar a realizar cualquier análisis.

---

## **Peligros Eléctricos**

- Desconecte el instrumento de todas las conexiones eléctricas a la red antes de retirar los paneles para evitar la posible exposición a peligrosos voltajes.
- Cuando sea necesario emplear una clavija eléctrica no original, asegúrese de colocar los cables de acuerdo con el código de colores y polaridades descritos en el manual y los códigos de seguridad de la red eléctrica.
- Sustituya los fusibles fundidos con fusibles del tipo y tamaño estipulados en el panel de fusibles ó en el manual.
- Sustituya los cables deteriorados inmediatamente con cables del mismo tipo y graduación.
- Asegúrese de que los valores de las líneas de electricidad se ajustan a los valores para los que el Instrumento ha sido preparado.

---

## **Botellas de Gas Comprimido**

- Guarde y maneje las botellas de gas con cuidado y de acuerdo con las normas de seguridad.
- Asegure las botellas a una estructura inmóvil ó a la pared.
- Guarde y mueva las botellas en posición vertical. Retire los reguladores antes de transportarlas.
- Guarde las botellas en un área ventilada, lejos de fuentes de calor, de luz solar directa y de temperaturas extremadamente bajas.
- Identifique las botellas claramente para evitar cualquier duda sobre su contenido.
- Utilice sólo reguladores y conexiones aprobadas.
- Utilice sólo tubos de conexión cromatográficamente limpios (Varian p/n 0391832600) y que tengan una graduación de presión significativamente mayor que la mayor presión del regulador.

---

## GC Prácticas de Seguridad

### ***Sistema de Extracción***

No se necesita un sistema de extracción para los detectores GC instalados en un laboratorio bien ventilado, excepto cuando se analicen muestras químicas peligrosas. Si instala un sistema de extracción:

- Utilice conductos a prueba de fuego.
- Instale un ventilador al final del sistema.
- Instale entradas de aire cuya vibración no afecte al trabajo del detector.
- Compruebe periódicamente el correcto funcionamiento del sistema.
- Asegurese de una correcta ventilación del laboratorio.

### ***Detectores con fuentes radioactivas***

- Lea con cuidado y cumpla todas las NOTAS, PRECAUCION, y ATENCION del Manual del Detector Ni63 ECD.
- Realice los test de contaminación radioactiva descritos en el Manual del Detector Ni63 ECD.
- Cumpla con los plazos y procedimientos de test de fugas.

### ***Peligro de Quemaduras***

Las zonas de calor ó frío (criogénicas) del Cromatógrafo de Gases pueden permanecer calientes ó frías durante bastante tiempo después de apagar el instrumento. Para evitar quemaduras asegúrese de que todas las áreas que se calienten ó enfríen han vuelto a la temperatura ambiente, ó protéjase adecuadamente las manos, antes de tocar las superficies potencialmente calientes ó frías.

---

## LC Prácticas de Seguridad

### ***Peligro de Alta Presión***

Si se rompe una línea de presión, ó se abre una válvula de seguridad accidentalmente bajo presión, la bomba puede generar líquidos a alta presión potencialmente peligrosos, produciendo un chorro a alta velocidad de líquidos volátiles y/ó tóxicos.

- Lleve protección facial cuando inyecte muestras ó realice mantenimiento de rutina.
- Nunca abra una línea ó una válvula bajo presión. Apague la bomba antes y deje que la presión baje a cero.
- Utilice depósitos irrompibles que sean capaces de operar a 50/60 psi.
- Mantenga cerrada la junta del depósito cuando se haya bajo presión.
- Lea y cumpla todas las NOTA, PRECAUCION, y ATENCION del manual.

### ***Cromatografía Flash***

El operador debe familiarizarse con las propiedades físico-químicas de los componentes de la fase móvil.

Alejar los disolventes del contacto directo con los tubos de poliuretano ya que ciertos disolventes pueden causar reblandecimiento de los tubos o posibles fugas con riesgo de explosión.

Todos los componentes del sistema deben estar conectados a un enchufe común con toma de tierra común. Esta toma de tierra debe ser una toma de tierra verdadera en lugar de flotante.

Los disolventes no-polares pueden originar carga estática cuando son bombeados por el sistema. Todos los recipientes que contienen fase móvil (incluyendo los tubos y los recipientes de recogida) deben estar conectados a tierra para disipar la electricidad estática.

Utilizar medidores de carga estática y los debidos dispositivos de descarga (por Ej., ionizadores de aire) para salvaguardarse contra la creación de electricidad estática.

### ***Radiación Ultravioleta***

Los detectores del Cromatógrafo de Líquidos que utilizan una fuente de luz ultravioleta disponen de protección para prevenir exposiciones radioactivas al personal.

Para una correcta protección:

- Asegurese de que las cubiertas de protección de la lámpara de los detectores está correctamente situada durante su funcionamiento.
- No mire directamente a las celdas del detector ó a la fuente de luz UV. Cuando inspeccione la fuente de luz ó la celda, utilice siempre una protección para los ojos como gafas de borosilicato ó poliestireno.

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### **Disponibilidad de Recambios**

Es Política de Varian disponer de Recambios para cualquier instrumento y la mayoría de los accesorios por un periodo de cinco (5) años después del último instrumento fabricado. Los recambios durante esos cinco años estarán disponibles, pero siempre bajo el sistema "Según disponibilidad". Los Recambios están definidos como todas aquellas partes individuales mecánicas ó eléctricas que son susceptibles de fallo durante su normal proceso de operación. Por ejemplo, relés, lámparas, sondas de temperatura, elementos del detector, motores, etc. Las planchas de metal, partes de la estructura, placas de circuitos integrados, y otros módulos funcionales son normalmente susceptibles de reparación y por lo tanto sólo estarán disponibles bajos el sistema "Según disponibilidad" después del último instrumento fabricado.

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### **Disponibilidad de Servicio**

Varian ofrece una gran variedad de sistemas de Servicio para mantener el soporte a sus usuarios tras el periodo de garantía. El Soporte de Servicio se ofrece a través de atractivos Contratos de Servicio ó bajo un sistema de facturación de mano de obra y materiales. El mantenimiento y el entrenamiento se realiza por ingenieros cualificados bajo Contrato ó petición.

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## Oficinas de Instrumentación Analítica Varian

Para cualquier consulta sobre Instrumentación Analítica, Servicio Técnico ó Recambios y Accesorios, contacte con su oficina local:

**Argentina**

Buenos Aires  
Tel. +54.11.4.783.5306

**Australia**

Mulgrave, Victoria  
Tel. +61.3.9566.1134

**Austria**

Vösendorf bei Wien  
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**Benelux**

Bergen Op Zoom  
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**Brazil and****Latin America (S)**

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Tel. +55.11.820.0444

**Canada**

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Tel. 800.387.2216

**China**

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**Europe**

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Tel. +1.800.367.4752  
(LC)

**VARIAN**[www.varianinc.com](http://www.varianinc.com)



# Informations et mesures de sécurité

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## Instructions de fonctionnement

Ce manuel d'instruction est conçu pour aider l'utilisateur à créer des conditions opératoires lui permettant de faire fonctionner le matériel efficacement et en toute sécurité. Il contient entre autres certaines observations spéciales présentées sous forme de NOTES, MISES EN GARDE et AVERTISSEMENTS. Il est important de faire fonctionner ce matériel conformément aux instructions du présent manuel et à toute autre information émanant de Varian. S'adresser au bureau régional Varian pour toute question relative à la sécurité ou à l'utilisation correcte du matériel.

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NOTE:	Information destinée à tirer le meilleur parti du matériel sur le plan des performances
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### MISE EN GARDE

**Attire l'attention sur une situation pouvant occasionner des dommages corporels légers et/ou des dégâts mineurs à l'appareil et indique comment remédier à cette situation**

### AVERTISSEMENT

**Attire l'attention sur une situation potentiellement dangereuse pouvant occasionner des dommages corporels importants et indique comment remédier à cette situation.**

## Symboles d'avertissement



**ATTENTION  
RISQUE  
D'ELECTROCUTION**



**ATTENTION  
SUBSTANCES  
CHIMIQUES DANGER**



**ATTENTION  
RISQUE DE BRÛLURES**



**ATTENTION  
DANGER POUR  
LES YEUX**



**ATTENTION  
RISQUE D'INCENDIE**



**ATTENTION  
RISQUE D'EXPLOSION**



**ATTENTION  
SOURCE DE RADIATION**



**ATTENTION  
PIECES EN MOUVEMENT**

## Description

Exposition à des tensions dangereuses. Débrancher le matériel du secteur avant de dévisser les panneaux protecteurs.

Présence éventuelle de substances chimiques dangereuses. Eviter tout contact, en particulier lors du remplissage des réservoirs. Prendre les mesures de protection adéquates pour les yeux et la peau.

Exposition à des surfaces chaudes ou traitées cryogéniquement. Prendre les mesures de protection adéquates pour la peau.

Les dommages causées aux yeux sont de deux natures différentes: jet de particules et de produits chimiques ou radiations UV. Utiliser des protections du visage et des yeux appropriées.

Risque potentiel d'incendie. Se conformer aux instructions du manuel pour faire fonctionner le matériel en toute sécurité.

Risque potentiel d'explosion en raison du type de gaz ou de liquide utilisé.

Présence d'une source de radiation ionisante. Se conformer aux instructions du manuel pour faire fonctionner le matériel en toute sécurité.

Garder les mains et les doigts hors de portée.

## Précautions générales en matière de sécurité

Les pratiques suivantes garantissent une utilisation sans risques du matériel:

- Effectuer régulièrement des essais d'étanchéité de tous les conduits d'alimentation et de tous les tuyaux du système pneumatique.
- Ne pas travailler avec des conduits de gaz déformés ou percés. Installer les conduits de gaz à l'écart des allées et venues et à l'abri du chaud ou du froid.
- Conserver les solvants organiques dans des récipients à l'épreuve du feu, bien ventilés et portant mention de la nature de leur contenu, en particulier lorsque lesdits solvants sont toxiques et/ou inflammables.
- Ne pas accumuler les solvants de rebut. Les éliminer conformément à un programme agréé d'élimination des déchets et non via les égouts municipaux.

**NOTE:** Ce matériel a été testé conformément aux dispositions de la directive CME afin de pouvoir porter le sigle CE de l'Union européenne. Il en résulte qu'il peut être sensible à des niveaux de radiation/d'interférence ou à des fréquences se situant hors des limites testées.

**ATTENTION** Ce matériel est conçu pour effectuer des analyses chromatographiques d'échantillons préparés selon des méthodes appropriées. Il convient de le faire fonctionner avec les gaz et/ou les solvants adéquats et dans les limites des pressions, des débits et des températures maximales spécifiées dans le présent manuel.

**ATTENTION** Le client est tenu d'informer le service Varian d'assistance à la clientèle que son matériel a été utilisé pour l'analyse d'échantillons biologiques dangereux, radioactifs ou toxiques avant que n'en soit effectué la maintenance.

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## Risques de chocs électriques

- Déconnecter le matériel de toute source d'alimentation avant d'en démonter les panneaux de protection, sous peine de s'exposer à des tensions dangereuses.
- En cas d'utilisation d'un cordon d'alimentation n'étant pas d'origine, s'assurer que celui-ci soit conforme à la polarité et au codage des couleurs décrits dans le manuel d'utilisation ainsi qu'à toutes les normes régionales de sécurité régissant le secteur de la construction.
- Remplacer les fusibles sautés par des fusibles de même type que ceux stipulés sur le panneau des fusibles ou dans le manuel d'utilisation.
- Remplacer les cordons d'alimentation défectueux ou dénudés par des cordons d'alimentation de même type.
- S'assurer que les sources de tension et la tension de secteur correspondent à la tension de fonctionnement du matériel.

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## Bouteilles à gaz comprimé

- Ranger et manipuler les bouteilles à gaz comprimé avec précaution et conformément aux normes de sécurité.
- Fixer les bouteilles à gaz comprimé à un mur ou à une structure inamovible.
- Ranger et déplacer les bouteilles à gaz comprimé en position verticale. Avant de transporter les bouteilles à gaz comprimé, retirer leur régulateur.
- Ranger les bouteilles dans un endroit bien ventilé et à l'abri de la chaleur, des rayons directs du soleil, du gel ou des sources d'allumage.
- Marquer les bouteilles de manière à n'avoir aucun doute quant à leur contenu.
- N'utiliser que des connexions et régulateurs agréés.
- N'utiliser que des tuyaux de raccordement propres sur le plan chromatographique (Varian P/N 0391832600) et pouvant supporter des pressions sensiblement plus élevées que la plus haute pression de sortie du régulateur. Store and handle compressed gases carefully and in strict adherence to safety codes.

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## Mesures de sécurité en CPG

### ***Système d'échappement***

Les détecteurs CPG installés dans une pièce bien ventilée ne nécessitent pas de conduits spéciaux d'échappement excepté lorsqu'ils sont destinés à analyser des substances chimiques dangereuses. Lors de l'installation de tels conduits:

- N'utiliser que des conduits à l'épreuve du feu
- Installer un ventilateur à la sortie du conduit.
- Placer les orifices d'aspiration de manière à ce que les vibrations ou les mouvements d'air n'affectent pas le fonctionnement du détecteur.
- Vérifier périodiquement l'état du conduit.
- S'assurer que le laboratoire est correctement ventilé.

### ***Détecteurs à source radioactive***

- Se conformer au manuel d'utilisation de l'ECD Ni63, en particulier à ses NOTES, MISES EN GARDE ET AVERTISSEMENTS.
- Effectuer les tests de décontamination radioactive décrits dans le manuel d'utilisation de l'ECD Ni63.
- Se conformer aux procédures et au calendrier des essais d'étanchéité.

### ***Risque de brûlures***

Les zones des chromatographes à gaz chauffées ou traitées cryogéniquement peuvent rester très chaudes ou très froides durant une période plus ou moins longue après la mise hors tension du matériel. Pour éviter les brûlures, s'assurer que ces zones sont revenues à température ambiante ou utiliser un dispositif adéquat de protection des mains avant de les toucher.

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## Mesures de sécurité en CPL

### ***Risques liés aux hautes pressions***

En cas de rupture d'un tuyau ou en cas d'ouverture accidentelle d'une vanne alors que le système est sous pression, la pompe peut occasionner des dommages en expulsant à grande vitesse des jets de liquides volatiles et/ou toxiques.

- Mettre un masque de protection lors de l'injection des échantillons ou en effectuant les opérations de maintenance de routine.
- Ne jamais déconnecter un conduit de solvant ou une vanne sous pression. Arrêter préalablement la pompe et laisser la pression descendre à zéro.
- Utiliser des réservoirs incassables à 50/60 psi.
- Laisser l'enceinte du réservoir fermée lorsque le réservoir est sous pression.
- Se conformer aux NOTES, MISES EN GARDE ET AVERTISSEMENTS du manuel d'utilisation.

### ***Chromatographie Flash***

L'utilisateur aura la connaissance des propriétés physico-chimiques des constituants de la phase mobile.

Eviter le contact direct des solvants avec les tuyaux en polyuréthane : certains solvants sont susceptibles de provoquer des faiblesses et des fuites avec risques d'explosion.

Tous les constituants du système devront être connectés à une source de courant commune et à une prise de terre commune. Cette prise de terre devra être fixe et non mobile.

Les solvants non-polaires peuvent produire de l'électricité statique lorsqu'ils passent au travers du système. Les bouteilles qui contiennent la phase mobile (incluant les tuyaux et les flacons de collecte de fractions) doivent être mises à la terre pour éliminer l'électricité statique.

Utiliser des appareils de mesure et de décharge d'électricité statique (par exemple des ionisateurs d'air) pour combattre la formation d'électricité statique.

### ***Radiations ultraviolettes***

Les détecteurs CPL utilisant une source lumineuse ultraviolette comportent un écran destiné à se prémunir contre les expositions aux rayonnements.

Pour s'assurer une protection permanente:

- Vérifier que le couvercle de protection de la lampe des détecteurs opérant à des longueurs d'onde variables et fixes soit bien en place durant le fonctionnement du matériel.
- Ne pas regarder directement les cellules du détecteur ou la source d'UV. Se protéger systématiquement les yeux lors du contrôle de la source lumineuse ou des cellules, par exemple au moyen de verres borosilicatés ou en polystyrène.

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### **Disponibilité des pièces de rechange**

La politique de Varian consiste à fournir des pièces de rechange pour tous les appareils et accessoires majeurs durant une période de cinq (5) ans après livraison de leur production finale. Les pièces de rechange ne sont fournies au terme de cette période de cinq (5) ans que suivant les disponibilités. Il faut entendre par pièces de rechange les pièces individuelles électriques ou mécaniques susceptibles de défaillance au cours de leur utilisation normale. Par exemple, les relais, les lampes, les sondes thermiques, les éléments de détecteur, les moteurs, etc. Les parties en tôles, les éléments ou assemblages structurels et les pièces de fonderie, les cartes à circuits imprimés et les modules fonctionnels sont normalement susceptibles d'être remis à l'état neuf pendant toute la durée de leur vie utile et ne sont dès lors fournies, au terme de la production finale des appareils, que suivant les disponibilités.

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### **Service d'assistance à la clientèle**

Varian fournit divers services destinés à aider sa clientèle après expiration de la garantie: service de réparation sur base de contrats de maintenance à prix attractifs ou sur base d'accords à durée limitée portant sur du matériel spécifique; support technique et service de formation assurés par des chimistes qualifiés sur base contractuelle ou en fonction des besoins spécifiques.

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## Points de vente des instruments analytiques Varian

Contactez votre point de vente régional Varian pour toute question commerciale ou de service d'assistance à la clientèle ou pour passer commande de pièces et de fournitures.

**Argentina**

Buenos Aires  
Tel. +54.11.4.783.5306

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# Informazioni sulla Sicurezza

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## ISTRUZIONI PER L'USO

Questo manuale ha lo scopo di aiutare l'operatore ad utilizzare lo strumento in modo sicuro ed efficiente. Le considerazioni e le precauzioni speciali vengono presentate in questo manuale sotto forma di avvisi di NOTA, CAUTELA e ATTENZIONE. E' importante che lo strumento venga utilizzato rispettando le istruzioni fornite in questo manuale o che verranno fornite successivamente dalla Varian. Per ogni eventuale chiarimento sull'uso o sulla sicurezza, si prega di contattare la Varian di Leinì (TO).

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NOTA: Sono informazioni utili ad ottenere le prestazioni migliori da parte dello strumento.

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### ATTENZIONE

Allerta l'operatore su situazioni che potrebbero causare ferite leggere e danni limitati allo strumento ed il modo di evitarle.

### ATTENZIONE

Allerta l'operatore su situazioni potenzialmente pericolose che possono causare danni molto seri ed il modo di evitarle.

## Segnali di ATTENZIONE



**ATTENZIONE**  
Pericolo di folgorazioni



**ATTENZIONE**  
ESPOSIZIONE A  
SOSTANZA CHIMICHE



**ATTENZIONE**  
Pericolo di scottature



**ATTENZIONE**  
PERICOLO PER  
GLI OCCHI



**ATTENZIONE**  
Pericolo di incendio



**ATTENZIONE**  
Pericolo di esplosioni



**ATTENZIONE**  
Pericolo di radiazioni



**ATTENZIONE**  
Parti in movimento

## Descrizione del Pericolo

Nello strumento sono presenti tensioni pericolose. Scollegare il cavo di alimentazione prima di togliere il pannello fissato con le viti.

Possono essere presenti composti chimici pericolosi. Evitare il contatto, specialmente quando si riempiono i contenitori. Usare protezioni opportune per la pelle e per gli occhi.

Pericolo di esposizione a superfici molto calde o raffreddate criogenicamente. Usare protezioni opportune per la pelle.

Particelle volanti, agenti chimici o radiazioni UV possono danneggiare gli occhi. Vanno quindi utilizzate le opportune protezioni per gli occhi e per il volto.

Pericolo potenziale di incendio. Seguire le istruzioni del manuale per lavorare con una maggiore sicurezza.

C'è pericolo di esplosioni a causa del tipo di gas o liquido utilizzato.

E' presente una radiazione ionizzante. Seguire le istruzioni del manuale per lavorare con una maggiore sicurezza.

Non tenere le mani o le dita vicino.

## Norme di Sicurezza

Per lavorare in modo sicuro sullo strumento, Vi consigliamo di adottare le seguenti procedure.

- Verificare periodicamente che non ci siano perdite sulle linee e sui raccordi pneumatici.
- Evitare che le linee dei gas vengano piegate o forate. Le linee vanno posizionate in modo tale da non essere calpestate e lontane da sorgenti o troppo calde o troppo fredde.
- I solventi organici vanno conservati in armadi speciali antiincendio, ventilati e con indicazioni chiare sul contenuto di materiali tossici e/o infiammabili.
- Non accumulare i solventi utilizzati. Adottare un programma regolare di smaltimento, ma mai nelle acque di scarico.

**AVVERTENZA** Questo strumento è stato testato secondo le Direttive EMC allo scopo di poter utilizzare il Marchio CE della Comunità Europea. Questo strumento può essere suscettibile a radiazioni/interferenze o frequenze che non sono entro i limiti collaudati.

**ATTENZIONE** Questo strumento è progettato per l'analisi cromatografica di campioni opportunamente preparati. Deve essere utilizzato usando gas e solventi adatti a questo scopo ed entro i limiti massimi di pressione, flusso e temperatura riportati in questo manuale. Se lo strumento non viene utilizzato secondo le modalità specificate dal costruttore, le condizioni di sicurezza previste potranno non essere sufficienti.

**ATTENZIONE** E' responsabilità del Cliente informare il Servizio Tecnico Varian, prima di qualsiasi intervento di riparazione, se lo strumento è stato utilizzato per l'analisi di campioni biologicamente pericolosi, radioattivi o tossici.

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## Pericoli Elettrici

- Prima di togliere i pannelli di protezione, scollegare lo strumento da tutte le alimentazioni elettriche in modo da evitare l'esposizione a voltaggi potenzialmente pericolosi.
- Quando si rende necessario sostituire il cavo di alimentazione, assicurarsi che il nuovo cavo rispetti sia le codifiche di colore e di polarità riportate nel manuale di istruzioni che quelle stabilite dalle norme di sicurezza del laboratorio.
- Sostituire i fusibili bruciati solo con fusibili che abbiano le stesse caratteristiche; queste ultime sono riportate sul pannello dei fusibili e/o nel manuale di istruzioni.
- Sostituire immediatamente i cavi di alimentazione difettosi o consumati con cavi dello stesso tipo e con le stesse caratteristiche.
- Assicurarsi che il voltaggio del pannello di alimentazione corrisponda a quello dello strumento da collegare.

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## Bombole dei Gas

- Occorre prestare molta attenzione quando si spostano bombole di gas compressi. Rispettare tutte le norme di sicurezza.
- Assicurare le bombole ad una parete o ad una struttura fissa.
- Spostare e conservare le bombole sempre in posizione verticale. Togliere i manometri prima di spostare le bombole.
- Conservare le bombole in un'area ben ventilata, non infiammabile, lontana da sorgenti di calore, non esposta a temperature troppo fredde o alla luce diretta del sole.
- Evidenziare in modo chiaro e che non lasci dubbi il contenuto di ogni bombola.
- Usare solo manometri e raccordi di qualità.
- Usare solo tubazioni cromatograficamente pulite (Numero di Parte Varian 0391832600) e calibrate per pressioni superiori a quella massima di uscita dal manometro.

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## Procedure di Sicurezza in GC

### **Scarico dei Gas**

Per i rivelatori GC non è richiesto alcun sistema particolare di scarico dei gas, se lo strumento è installato in una stanza ben ventilata e se non viene utilizzato per l'analisi di sostanze chimiche pericolose. Se si deve installare un sistema di scarico dei gas:

- Usare condutture non infiammabili
- Installare un aspiratore in uscita
- Posizionare la presa d'aria in modo che le vibrazioni e il movimento dell'aria non disturbino il rivelatore.
- Eseguire verifiche periodiche per garantire un funzionamento corretto.
- Garantire una buona ventilazione nel laboratorio.

### **Rivelatori a Sorgente Radioattiva**

- Leggere e rispettare tutte gli avvisi di NOTA, CAUTELA e ATTENZIONE riportati nel manuale del rivelatore ECD al Ni63.
- Eseguire tutti i test di contaminazione radioattiva rimovibile descritti nel manuale dell'ECD al Ni63.
- Rispettare tutte le procedure e le scadenze di verifica per eventuali perdite.

### **Pericolo di Scottature**

Le zone calde o raffreddate criogenicamente del gascromatografo possono mantenere la loro temperatura per parecchio tempo, dopo aver spento lo strumento. Per evitare scottature, assicurarsi che le zone riscaldate o raffreddate siano a temperatura ambiente oppure indossare delle protezioni adeguate prima di toccare tali superfici.

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## Procedure di Sicurezza in LC

### ***Pericolo di Alte Pressioni***

In caso di rottura di una linea o di apertura accidentale di una valvola, quando il sistema è sotto pressione, la pompa può liberare liquidi tossici e/o volatili molto pericolosi.

- E' opportuno adottare un sistema di protezione del viso quando si inietta il campione o si esegue una manutenzione routinaria del sistema.
- Non smontare mai una linea del solvente od una valvola quando il sistema è sotto pressione. Fermare prima la pompa ed aspettare che la pressione scenda a zero.
- Usare dei contenitori per solventi infrangibili ed in grado di lavorare a 50/60 psi.
- Quando i contenitori sono sotto pressione, usare una protezione esterna.
- Leggere e rispettare tutti gli avvisi di NOTA, CAUTELA e ATTENZIONE.

### ***Cromatografia Flash***

L'operatore deve conoscere le proprietà fisico-chimiche delle componenti della fase mobile.

I solventi non vanno messi in contatto diretto con il tubo di erogazione in poliuretano, dal momento che alcuni solventi possono causare indebolimento e perdite con possibili scoppi.

Tutte le componenti del sistema vanno collegate ad una fonte di alimentazione e ad una messa a terra comuni. E' meglio che per quest'ultima venga utilizzata una spina con polo di terra.

I solventi non-polari possono sviluppare una carica statica quando vengono pompati attraverso il sistema. Tutti i recipienti che contengono la fase mobile (inclusi i tubi e i recipienti di raccolta) devono avere una messa a terra per disperdere l'elettricità statica.

Vanno utilizzati dispositivi di misurazione e scarico (ad esempio ionizzatori d'aria) per evitare l'aumento di elettricità statica.

### ***Radiazioni Ultraviolette***

I rivelatori di cromatografia liquida che usano sorgenti a luce ultravioletta montano degli schermi di protezione per evitare che gli operatori siano esposti a radiazioni pericolose.

Per una protezione sicura:

- Assicurarsi che i coperchi delle lampade dei rivelatori a lunghezza fissa e variabile siano sempre al loro posto, quando si lavora.
- Non guardare mai direttamente dentro le celle o alla sorgente di luce UV. Quando si vuole ispezionare la lampada o le celle, usare sempre delle protezioni adatte per gli occhi, quali vetro in borosilicato e polistirolo.

---

### **Disponibilità delle Parti di Ricambio**

E' politica della Varian il fornire le parti di ricambio per lo strumento ed i suoi accessori per un periodo di cinque (5) anni a partire dalla data di produzione dell'ultima unità della serie. Le parti di ricambio saranno disponibili anche dopo questo periodo di cinque (5) anni ma solo in base alla disponibilità delle stesse. Per parti di ricambio si intendono i componenti elettrici e meccanici soggetti ad usura durante l'uso, in condizioni normali, dello strumento. Come esempio, citiamo i relay, le lampade, i probe di temperatura, i componenti del rivelatore, i motorini, ecc. Le parti strutturali o da fusione, le schede elettroniche ed i moduli funzionali possono essere ricostruiti e rimessi a nuovo durante tutto il loro periodo di vita e perciò sarà possibile acquistarli, dopo la produzione dell'ultima unità delle serie, solo in base alla loro disponibilità.

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### **Servizi Tecnico**

La Varian, alla scadenza del periodo di garanzia, è in grado di fornire ai suoi clienti un'ampia scelta di opzioni. Le riparazioni possono essere effettuate sulla base di contratti di manutenzione particolarmente vantaggiosi od in base ad una tariffa oraria più il costo delle parti. A richiesta, si possono avere corsi per operatori sia sotto forma di contratto che a tariffe da concordare.

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## Uffici Vendite della Divisione Strumenti Analitici della Varian

Per informazioni relative alla Vendita, al Servizio Tecnico o all'acquisto di Parti di ricambio, si prega di contattare l'ufficio Varian piu' vicino.

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### **Russian Federation**

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### **Spain**

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### **Sweden**

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### **United Kingdom and**

### **Ireland**

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Tel. +44.1932.898000

### **Venezuela**

Valencia  
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### **United States**

Walnut Creek,  
California, USA  
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(GC and GC/MS)  
Tel. +1.800.367.4752  
(LC)



**VARIAN**

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# Sicherheitsinformationen

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## Arbeitsanleitungen

Diese Arbeitsanleitung will Ihnen bei der Aufstellung solcher Arbeitsbedingungen helfen, die einen sicheren und wirkungsvollen Gebrauch Ihrer Geräte ermöglichen. Besondere Überlegungen und Vorsichtsmaßnahmen erscheinen in diesem Handbuch in Form von HINWEIS, ACHTUNG und WARNUNG, wie unten beschrieben. Es ist wichtig, daß Sie Ihr Gerät in Übereinstimmung mit dieser Arbeitsanleitung und allen möglichen zusätzlichen Informationen von Varian betreiben. Alle Fragen bezüglich Sicherheit und Handhabung Ihres Gerätes richten Sie an Ihr Varian Büro.

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HINWEIS:	Eine Information, um einen optimalen Wirkungsgrad Ihres Instruments zu erzielen.
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### ACHTUNG

**Weist auf Situationen, die zu mäßiger Beeinträchtigung und/oder zu Geräteschäden führen und auf die Vermeidung dieser Situationen hin.**

### WARNUNG

**Weist auf mögliche Gefahrensituationen, die zu ernsthaften Verletzungen führen können und auf die Vermeidung dieser Situationen hin.**

## Warnungssymbol



**WARNUNG  
ELEKTRISCHER  
SCHLAG**



**WARNUNG  
CHEMISCHE GEFAHR**



**WARNUNG  
VERBRENNUNGSGEFAHR**



**WARNUNG  
AUGENVERLETZUNG**



**WARNUNG  
FEUERGEFAHR**



**WARNUNG  
EXPLOSIONSGEFAHR**



**WARNUNG  
STRAHLUNGSQUELLE**



**WARNUNG  
BEWEGTE TEILE**

## Warnungsbeschreibung

Gefährliche Spannungen bestehen innerhalb des Instruments. Trennen Sie das Gerät vom Netz, bevor Sie abschraubbare Paneele entfernen.

Gefährliche Chemikalien können vorhanden sein. Vermeiden Sie jeden Kontakt, besonders beim Auffüllen der Reservoirs. Benutzen Sie wirksamen Augen und Hautschutz.

Sehr heiße oder tiefstgeköhlte Oberflächen können freigelegt sein. Benutzen Sie einen wirksamen Hautschutz.

Herumfliegende Partikel, Chemikalien oder UV-Strahlung können Augenschäden verursachen. Tragen Sie deshalb einen geeigneten Schutz für Augen und Gesicht.

Es besteht eine mögliche Feuergefahr. Beachten Sie die Vorschriften im Handbuch für eine gefahrlose Benutzung.

Eine mögliche Explosionsgefahr besteht infolge der benutzten Gas- oder Flüssigkeitsart.

Es besteht eine ionisierende Strahlungsquelle. Beachten Sie die Vorschriften im Handbuch für eine gefahrlose Benutzung.

Bleiben Sie mit Ihren Händen und Fingern weg.

## Allgemeine Sicherheitsmaßnahmen

Befolgen Sie diese Sicherheitspraktiken für eine gefahrlose Gerätebenutzung.

- Prüfen Sie regelmäßig alle Versorgungs- und Pneumatikleitungen auf Lecks.
- Gasleitungen dürfen nicht geknickt oder angestochen werden. Verlegen Sie die Leitungen außerhalb von Laufwegen und abseits von extremer Hitze oder Kälte.
- Lagern Sie organische Lösungsmittel in feuerfesten, belüfteten und eindeutig bezeichneten Schränken, damit sie leicht als toxische und/oder brennbare Materialien erkannt werden.
- Sammeln Sie keine Lösungsmittelabfälle. Entsorgen Sie solche Materialien über ein geregeltes Entsorgungsprogramm und nicht über die öffentlichen Abwasserleitungen.

**HINWEIS** Dies Instrument wurde nach den zutreffenden Vorschriften der EMC Direktive getestet, die zum Führen des CE Zeichens der Europäischen Union berechtigen. Dieses Gerät kann an sich auf Strahlungs-/Störpegel oder Frequenzen außerhalb der getesteten Grenzen reagieren.

**WARNUNG** Dies Instrument ist für chromatographische Analysen entsprechend präparierter Proben gedacht. Es muß mit geeigneten Gasen und/oder Lösungsmitteln und innerhalb der im Handbuch spezifizierten maximalen Werte für Druck, Flüsse und Temperaturen betrieben werden.

**WARNUNG** Der Kunde ist vor der Durchführung irgendeines Geräteservices verpflichtet den Varian Kundendienstvertreter zu informieren, wenn das Instrument für Analysen gefährlicher biologischer, radioaktiver oder toxischer Proben benutzt worden ist.

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## Elektrische Gefahren

- Lösen Sie das Instrument von allen Stromquellen, bevor Sie Schutzpaneele entfernen, damit Sie nicht mit potentiell gefährlichen Spannungen in Berührung kommen.
- Wenn ein Nicht-Original Netzkabelstecker benutzt werden muß, muß das Austauschkabel die im Handbuch beschriebene Farbcodierung und Polarität beibehalten und alle örtlichen Sicherheitsvorschriften erfüllen.
- Ersetzen Sie durchgebrannte Sicherungen nur mit Sicherungen der Werte, die am Sicherungspaneel oder im Handbuch angegeben sind.
- Ersetzen Sie fehlerhafte oder durchgescheuerte Netzkabel sofort durch Kabel gleicher Art.
- Sorgen Sie dafür, daß Spannungsquellen und die Netzspannung den gleichen Wert haben, für den das Instrument verdrahtet ist.

---

## Gasdruckflaschen

- Lagern und handhaben Sie komprimierte Gase vorsichtig und in strikter Einhaltung der Sicherheitsvorschriften.
- Befestigen Sie die Gasflaschen an feststehenden Aufbauten oder an Wänden.
- Lagern und transportieren Sie Gasflaschen in aufrechter Stellung. Druckregler zuvor abnehmen.
- Lagern Sie Gasflaschen in gut durchlüfteten Räumen, weit genug weg von Heizungen, direktem Sonnenschein, Frosttemperaturen und Entzündungszonen.
- Kennzeichnen Sie die Flaschen so eindeutig, daß kein Zweifel über deren Inhalt bestehen kann.
- Benutzen Sie nur geprüfte Druckminderer und Verbindungsstücke.
- Benutzen Sie nur chromatographisch reines Verbindungsrohr (Varian part number 0391832600), das wesentlich höheren Druck als den höchsten Ausgangsdruck des Druckminderers aushält.

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## GC Sicherheitspraktiken

### **Abgassystem**

Für GC Detektoren, die in einem gut durchlüfteten Raum installiert sind, ist keine spezielle Abgasführung erforderlich, außer wenn die Detektoren zum Testen gefährlicher Chemikalien benutzt werden. Wenn Sie eine Abgasführung installieren:

- Benutzen Sie nur feuerfeste Führungen.
- Installieren Sie ein Gebläse am Ausgang.
- Ordnen Sie die Ansaugöffnung so an, daß ihre Erschütterungen oder Luftströmungen nicht die Detektorfunktion beeinträchtigen.
- Prüfen Sie regelmäßig die einwandfreie Arbeitsweise der Abgasführung.
- Sorgen Sie für gute Entlüftung im Laborbereich.

### **Radioaktive Detektoren**

- Lesen Sie sorgfältig und befolgen Sie alle HINWEISE, ACHTUNGEN und WARNUNGEN im Ni63 ECD Handbuch.
- Führen Sie die Tests für zu beseitigende radioaktive Kontamination durch, die im Ni63 ECD Handbuch beschrieben sind.
- Erfüllen Sie die Zeitpläne und Verfahren zur Dichtigkeitsprüfung.

### **Verbrennungsgefahr**

Beheizte oder tieftemperaturgekühlte Zonen des Gaschromatographen können beträchtlich lange heiß oder kalt bleiben, nachdem das Instrument bereits abgeschaltet ist. Zur Vermeidung schmerzhafter Verbrennungen müssen Sie darauf achten, daß alle beheizten oder gekühlten Zonen auf Raumtemperatur zurückgegangen sind oder Sie müssen ausreichenden Handschutz benutzen, bevor Sie möglicherweise heiße oder kalte Oberflächen berühren.

---

## LC Sicherheitspraktiken

### ***Gefahr durch hohen Druck***

Wenn eine Leitung bricht, eine Entlüftungseinheit sich öffnet oder ein Ventil sich unbeabsichtigt unter Druck öffnet, kann durch die Pumpe möglicherweise ein gefährlich hoher Flüssigkeitsdruck entstehen, der einen Strahl flüchtiger und/oder toxischer Flüssigkeiten von hoher Stömungsgeschwindigkeit verursacht.

- Tragen Sie einen Gesichtsschutz, wenn Sie Proben injizieren oder Routinewartungen durchführen.
- Öffnen Sie niemals eine unter Druck stehende Lösungsmittleitung oder ein Ventil. Halten Sie zuerst die Pumpe an und lassen Sie den Druck auf Null abfallen.
- Benutzen Sie splittersichere Reservoirs, die für einen Druck von 3,4 bis 4,1 bar ausgelegt sind.
- Halten Sie die Reservoirverkleidung geschlossen, wenn die Reservoirs unter Druck stehen.
- Lesen Sie und befolgen Sie alle HINWEISE, ACHTUNGEN und WARNUNGEN im Handbuch.

### ***Blitzlicht-Chromatographie***

Der Bediener sollte mit den physikalisch-chemischen Eigenschaften der Komponenten vertraut sein, aus denen sich die mobile Phase zusammensetzt.

Vermeiden Sie direkten Kontakt der Lösungsmittel mit den Zuführungsleitungen aus Polyurethan, da einige Lösungsmittel das Material der Leitungen schwächen und damit Undichtigkeiten oder Brüche hervorrufen können.

Alle Systemkomponenten sollten an der gleichen Netzstromquelle und einer gemeinsamen Erdung angeschlossen sein. Dabei muss es sich um eine echte, nicht um eine schwebende Erdung handeln.

Nicht-polare Lösungsmittel können sich beim Pumpen durch das System statisch aufladen. Alle Gefäße, die mobile Phase enthalten (einschließlich Leitungen und Sammelgefäße), müssen zur Ableitung elektro-statischer Aufladungen geerdet sein.

Setzen Sie Geräte zur Messung und Ableitung elektrostatischer Aufladungen (z.B. Geräte zur Luftionisierung) als Maßnahmen gegen den Aufbau statischer Elektrizität ein.

### **Ultraviolette Strahlung**

Detektoren in Liquidchromatographen, die eine ultraviolette Lichtquelle benutzen, besitzen eine Abschirmung, die das Bedienungspersonal gegen Abstrahlungen schützt. Zum ständigen Schutz:

- Achten Sie darauf, daß die schützende Lampenabdeckung der Detektoren mit variablen und festen Wellenlängen während des Betriebs an ihrem Platz ist.
- Schauen Sie nicht direkt in die Flüssigkeitszellen im Detektor oder in die UV Lampe. Zum Inspizieren der Lichtquelle oder der Flüssigkeitszelle benutzen Sie immer einen wirksamen Augenschutz, wie er durch Borsilikatglas oder Polystyrol gewährleistet wird.

---

### **Verfügbarkeit von Ersatzteilen**

Es ist Varian's Grundsatz, Ersatzteile für alle Instrumente und die wichtigsten Zubehöre für einen Zeitraum von fünf (5) Jahren nach dem Fertigungsauslauf dieser Geräteserie verfügbar zu haben. Nach diesem Zeitraum von fünf (5) Jahren können Ersatzteile auf der Basis solange vorhanden bezogen werden. Als Ersatzteil werden hier solche elektrischen und mechanischen Einzelteile verstanden, die unter normalen Bedingungen ausfallen können. Beispiele sind Relais, Lampen, Temperaturfühler, Detektorelemente, Motore usw. Metallbleche, Formteile oder Baugruppen und Gußteile, PC Boards und Funktionsmodule können normalerweise neuwertähnlich für eine brauchbare Lebensdauer instandgesetzt werden und werden deshalb nur auf der Basis solange vorhanden nach dem Produktionsauslauf des Instruments geliefert werden.

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### **Serviceverfügbarkeit**

Varian bietet seinen Kunden auch nach dem Auslaufen der Garantie eine Vielfalt von Serviceleistungen an. Reparaturservice kann zu attraktiven Preisen über eine Wartungsvereinbarung oder nach Zeit- und Materialaufwand zur Verfügung gestellt werden. Technische Unterstützung und Training bieten wir Ihnen durch qualifizierte Chemiker sowohl auf einer Kontraktbasis als auch nach Ihren Erfordernissen an.

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## Varian, Inc. Analytical Instruments Verkaufsbüros

Für Verkaufs oder Servicehilfe und zum Bestellen von Teilen und Zubehörern setzen Sie sich bitte mit Ihrem Varian Büro in Verbindung.

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(LC)



# **VARIAN**

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# Introduction

The ProStar 325 Variable Wavelength UV-Visible Detector can be operated as a stand-alone HPLC detector or can be integrated into a Liquid Chromatography System. The detector can be controlled remotely by the Varian Star or Galaxie Chromatography Workstation software through Ethernet communications. In this situation, all functions of the detector are controlled through the Workstation software.

In the stand-alone mode of operation, all user inputs are made using a handheld PC running the "Varian HPLC Control" software. The handheld PC communicates with the detector using infrared as the medium and the IrDA (Infrared Data Association) Data protocol suite.

The detector measures the sample absorbance at the user-selected wavelength. The absorbance is displayed on the Home page (and graphically on the Graph page) of the HPLC Control software. Wavelength absorbance parameters are time programmable on the stand-alone unit.

This manual instructs the user in the installation and operation of the ProStar 325 Detector for stand-alone applications. For information on operating the detector using a desktop PC, refer to the Star or Galaxie Chromatography Workstation manual.

Features of the ProStar 325 Detector are:

- ❑ Stackable module
- ❑ Interchangeability of flowcells easily performed by the operator
- ❑ Simple lamp replacement procedure performed by the operator
- ❑ Easy operation using a handheld PC
- ❑ Can be controlled by the Star or Galaxie Chromatography Workstation software
- ❑ Can be upgraded for operation as a dual wavelength detector
- ❑ Can detect peaks up to 40 AU per cm with appropriate flowcell



*Figure 1 The ProStar 325 UV-Vis Detector*

# Installation

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## Receiving inspection

Receiving inspection instructions are detailed in the Pre-installation manual that you will have received prior to delivery of the detector.

In summary, before accepting delivery, you must inspect the package externally for signs of obvious damage; for example, water stains and crushed corners. A further inspection must be made for concealed damage, within the time limit stated in the terms and conditions of carriage. Any shipping damage must be reported to the carrier, and to your Varian Sales Office.

---

## Unpacking

1. Ensure you have enough room on the bench to put the ProStar 325 detector once it is removed from the box.
2. Carefully unpack the unit from the shipping carton and place it on the bench. This is best done by two people.



### WARNING

**The ProStar 325 detector weighs in excess of 15 kg. Avoid back strain or injury by following all precautions for lifting heavy objects.**

3. Make sure to check carefully for all miscellaneous components that might be contained in the inner compartments.

---

**NOTE:** The ProStar 325 detector is a sensitive instrument and should always be handled with the degree of care appropriate for laboratory instrumentation.

---

**Tip:** Keep the shipping carton, as it provides excellent protection if you have to transport or store the detector in the future.

After you have completed unpacking, ensure that all items ordered have been received. You should have the following items:

- ☐ ProStar 325 Detector (part number 0010080100)  
OR  
ProStar 325 UV-Vis Detector (part number 0010081300)  
OR  
ProStar 325 Dual Wavelength Detector (part number 0010081400)  
OR  
ProStar 325 UV-Vis Dual Wavelength Detector (part number 0010081500)
- ☐ ProStar 325 door (part number 0110728800)
- ☐ Door cap (part number 0910206600)
- ☐ ProStar 325 CD-ROM (part number 8510201500)
- ☐ Country kit containing fuses and power cable, part number 9810033900 (Australia), 9810034000 (USA) or 9810034100 (Europe)
- ☐ Back pressure restrictor (part number 0110743300)
- ☐ This operation manual (part number 8510201600)

Flowcells should be ordered separately. See page 60 for suitable flowcells.

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**NOTE:** Report any missing or damaged items to your Varian Sales Office.

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## Location of the detector module

Place the detector conveniently near your HPLC system. The modular design of the ProStar 325 Detector enables you to locate it anywhere within the limitations imposed by the length of the power cord, fluid lines and signal cables. In order to keep liquid dead volume as low as possible and to minimize peak broadening in the lines, the distance between the column outlet and the flowcell inlet should be kept to a minimum.

For best performance, the detector should be located on a clean, sturdy, vibration free bench in an area free of:

- ☐ Heat sources (such as direct sunlight or a heater vent)
- ☐ Drafts (such as an open doorway, window, or air conditioner vent)
- ☐ Smoke or UV-absorbing vapor
- ☐ Corrosive or dusty atmosphere
- ☐ Potential liquid spills

Provide approximately four inches of space behind the unit so that the cooling fan intake is not impeded, and to allow easy access to the rear panel services (see page 48).

## Connecting power and other cables

The ProStar 325 can communicate with other modules and devices in the entire HPLC system. All power and signal connections are made on the rear panel of the ProStar 325 (see Figure 2). The connectors on the rear panel support communication configurations to a wide range of Varian modules and non-Varian devices, such as autosamplers, pumps, valves and injectors.

### CAUTION

Turn off the power to the detector before making power and signal cable connections.



Figure 2 ProStar 325 rear panel services

The following table summarizes the function of each connection:

*Table 1 Rear panel services functions*

Service	Function
Main power receptacle	3-pin receptacle with 2 fuses
J14 Analog out	9-pin female "D" shell connector used for two channels (A and B) of analog output
J4 Relay out	15-pin female "D" shell connector used for time programmed contact closures
J1 Comm	RJ-45 type connector used to interface the ProStar 325 to a desktop PC
P9 Sync signal	15-pin male "D" shell connector used with synchronization signal cable
J10 Sync signal	9-pin female "D" shell connector used with synchronization signal cable

### **AC power**

The ProStar 325 Detector may be connected to any voltage in the range 100–240 VAC  $\pm$  10%, 50/60 Hz  $\pm$  1 Hz, single phase, without modification or the need to change fuses.

Before connecting power to the detector, ensure that the power switch on the front of the instrument is OFF (the rocker switch **O** is pressed). The power switch is a rocker switch that connects from the front of the detector directly to the power receptacle on the rear panel. Plug one end of the power cord into the power receptacle on the rear panel and the other end into your AC power source.



### **WARNING**

**It is important for operator safety and proper operation of the ProStar 325 UV-Vis Detector that you use the power cord supplied, together with a properly grounded 3-wire power strip.**

All devices in the liquid chromatography system should be connected to the same power source, using a properly grounded (3rd wire to earth) multiple outlet power strip. Power strips for operation at 125 VAC, 50-60 Hz are available from Varian, part numbers R0-38602C-B6 (5 outlets) or R0-03824C-B6 (6 outlets).

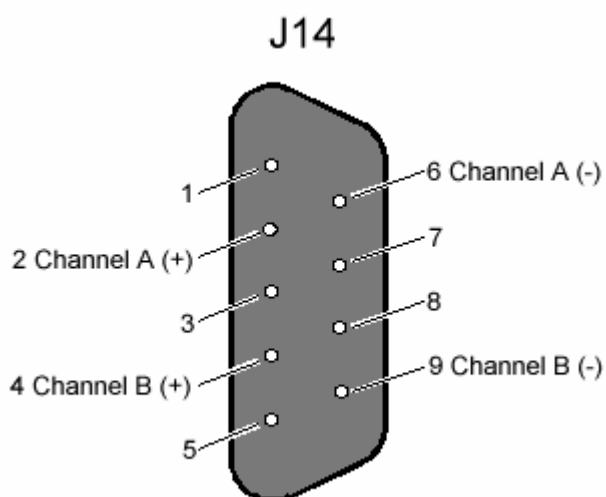
---

NOTE: **Do not turn on the AC power yet.** All required external devices and hydraulics must first be connected.

---

### **Analog output**

For analog output signals, install the optional analog output cable (part number 0110744200) into the J14 receptacle. Pin designations are shown below. The output levels of the analog output are described in the Appendix.)



*Figure 3 Pin designation for J14*

The open ends of the analog output cable have labels with the signal names (Channel A + -, Channel B + -).



## Relay output

For time programming external events, a contact closure Relay output is available. To configure the Relay output, install the optional Relay output board (part number 0210187590) into the J4 receptacle. Pin designations are shown below.

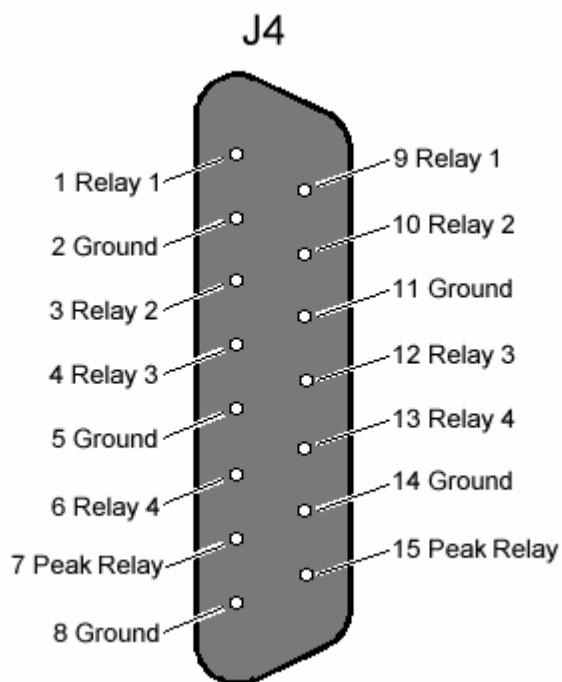


Figure 4 Pin designation for J4

There are four general purpose output relays and one dedicated Peak relay. Each output uses a DIP relay that is capable of handling 500 mA of contact current. At reset or power up, the output relay contacts are set to the default parameters (open). After loading a method they will be set as defined in the method's time=0 parameters.

The Peak relay is software programmable for duration, delay and active sense. At power up, the relay contact will be set to the inactive state (as defined by the value of the “active sense” parameter stored in the detector). Upon being triggered, relay activation will occur for the time interval equal to the “Peak Sense duration” parameter as stored in the method.

The Peak relay can be activated from any of the following sources (only one source can be active at any one time):

- ❑ Time Slice event – Once time slice has been turned on, it will provide a periodic activation of the Peak Sense relay at an interval defined in “Time Slice period” within the method. Time Slice can be turned on and off by time.
- ❑ Pulse event – A single timed programmed activation of the Peak Sense relay as defined in the method.
- ❑ Peak sense has been turned on.

To connect open-ended wires to the relay signals available at J4, use the optional Relay output board (part number 0210187590, refer to Figure 5). Simply plug this PWB into the rear panel connector.

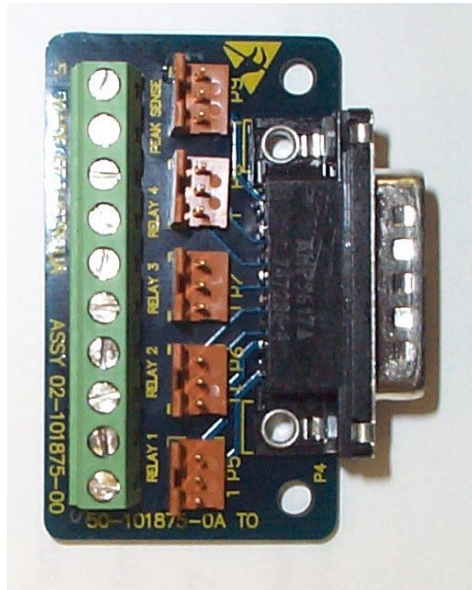


Figure 5 Relay output board

Two cables are available to attach to the Relay output board: a relay interface cable used to attach to the 3 pin connectors (part number 0110743800) and a cable used to attach to the terminal strip (part number 0110744100).

With the 3 pin connectors, the contact closure is between pins 1 and 2 of the plugs. Pin 3 is connected to ground. The relay interface cable has three open-ended wires. The relay contact is connected between the clear and the black wire. The green wire is connected to ground.

## ***Desktop PC communications***

Communication between the ProStar 325 and a desktop PC occurs by an Ethernet connection. Communication by an Ethernet connection will be required if the detector is being controlled remotely by a Star or Galaxie Chromatography Workstation, and also to operate the extended diagnostics application (the ProStar 325 Verify software – see page 109 for more information about diagnostics). When the Workstation provides HPLC system control, the synchronization cables from P9 and J10 are not used.

To create an Ethernet connection, insert an RJ45 cable included in the ship kit into the J1 receptacle and into the PC. The Ethernet cable that comes with the ProStar 325 is a cross-over cable, which is appropriate for connecting the detector directly to a PC. Connecting the detector to a network or a hub will usually require a patch cable. A patch cable can be purchased either locally or from Varian (part number 0110723300).

Most PCs come pre-configured with an Ethernet connection, which is usually built into the motherboard, or with an Ethernet network card installed. However, if you have a PC that has no network interface, you will need to install and configure a Network Interface Card (PCI bus). The PC must have a spare PCI slot for the installation of this device. You are also responsible for setting up and maintaining any LAN configuration where a detector may be used. All network issues are to be dealt with by the user.

## Synchronization signals

The synchronization signals at P9 and J10 are used to synchronize the operation of a group of instruments that are not interfaced to a Star or Galaxie Chromatography Workstation.

The synchronization signals come in four pairs and define how the detector will operate in a HPLC system. These signals are important for controlling timing and synchronization of the detector with the other devices in the system. Synchronization signals are closely tied to the detector states and transitions. P9 and J10 pin designations are shown in Figure 6.

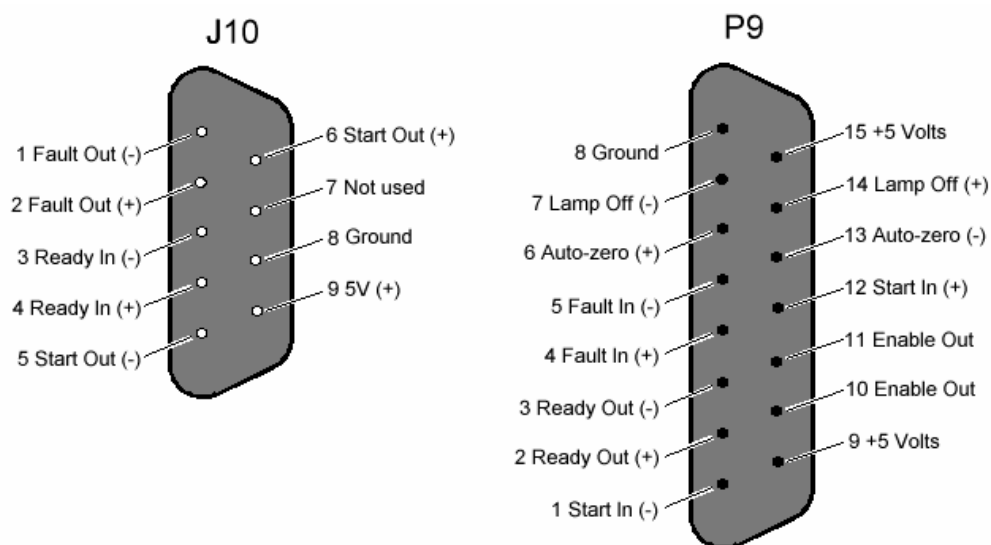


Figure 6 Pin designations for J10 and P9

P9 provides connections when the ProStar 325 acts as a “slave” and receives control from another module. J10 provides connections when the ProStar 325 acts as a “master” and sends control to another device.

An input is activated or said to be present when its two signal wires are connected together. This can be done with a relay contact closure. If the inputs are driven from another instrument with optical isolators or other polarized devices, then attention must be paid to the polarity of the signal wire connections. The positive (+) output signal must be connected to the positive (+) input signal and the negative (-) output to the negative (-) input.

The color coding and physical design of the cable connectors ensure that correct signals and polarity are matched.

The outputs are optical isolators and simulate a relay contact closure when they are activated (refer to Figure 7). The minimum requirement for an input signal to be detected is 200 milliseconds.

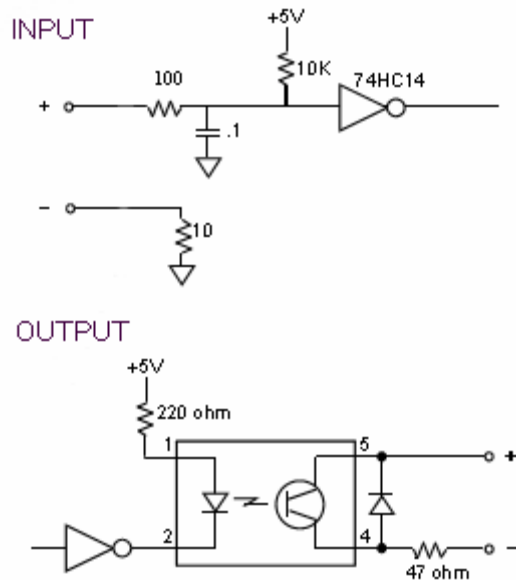


Figure 7 Input/output schematics

<b>Enable Out:</b>	A non-polarized constantly active output (a short). This output can be used to activate Enable In on the next instrument.
<b>Ready In:</b>	<p>When Enable Ready In is set (software switch), this polarized input signal must be present before the ProStar 325 can go to the Ready state.</p> <p>Specifically, when the ProStar 325 is in the NOT Ready Lamp On state, on receiving a Ready In signal, a monitor period will occur after which the ProStar 325 goes to the Ready state. It must stay active until the ProStar 325 starts. Ready In will be ignored in all other states.</p>
<b>Ready Out:</b>	This polarized output signal indicates that the ProStar 325 is in the Ready state and is ready to start a time program.
<b>Start In:</b>	This polarized edge triggered input signal will start the active method if the ProStar 325 is in the Ready state.
<b>Start Out:</b>	This polarized output signal will be activated for 600 milliseconds when the ProStar 325 starts a time program.
<b>Fault In:</b>	<p>This polarized edge triggered input signal informs the ProStar 325 that a fault condition exists in another instrument in the system. The ProStar 325 halts the time program and sends a Fault Out signal. The lamp can be programmed to either remain on or turn off upon receiving a fault signal.</p>
<b>Fault Out:</b>	<p>This polarized output signal will activate for 600 milliseconds when either of the following conditions occurs:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> The ProStar 325 discovers an internal fault condition that warrants aborting the run.</li> <li><input type="checkbox"/> The ProStar 325 receives a Fault In signal and it has no internal fault condition itself.</li> </ul>
<b>Auto-zero:</b>	This edge-triggered contact closure causes an auto-zero adjustment.
<b>Lamp off:</b>	This edge-triggered contact closure switches the lamp off. It is possible to turn the lamp back on manually if the contact is still closed.

An optional I/O board (part number 0210186590) is available to interface between the ProStar 325 synchronization signals and other devices. This board is inserted into the P9 and J10 connectors and connects to a terminal strip on the adapter board. This terminal strip accepts bare wire leads from cables connecting other devices. These cables may originate from the other device, or a dedicated cable can be used, if available for the particular application.

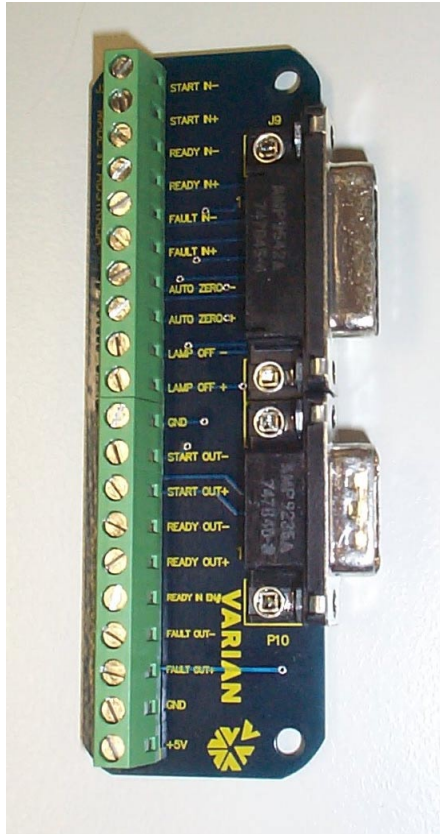


Figure 8 The I/O Adapter Board



## Wiring guide

The following figure shows the wiring in a typical HPLC system.

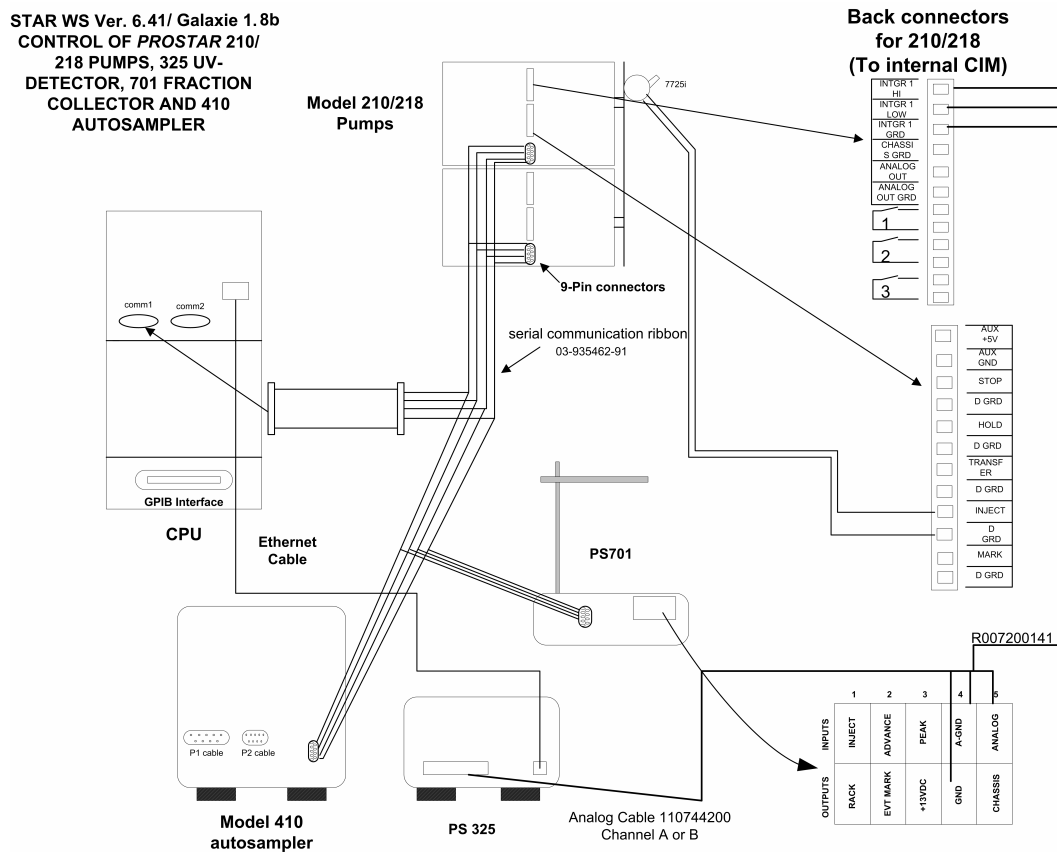


Figure 9 Wiring guide

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## Hydraulic connections

Hydraulic connections are located at the front of the ProStar 325 detector.

The only line installed by the user where dead volume and low holdup are critical is the line from the column exit to the flowcell inlet port. This line should be as short as possible.

The ProStar 325 detector can be fitted with any one of four flowcells (ordered separately). Each one has an inlet and outlet connection and quartz optics cell window. Your chosen flowcell type is packed internally in the detector. The four flowcell types are outlined in Table 2.

*Table 2 Compatible flowcells*

Flowcell type	Flowcell P/N	Pathlength*	Column ID
Analytical	0210181800	9 mm x 0 mm	2 to 8 mm
Preparative	0210181900	9 mm x 1 mm	4 to 76 mm
Super Prep	0210182000	4 mm x 0.15 mm	8 to 152 mm
Microbore	0210182100	4 mm x 0 mm	1 to 4 mm

\* A pathlength of  $a$  mm x  $b$  mm means that the sample light path has a pathlength of  $a$  mm, and the reference light path has a pathlength of  $b$  mm. A reference light path of zero means there is no fluid in the cell — air acts as the reference.

## Installing a flowcell

The ProStar 325 is not shipped with a flowcell installed. You will need to install the flowcell that you purchased with the detector. Each flowcell comes with a set of recommended nuts and ferrules that may be fitted to tubing as shown in the example in Figure 10.

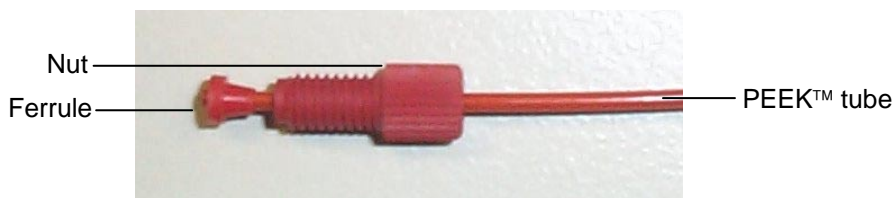


Figure 10 PEEK™ tube with ferrule and nut fitted.

Tubing connections are PEEK™ type, except for the Super Prep flowcell which uses Tefzel® tubing 0.125 x 0.062.

Table 3 Compatible tubes, nuts and ferrules for each flowcell

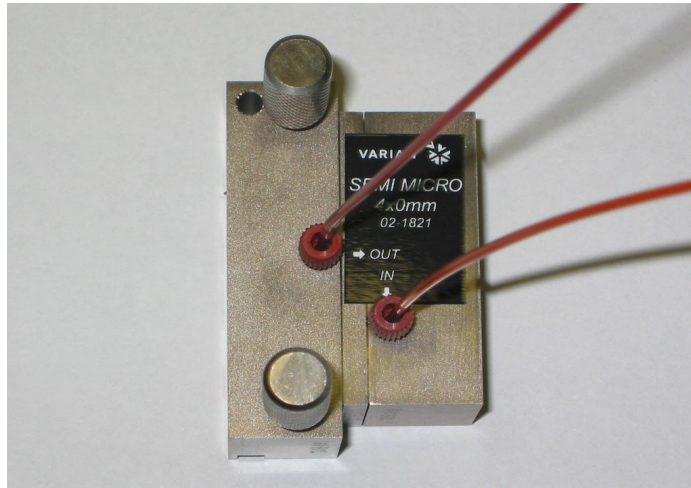
Flowcell type	Part number	Description
All except 4 x 0.15	1610126500	Fitting 1/16 tube nut/ferrule flat bottom (Pack of 10)
4 x 0.15	1610126900 1610126400	Fitting 1/8 tube nut flat bottom (each) Fitting 1/8 tube ferrule (Pack of 10)

### To install a flowcell:

1. Fit the nuts and ferrules on the PEEK™ tube as shown in Figure 10.

**NOTE:** 1/16" tubing is used on all flowcells except for the 4 x 0.15. This will require 1/8" tubing and the nuts, ferrules and flowcell fittings are also larger, due to the high flow rates of these flowcells.

2. Screw these two tubes into the body of the flowcell. Be careful not to cross thread the connector into the flowcell body. Do not over tighten, as this will damage the threads. Each flowcell has an inlet and outlet connection (refer to Figure 11).



*Figure 11 Flowcell showing thumbscrews and inlet and outlet connections with tubing connected. The top connection is the outlet, and the bottom connection is the inlet. A 9 x 0 flowcell is shown. The position of the inlet and outlet connections varies for different flowcells.*

3. Remove the panel on the front right side of the detector by unscrewing the screw in the top left corner of the panel to access the flowcell compartment (refer to Figure 12).



*Figure 12 Removing the front panel from the ProStar 325*

4. Carefully position the flowcell so that the two thumbscrews are positioned in the threaded holes in the flowcell compartment. Push at the center of the flowcell to ensure it is positioned squarely in its housing and that it is not tilted in any way (refer to Figure 13).



*Figure 13 Positioning the flowcell in the flowcell compartment*

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NOTE:	It is critical to the performance of the detector that the flowcell is inserted correctly. The internal optical components of the flowcell are an integral part of the detector's optical system. If the flowcell is not fitted correctly, it will have an adverse effect on detector performance.
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5. Secure the flowcell by tightening the thumbscrews with your fingers. Alternate tightening the thumbscrews until they are snug.
6. Replace the front panel.

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NOTE:	For optimum performance, the detector should be operated with the front panel in place. This is because the foam on the inside of the panel stops breezes, which may cause instability and noise, from reaching the flowcell.
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To remove a flowcell, follow the above steps in the reverse order.

---

**NOTE:** The flowcell should be removed with the connecting tubing fitted. These must be removed outside the detector compartment.

---

If the flowcell type is changed, perform a lamp calibration (refer to page 105).

### ***Detector outlet back pressure restrictor***

If you are using a 9 x 0 or 4 x 0 flowcell, or a 9 x 1 flowcell at lower flow rates for analytical work, the back pressure restrictor assembly (part number 0110743300) that was supplied with your detector should be threaded into the outlet line from the flowcell. The back pressure restrictor applies approximately 40 psi back pressure on the flowcell. This prevents outgassing and bubbles from forming or being trapped in the flowcell, which can cause an unstable baseline.

Note the arrow stamped on the restrictor body. This arrow must point away from the flowcell outlet port, and toward the waste receiver. The threaded plastic fittings should be finger tightened only enough to prevent leaks.

About 122 cm (48") of 1.6 mm (1/16") tubing is supplied at both the inlet and outlet of the restrictor. The inlet tubing is provided with a 1.6 mm (1/16") plastic tubing fitting for connecting to the flowcell outlet port. Either the outlet tubing can be directed to the waste container, or the tubing removed, and the restrictor itself dropped to the bottom of the waste bottle.

The restrictor pressure setting is not adjustable. If the restrictor fails or becomes plugged, replace the existing cartridge with a new 40 psi replacement supplied in the Cartridge Replacement Kit (part number 0391923990). Restrictors with higher back pressures are available if the mobile phase you are using causes significant bubble problems with the standard restrictor.

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## Installing the door

The module door may be attached to the front of the ProStar 325 to cover the tubing connections to the flowcell.

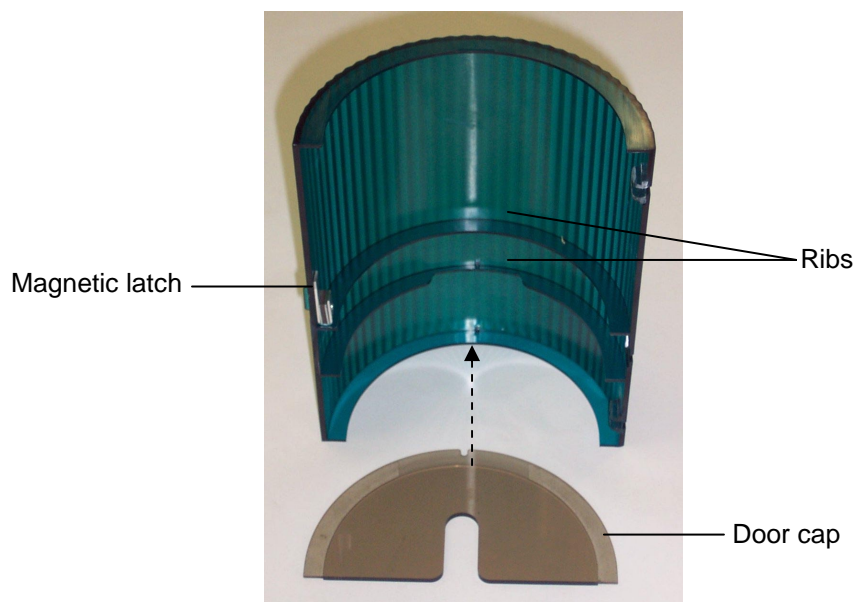
### *Installing the door cap*

If the ProStar 325 is the top module in the stack, the door cap should be installed before installing the door on the module.

If the ProStar 325 is not at the top of the stack, do not install the cap and proceed to the instructions describing door installation on page 67.

#### **To install the door cap:**

1. Stand the door **upside down** on a flat surface (i.e., with the two “ribs” towards the bottom, refer to Figure 14).



*Figure 14 Inserting the door cap onto the ProStar 325 door*



2. Take the cap and remove the protective paper exposing the adhesive that will attach the cap to the door.
3. Insert the cap into the door and press the adhesive onto the inside of the door lip. Be sure to keep the door edges and cap edges flush (refer to Figure 14).

### ***Installing and removing the door***

#### **To install the door:**

1. Insert the top hinge pin into the top hinge.
2. Gently press down on the top of the door (refer to Figure 15) and slide the lower hinge pin into the lower hinge. The door should now pivot on the pins and close. The magnetic door latch should stick to the instrument.



*Figure 15 Installing the ProStar 325 door*

#### **To remove the door:**

1. Gently push down on the door and slide the lower hinge pin out of the lower hinge.
2. Lift and slide out the top of the door.

---

## Installing the HPLC Control software

The handheld PC used to control the ProStar 325 detector requires the Pocket PC 2000 or Pocket PC 2002 operating system to run the HPLC Control program.

### To install the software:

1. Set up the Microsoft ActiveSync software (version 3.5 or later).
2. Using a desktop PC, run the setup executable on the supplied ProStar 325 CD-ROM (part number 8510201500).

Next time the handheld PC is plugged into its cradle, the software will be automatically transferred across from the desktop PC.

### To uninstall the software using a desktop PC:

1. Plug the handheld PC into its cradle and wait for a connection to be made with the desktop PC.
2. Use the **Add/Remove Programs** dialog (accessed from the **Tools** menu) to remove the HPLC Control program.

### To uninstall the software using the handheld PC:

1. Tap the Windows **Start** icon, then **Settings**.

---

**NOTE:** The term “tap” refers to the action of pointing to and touching an object on the handheld PC screen with the stylus device.

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2. Tap the **System** tab, and then select **Remove Programs**.
3. Select **Varian HPLC Control**, and then tap the **Remove** button.

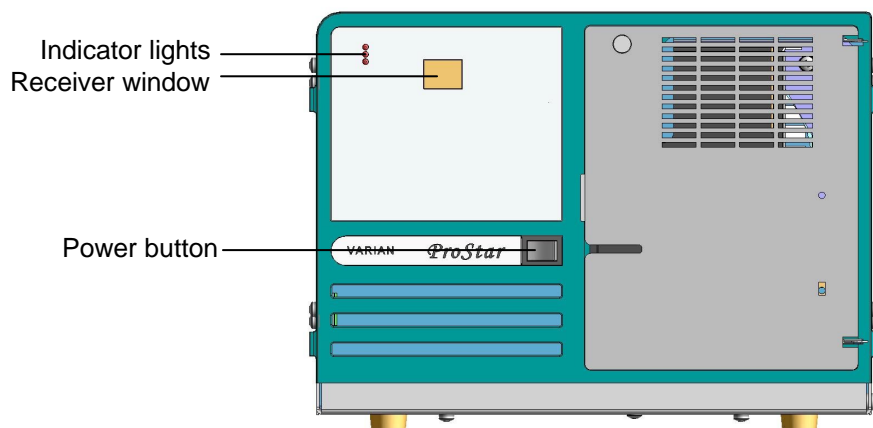
# System description

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## Controls and lights

The following controls and lights are located on the front of the detector:

- ☐ Indicator lights
- ☐ Receiver window
- ☐ Power button



*Figure 16 Lights and power button on the front of the ProStar 325 detector*

Three indicator lights are located at the top left. They are:

- ❑ Power
- ❑ Lamp
- ❑ Ready/Run

At power up, the detector goes through an initialization sequence to calibrate its wavelength and verify its overall operation. During this period, the LED's on the front of the detector change color to indicate its current status. The table below defines each status:

*Table 4 LED indicator lights*

LED	Status	Color
Power	Power up	Orange
	Initializing	Orange flashing
	Power on	Green
Lamp	Initializing	Green flashing
	Lamp on	Green
	Fault	Red
Ready/Run	Not ready	Off
	Ready/Stopped	Green
	Method running	Orange

The receiver window, used for infrared communication between the detector and the handheld PC, is located to the right of the indicator lights. When controlling the ProStar 325 with the handheld PC, simply point the device at the detector to establish communication. It needs to be in line of sight and has a working range of approximately one meter.

The ProStar 325 power button is located to the right of the ProStar logo. Press **I** to turn the mains power on. Press **O** to turn the mains power off.






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## Handheld PC

A handheld PC running the HPLC Control software provides control of the detector when a Varian Star or Galaxie Chromatography Workstation is not being used. The HPLC Control software displays instrument status information, operator inputs for method building, error messages, and so on. All entries/selections are made with the stylus device.

### ***HPLC Control software overview***

The HPLC Control software consists of five main pages, accessed by tapping the appropriate icon at the bottom of the screen:

- Home (accessed by tapping )
- Method (accessed by tapping )
- Graph (accessed by tapping )
- Log (accessed by tapping )
- IP Settings (accessed by tapping )

---

**NOTE:** The term “tap” refers to the action of pointing to and touching an object on the handheld PC screen with the stylus device.

---

In addition to these four icons, there is also a Calibration icon, a Help icon and a Tools menu at the bottom of the screen.

Tap the Calibration icon to access the Calibration page, where you can perform an instrument or lamp calibration (refer to page 105).

Tap the Help icon to access the online help.

Choose **About HPLC Control** from the Tools menu to view the software, instrument firmware and instrument hardware versions.

Choose **Errors** from the Tools menu to display any errors that have occurred. Tap **OK** to close the Error window.

Choose **Exit** from the Tools menu to close the HPLC Control software.

Operation of the detector involves starting up, setting up a method, performing a run and viewing results. See the Operation chapter on page 79 for full details on operating the detector.

---

## Optics hardware

The main optics components are the:

- ❑ UV (and optional visible) source lamp assembly
- ❑ Beam splitter
- ❑ Flowcell assembly
- ❑ Monochromator (containing collimators and grating)
- ❑ Photodiode detectors

The only user-serviceable optics components are the flowcell and lamp assemblies. These assemblies are located behind the panel on the front right side of the detector. To access the flowcell and lamp assemblies, undo the captive screw in the top left corner and remove the front panel. All other optical components are pre-aligned and sealed and must not be readjusted under any circumstance.

### ***Optical path***

The optical path of the ProStar 325 detector is as follows (for a graphical representation, see Figure 17 on page 73):

Light coming from the source lamp is passed through a focusing lens before hitting the beam splitter. The sample path then hits mirror N1 and the reference path hits mirrors N2 and N3. The two beams pass through an entrance mask which shapes the beam to the geometry required before entering the flowcell. Upon leaving the flowcell, they again pass through a mask before entering the monochromator. This mask helps determine the resolution of the detector optics.

In the monochromator, the light is directed onto the entry collimating mirror and then onto the grating. The dispersed light hits the exit collimating mirror before leaving the monochromator through the exit mask. From here the beams are focused onto the dual photodiode detectors.

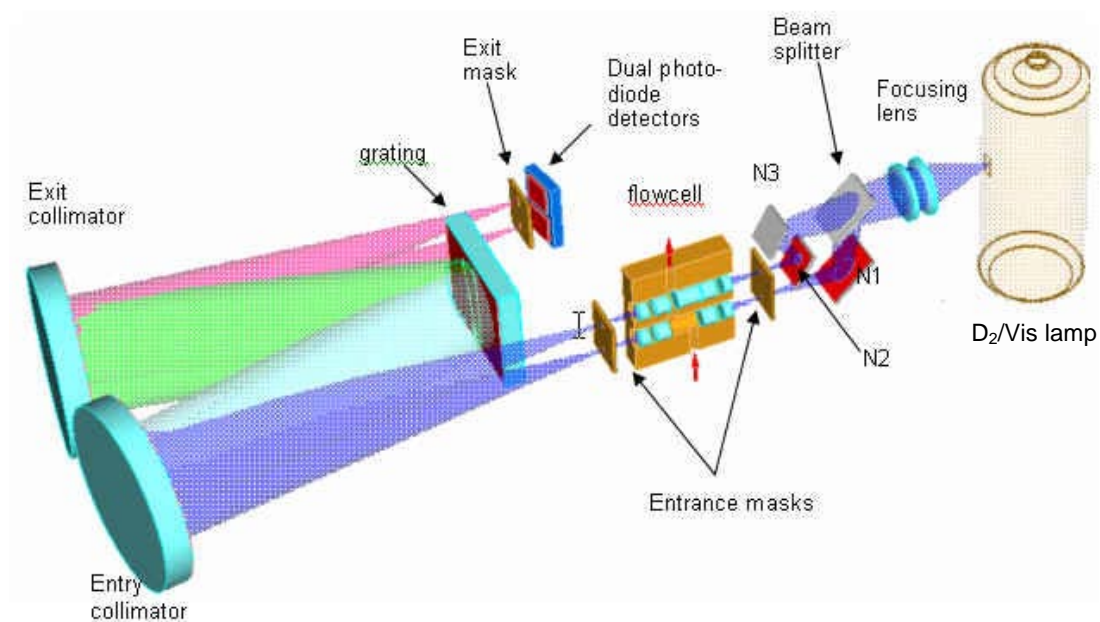
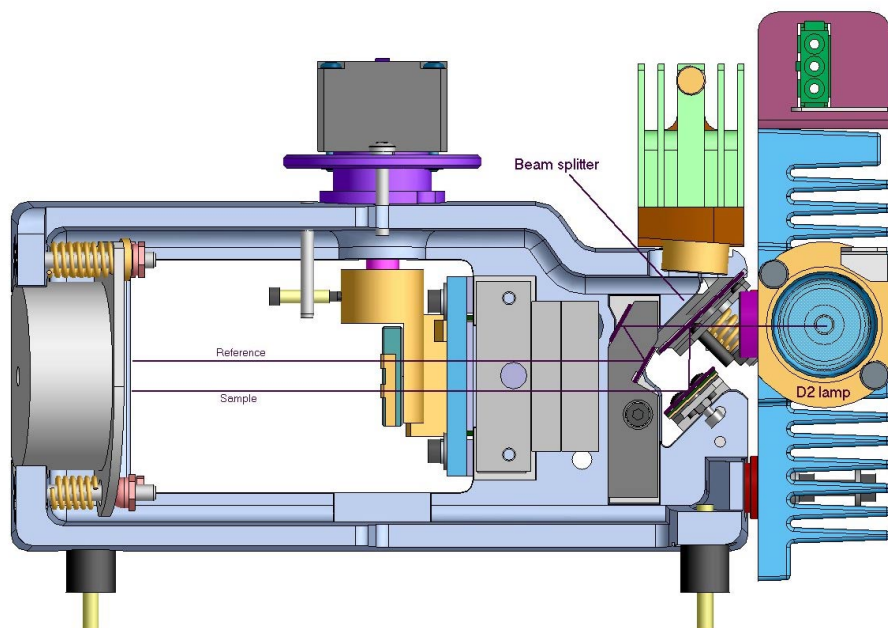


Figure 17 Optical ray trace diagram

### ***Deuterium (UV) lamp assembly***

The lamp assembly consists of the lamp bulb rigidly cemented into its mounting bracket. The assembly is pre-aligned. Lamp replacement is easy to perform, as no alignment procedures are required. See page 97 for instructions on how to replace the UV lamp.



*Figure 18 Deuterium lamp optical path*



**Visible lamp assembly (optional)**

When this option is fitted, the visible lamp mounts on top of the optics module and is held in place by two screws. These are in a fixed position therefore allowing replacement of the lamp without the need for alignment. See page 102 for instructions on how to replace the visible lamp.

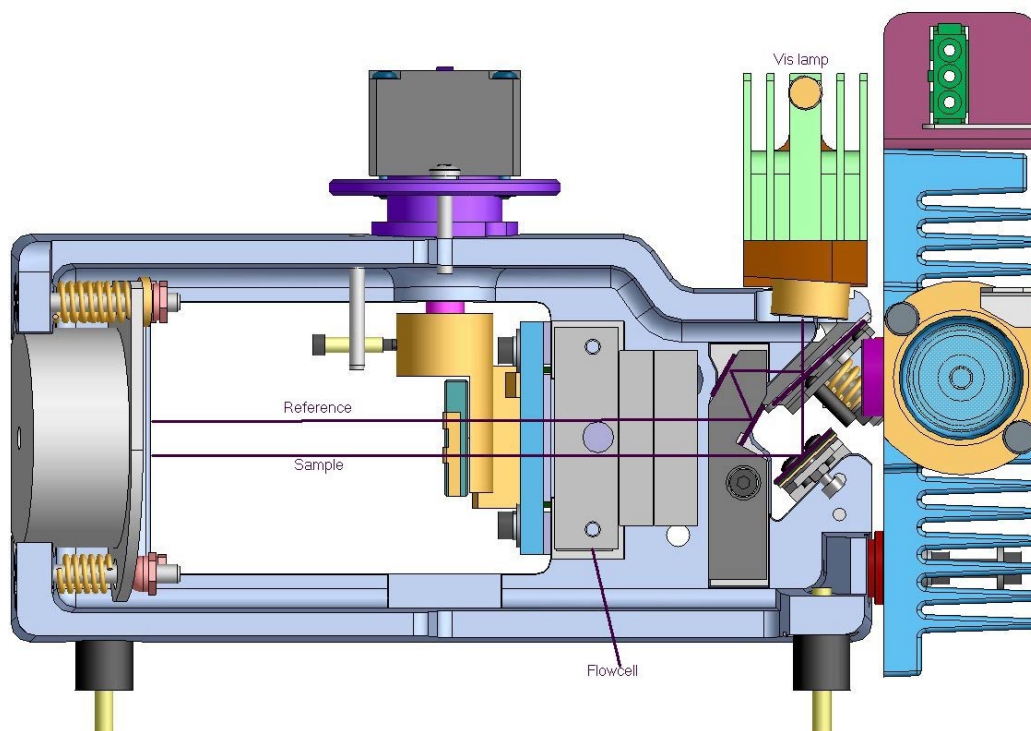


Figure 19 Visible lamp optical path

**Beam splitter**

The beam splitter is a silica plate that divides the beam into sample light and reference light.

## Entrance and exit masks

The masks used throughout the optical system, determine the optical resolution of the detector.

## Flowcell assembly

The function of the flowcell is to direct the focused light from the lamp module through a critically dimensioned sample/solvent flow path and then into the monochromator. Focusing is achieved by quartz optics lenses fitted to the flowcell.

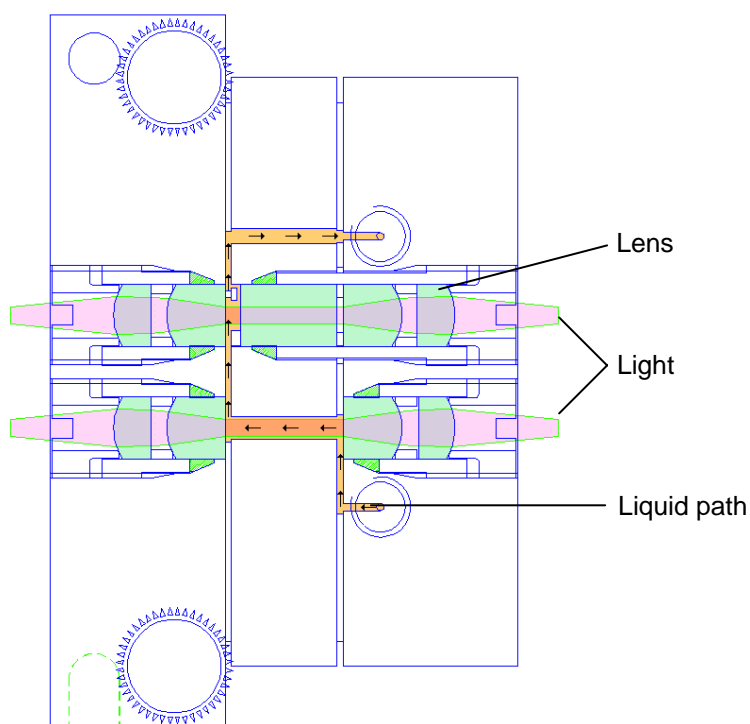


Figure 20 A typical flowcell (9 x 1). Arrows show the liquid flow path.

Flowcells are made of titanium and have a maximum working pressure range of approximately 1000 psi. The lens retainers are made of brass and the gaskets are made of Teflon® (FEP).

The flowcell and its attending hardware are designed for removal, installation and replacement by the user. See page 60 for instructions on how to replace the flowcell.

Whenever the type of flowcell is changed, you must perform a lamp calibration (refer to page 105).

## ***Monochromator***

The monochromator is an enclosed unit that disperses a beam of light which has been directed through the flowcell, and discriminates within 1 nm, to a specifically selected wavelength.

The monochromator assembly contains the following components:

- ❑ An entrance mask that produces a well defined beam of polychromatic UV or visible radiation.
- ❑ An entry collimating mirror.
- ❑ A diffraction grating that disperses incident radiation into a continuous spectrum.
- ❑ A stepping motor to rotate the grating and obtain the desired wavelength of exit radiation.
- ❑ An exit collimating mirror.
- ❑ An exit mask producing a very narrow bandwidth of light that is passed on to the detectors.

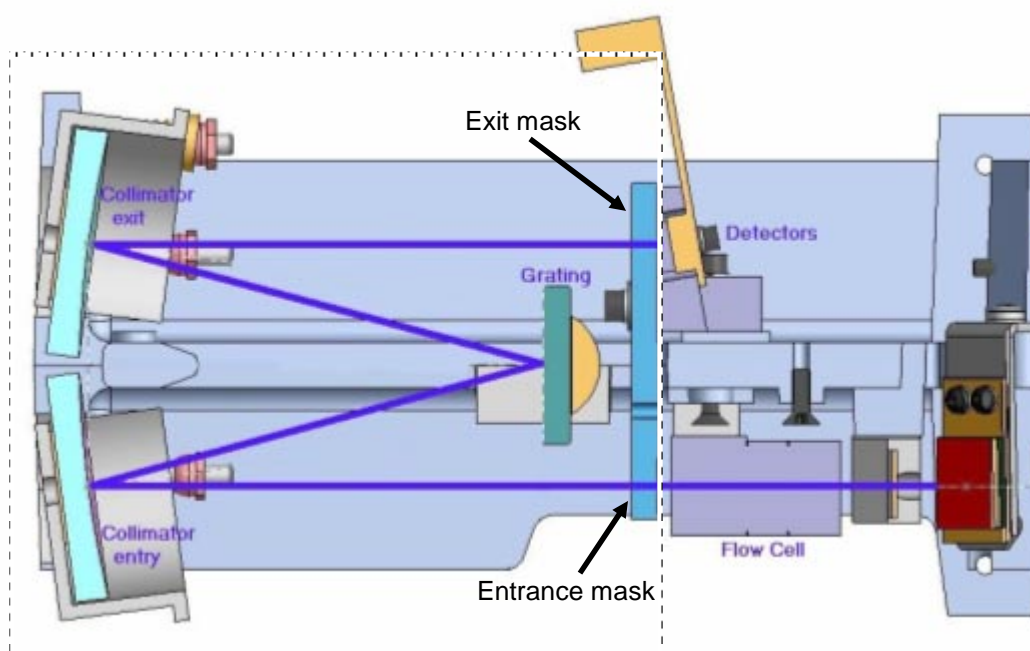


Figure 21 Monochromator optical path; top view. (Monochromator is designated by dotted line)

### Grating details

Grating size:	70 x 45 mm
Blaze angle:	8.5° (UV)
Blaze wavelength:	250 nm (UV-Vis)
Reciprocal dispersion:	0.98 nm/mm (UV-Vis)
Lines per mm:	1200 lines/mm (UV-Vis)

### Photodiode detectors

The detector is capable of operating in the 190–900 nm range. Dual silicon photodiode detectors provide an output for measurement by the electronics system.

# Operation

These operating instructions assume that all installation procedures for the detector have been successfully completed, and that all other major components of the system have been set up for normal operation. These operating instructions are for stand-alone applications only.

---

## Starting up

Starting up involves turning the power on, starting the HPLC Control program and turning on the lamp.

### *Turning the power on*



**WARNING:**  
EXPLOSION HAZARD



**WARNING:**  
CHEMICAL HAZARD

There is a danger of ignition when using flammable chemicals such as organic solvent.

Always check the flow path for leakage of solvent or waste solution during use and leakage of solvent inside the instrument. If an abnormality is found, stop the operation immediately.

Provide sufficient ventilation in the room.

This instrument is not explosion-proof.

Aqueous solvents or organic solvents having an ignition point above 70°C can be used. Do not use organic solvents having an ignition point below 70°C.

Be careful about ignition due to static electricity when using flammable chemicals. Use a conductive vessel and carry out grounding correctly, especially when using a non-conductive chemical.

Turn the detector on by pressing the power switch located on the front of the instrument to the on (I) position. The POWER indicator light will be illuminated in orange and will flash while the firmware is initializing. When the firmware is ready, the POWER indicator light will stop flashing and change to green.

If your detector fails to power up when the power switch is turned on, check that the power cord is properly connected, and check for power at the wall receptacle. If everything seems to be OK, check the fuses (refer to page 104).

### ***Starting the HPLC Control program***

Using the handheld PC, start the HPLC Control program by tapping the Windows **Start** icon and then Varian HPLC. The HPLC Control Home page will be displayed.

Infrared connection to the detector is automatic. As you approach an instrument holding the handheld PC, the Status display on the Home page should display that the detector is “online”.

If two detectors are in close range, the HPLC Control software will display a dialog allowing you to choose the detector to which you would like to connect.

### ***Turning on the lamp***

---

NOTE: Turning the detector power on does **not** turn on the lamp.

---

To turn on the deuterium (UV) lamp, point the handheld PC at the detector's receiver window and tap the **D2** button on the Home page of the HPLC Control software.

---

NOTE: The receiver window is located to the right of the indicator lights on the front of the detector.

---

The LAMP indicator light will be illuminated in green and will flash during the initialization period. Following the initialization period, the lamp ignites and the LAMP indicator will stop flashing and remain continuously on. The detector then goes through a calibration and monitoring period. Following the monitoring period, the READY indicator light will be illuminated in green.

To turn on the optional visible lamp, tap the **Vis** button on the Home page. The visible lamp comes on instantly.

---

NOTE: It is imperative that whenever the ProStar 325 detector lamp is turned on, the pump should be running with a non-absorbing solvent (water) flowing through the cell, with no air bubbles present. If, at any stage, a warning message is displayed indicating that the gain values loaded into RAM are incorrect (because of the presence of air or an absorbing solvent in the cell), you might like to calibrate the detector. This is performed on the Calibration page in the HPLC Control software.

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## Preparing for a run

The HPLC Control Home page is the first page displayed when the software is started. The Home page is where you perform basic detector controls, such as turning on the lamp, and starting and stopping a run. It also displays the absorbance, run time, wavelength, end time and detector status (for example, offline, ready and online).


To perform an auto-zero absorbance reading, tap the **A/Z** button. When you tap **A/Z**, the absorbance display and analog output are reset to zero.

---

NOTE: The **Change** button is only available during a run. See page 91 for more information about changing the end time.

---

Before starting a run, you must first select a method from the **Method** drop down list. Choose from the supplied methods, or create your own. (To create your own method, or edit an existing method, see page 82.)

To set Flow Cell and Synchronization options, open the Method page by tapping the Method icon  at the bottom of the screen, and tap the **Options** button to display the Options page.

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NOTE: The Options button is only available when the handheld PC is communicating with the detector.

---

Select your flowcell type. Select from 9 x 0, 9 x 1, 4 x 0 or 4 x 0.15. If you are using a 9 x 1 or 4 x 0.15 flowcell, enter a ratio. Then, make your synchronization choice — if you would like to Enable Ready In, select the checkbox.

**Enable Ready In** - When Enable In is not set, the Ready In signal is ignored and is equivalent to a constantly present Ready In. When Enable In is set, the ProStar 325 must receive a Ready In signal to go to the READY state.


It is only necessary to change the options when you change your flow cell or your synchronization cabling setup.

Tap the IP icon () to view IP Settings currently in use if you are connected to the Varian Star or Galaxie Chromatography Workstation.

Tap **Fixed Settings** to set the fixed IP settings.

---

## Creating and editing methods

To create or edit a method, tap the Method icon  at the bottom of the screen. The Method page will be displayed.

All existing methods are listed at the top of the page. Up to nine methods can be stored in the memory. The method currently loaded on the instrument has “(Instrument)” beside it.



**Tip:** Ensure that your handheld PC battery is always charged, as, if the battery goes flat the method information may be lost.

---

**NOTE:** There can be unsupported values displayed in the hand held PC if you also have a Star or Galaxie Workstation connected to the ProStar 325. Unsupported values are preceded by an asterisk (\*) and are displayed when you view the active instrument method. These values are for status information only and are only available for use with the Star and Galaxie Chromatography Workstation software.

---

To create a new method, tap the **Add** button. To edit an existing method, select the method you would like to edit by tapping the method in the list so that it is highlighted, then tap the **Edit** button. Selecting **Add** or **Edit** will display the “Method – General” page. (See page 84 for more information.)

**Tip:** Methods can be created and edited while an analysis is in progress. You can also instantly insert a new line into the currently running method using the **Insert Line** button. This will display the Method – Lines page.

To delete a method, select the method, then tap the **Delete** button. A prompt will appear asking you to confirm that you would like to delete the selected method.

To use the settings in an existing method as a basis for a new method, select the method, then select the **Copy Selected** check box. Then when you tap the **Add** button, the new method will have the same settings as the highlighted method.

Tap the **Transfer** button to load the currently selected method into the detector.

## **Method – General page**

The Method – General page is accessed by tapping the **Add** or **Edit** buttons on the Method page.

### **To set up the Method – General page:**

1. Enter a name for the method.
2. Enter an end time for the method, and the action to perform at the end of the run (Reset or Hold).
3. Tap **Reset** to make the method return to Time=0 conditions at the end of the run. Tap **Hold** to stop the Method Clock and hold the last specified conditions.
4. Once you have made your selections, tap the **Lines** tab to display the “Method – Lines” page.

## **Method – Lines page**

The Method – Lines page is accessed by tapping the **Lines** tab on the Method page, or by tapping the **Insert Line** button on the Method page.

The Method – Lines page displays each line in the method. You can add new lines, or edit existing lines.

To add a new line, tap the **Add** button.

If you have accessed the Method – Lines page by tapping the **Insert Line** button on the Method page, tap the **Insert Now** button to instantly add a line to the currently running method

To edit a line, select the line you would like to edit by tapping the appropriate row in the table so that it is highlighted, then tap the **Edit** button.

Selecting **Add** or **Edit** displays the “Method Line – General” page. (See the next section for more information.)

To delete a line, select the line you would like to delete, then tap the **Delete** button.

### ***Method Line – General page***

The Method Line – General page is accessed by tapping the **Add** or **Edit** buttons on the Method – Lines page.

On the “Method Line – General” page, enter a run time for the line. (Note that the Run Time of the Time=0 line cannot be changed.) Enter the first wavelength and attenuation, and select if you would like to auto-zero. Auto-zeroing adds the necessary offset voltage to the recorder and data system output to achieve a zero output voltage signal. For dual wavelength detectors, enter the second wavelength and attenuation, and select if you would like to auto-zero. (See page 87 for information on how to enable dual wavelength.)

Tap the **Peak Relay** tab to display the “Method Line – Peak Relay” page.

If you have accessed the Method Line Editor by tapping **Insert Line** on the Method page, you can enter method line parameters and tap the **Insert Now** button to instantly insert a new line while the detector is running.

### ***Method Line – Peak Relay page***

The Method Line – Peak Relay page is accessed by tapping the **Peak Relay** tab on the Method Line page. The Peak Relay page is used to select the function that activates the Peak Relay. The Peak Relay can be used to activate a fraction collector for sample preparation, and column switching applications.

On the Method Line – Peak Relay page, select the relay mode you require. Choose from Time Slice or Pulse Relay.

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NOTE:	The Peak Relay page is not available if you have accessed the Method Line Editor by tapping <b>Insert Line</b> on the Method page.
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## Time Slice

Select **Time Slice** to activate the Peak Relay initially, and thereafter for a specified time interval expressed in seconds. This interval is called the period. For other adjustments to the Peak Relay see page 91.

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NOTE: Time slice should not be activated on the first method line.

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The Time Slice function is used when you want to partition a selected peak into a number of segments. At the completion of each segment, the sample collector is advanced to the next sample vial by activation of the Peak Relay.

The Time Slice function can be triggered (turned on or off) by time programming (using the **Trigger** field).

The Peak Relay is only activated when a detector method is running. When a method reaches a Method End Time, the Time Slice function is turned off.

To enter the correct time in the **Period** field, measure the peak width at half height of the peak or peaks of interest. Divide this value by the number of segments you want to collect, and enter that value.

## Pulse

Select **Pulse** for single Peak Relay activation at the specified times. It is used to send a single relay closure to the sample collector at a specified time for any purpose you may determine.

---

NOTE: Pulse cannot be activated on the first method line.

---

**Example:** Suppose you estimate that your sample receiver will fill and overflow at about 3 minutes. You may set the Pulse function to advance the sample collector at 2.75 minutes to the next sample receiver.

Tap the **Relays** tab to display the Method Line – Relays page.

**Method Line – Relays page**

The Method Line – Relays page is accessed by tapping the **Relays** tab on the Method Line page.

Select the relays you require.

Once all your method line selections have been made, tap **OK** in the top right corner of the screen to close the Method Line – Relays page and return to the Method – Lines page.

Tap the **Acquire** tab to display the Method – Acquire page.

**Method – Acquire page**

The Method – Acquire page is accessed by tapping the **Acquire** tab on the Method page.

On the Method – Acquire page, select the bunch rate you require. Choose from 1, 2, 4, 8, 16, 32, 64, 128 and 256. Bunch Rate is only adjusted when connected to the Star or Galaxie Workstation. When in dual wavelength mode, bunch is set at 1 and is not adjustable. In single wavelength mode, leave the bunch rate at its default value.

Select the Response Time. Choose from 0.050, 0.500, 1.00 and 2.00 seconds. The larger the response time, the more noise is reduced. In most cases, the 2.00 second response time should be chosen. If fractions are being collected in a preparative or semi-preparative mode, a smaller response time should be chosen to minimize time shift of the peak retention time. The larger the Response time the longer the delay added to the retention time of a peak.

Select the Wavelength Mode you require. Choose from Single and Dual.

Tap the **Analog** tab to display the Method – Analog page.

**About Extended Range**

If you chose the 9 x 1 or 4 x 0.15 flowcell, extended range is automatically turned on. Use the ratio indicated on the flowcell or use 8 for the 9 x 1 and 28 for the 4 x 0.15.

Normally in HPLC with a long pathlength flowcell, high sample concentrations increase absorbance to the point of saturation. The light path becomes opaque (transmittance near zero) and the signal output on the recorder or integrator is truncated, or flat-topped. Any signal beyond this point is lost until absorbance reduces enough to allow transmittance.

When there are large sample concentrations in HPLC, which result in high absorbance, causing truncated peaks and loss of peak information, the classical remedy is to reduce sample concentration or change to a flowcell with a shorter light path. The flowcell with the shorter light path will be less sensitive but its saturation point will be much higher, thereby allowing higher sample concentration and Extended Range.

The ideal solution for increasing absorbance would be a flowcell with two pathlengths, providing dual path operation, which would switch automatically to the short pathlength when concentration became too high for operation on the long pathlength. The useful dynamic range would be extended by the ratio of the long pathlength to the short pathlength. If the maximum range attainable on a detector with an 8 mm pathlength were 1.5 AU, then a 1 mm flowcell would allow a maximum range of 12 AU relative to the 8 mm path ( $8 \times 1.5$ ). As the absorbance decreased, the detector would switch back to operation on the long path for maximum signal-to-noise ratio.

The unique optional dual pathlength flowcells used in the ProStar 325 provide seamless automatic Extended Range. The dual pathlength flowcell performs as two flowcells in one, allowing HPLC work well beyond the normal +LIMIT value (the highest absorbance in normal range). As absorbance continues to increase, the ProStar 325 automatically switches to operation on the short pathlength. The useful range is extended to the extended +LIMIT, which is the normal +LIMIT multiplied by the flowcell ratio. Extended Range operation is shown in Figure 22.

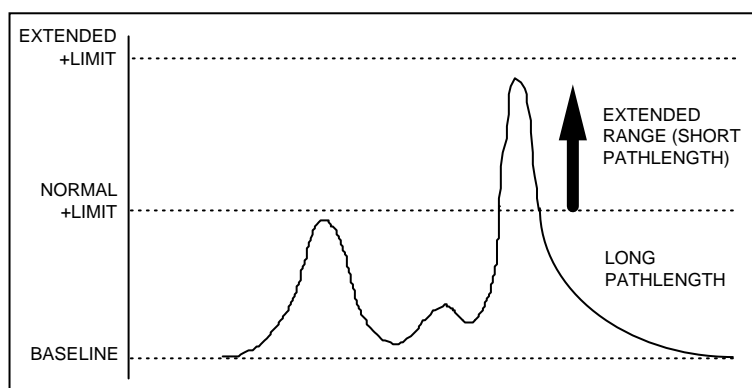


Figure 22 Extended Range operation

The detector constantly samples both beams and records offset constants, even in analytical operation. Because of this, the detector has in memory the necessary constants to mathematically scale and seamlessly extend the long path response with the short path response. During Extended Range operation, the long pathlength is constantly sampled, and as absorbance decreases there is a seamless switch back to dual beam operation in normal range.

A comparison of two chromatograms, one from the ProStar 325 Detector and the other from a typical UV detector using the same conditions, is shown in Figure 23.

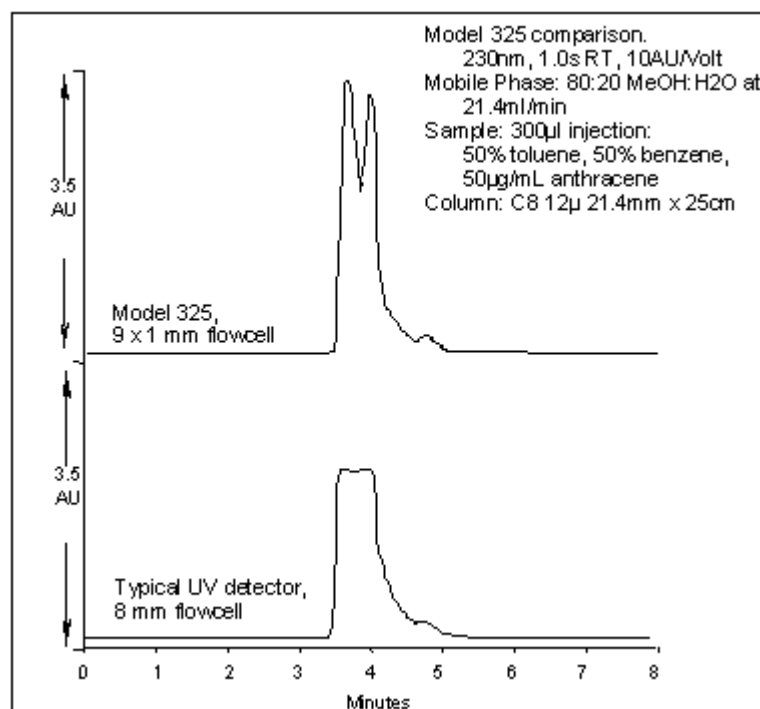


Figure 23 Automatic Extended Range

### Method – Analog page

The Method – Analog page is accessed by tapping the **Analog** tab on the Method page.

On the Method – Analog page, select your requirements for the first analog source. Choose from Off, Wavelength 1 or Wavelength 2. Select Peak Ticks 1 if you desire. Peak Ticks are small spikes added to the analog output to indicate when the Peak relay is activated. Then select your analog requirements for the second source.

Tap the **Relay** tab to display the Method – Relay page.



### **Method – Relay page**

The Method – Relay page is accessed by tapping the **Relay** tab on the Method page. This page is used to time program the Peak Relays. The Peak Relays can be used to activate a fraction collector for sample preparation, and column switching applications. The Peak Relay is activated by Time Slice or Pulse. The type of Peak Relay is selected on the Method Line – Peak Relay page (see page 85).

On the Method – Relay page, make your Peak Relay selections. Choose from Closed or Open, and enter the Duration and Delay times.

If your selection is Close on Activation, the relay is normally open. Conversely, if you command Open on Activation, the relay will be normally closed.


The Duration is the length of time the relay is activated, whether closed, or open. The time entered for the Duration will be dictated by the specifications of the particular sample collector or column switching valve used. Generally a Duration of 0.5 seconds will satisfy most applications.

The Delay is based on the liquid hold-up (tubing volume and flow rate) of your system and represents the time it takes for the sample to move from its time of detection to its delivery to the collection vial. The proper Delay value ensures that the sample represented by the peak of interest is collected in the expected vial.

Once you have made your relay selections, tap **OK** in the top right corner to return to the Method page.

---

### **Performing a run**

Once you have a method that suits your needs, you can commence a run. To do this, tap the Home icon  to display the HPLC Control Home page.

Select your method from the Method drop-down list. The method will be loaded into the detector.


Tap the **Start run** button to commence the run. The Status at the bottom of the Home page will display "Running", and the READY/RUN indicator light on the instrument will change from green to orange.

If the chromatography is coming off slower than first thought, you can extend the run. To do this, tap the **Change** button and enter a new end time.

If you decide you need an extra line, you can tap the **Insert Line** button on the Method page to display the Method – Lines page. Here you can enter the appropriate line, and tap **Insert Now** to instantly insert a new line while the method is running.

---

## Viewing results

While a method is running, results can be viewed graphically on the Graph page. The Graph page is accessed by tapping the Graph icon  at the bottom of the screen.


The graph page features a chromatogram display that shows a trace collection (Time vs Absorbance) graph. The black trace represents wavelength 1, while red is used for wavelength 2.

Note that average data points are displayed, rather than a bandwidth of points.

Use the slide bar to scroll the graph horizontally. This slide bar appears after a runtime greater than one minute.

---

## Log page

The Log page enables you to view a Run log and an Error log. The Log page is accessed by tapping the Log icon  at the bottom of the screen. Tap the down arrow to choose the log you require. These logs are not editable.

The Run log shows a history of events that have occurred during a run. When the **Start run** button is tapped on the Home page, previous Run log entries are removed and new data is recorded.

The Error log shows a history of errors. When a fatal error is detected, the error is entered in the Error log with a unique code number and brief description. See the Appendix on page 117 for a list of the error codes and their meanings.

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# Maintenance

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## General

The Varian ProStar 325 detector requires three maintenance procedures to be performed periodically:

- ❑ Changing and cleaning the flowcell
- ❑ Replacing the lamp(s)
- ❑ Calibrating the lamps

Flowcell removal and replacement will be necessary if a flowcell of different pathlength is desired, or if cleaning procedures do not satisfactorily clean the cell.

Lamp replacement is required when the lamp output deteriorates to the level that it affects the reliability of analytical results.

Lamp calibration is recommended every 2000 deuterium lamp hours, and whenever a lamp is changed or the flowcell type is changed.

This chapter also covers fuses and cleaning the instrument.

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## Maintaining and cleaning the flowcell

The high sensitivity of the detector and the low volume of the flowcell make it imperative that a high standard of solvent purity and general system cleanliness be maintained. A contaminated flowcell can lead to noise and drift problems that are often mistakenly attributed to other areas of the system.

The cell can be cleaned in place quite successfully by using the following procedure:

1. Remove all reservoirs containing organic solvent from the system. Replace the column with a clean length of 1.6 mm (1/16") OD stainless steel tubing. Fill all of the reservoirs with HPLC grade water and flush the system thoroughly to remove any trace of organic solvents.
2. After the system has been rinsed with water, pump 25% phosphoric acid through the flowcell. This acid is prepared by diluting one part of concentrated phosphoric acid with three parts of HPLC grade water.
3. After pumping 50 mL of the 25% acid through the cell at 1–2 mL/min, rinse by pumping 100–200 mL of HPLC grade water through the system. Do not allow the acid to remain in the cell for more than one hour. Dispose of the acid in accordance with approved waste disposal procedures.
4. Do a final rinse with acetonitrile or methanol.

The frequency of need for cell cleaning depends to a great extent upon the cleanliness maintained during routine operation. In severe cases of contamination, for instance if there is precipitate in the cell, the cell must be replaced.

### CAUTION

**Do not dismantle the flowcell.**

When making or breaking solvent line fittings, care should be taken to prevent any contamination of exposed fittings. Tubing should be sealed or capped when not connected. Thread lubricants should never be applied to compression fittings.

Only high purity (HPLC) solvents should be used.

The external windows of the flowcell can be cleaned with a dry, clean source of compressed air or nitrogen. To do this:

1. Remove the flowcell and carefully blow any dust or contamination from the external windows.
2. Replace the flowcell, ensuring that the sample and reference beam windows are not obstructed.

For full details on removing and replacing the flowcell, please refer to the section titled 'Installing a flowcell' on page 60.

---

NOTE:	To avoid possible degradation in performance due to dust, flowcells should be stored in sealed plastic bags when they are not in the detector. Whenever the flowcell is removed, set the flowcell with the faceplate upward. Avoid touching the inside of the flowcell recess. Cover the flowcell opening with a piece of card, or always place a flowcell in the flowcell opening.
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## Replacing the Deuterium (UV) lamp

Your new replacement lamp is delivered to you pre-tested and aligned in a mounting bracket. It is designed for direct replacement and requires no alignment procedures after it has been installed.

Work through the following steps for removal of the old lamp, and installation of the new one.



### **WARNING:**

**To avoid electric shock and eye damage, turn the main power switch to OFF and disconnect the power cord before starting the lamp replacement procedure.**



**WARNING:**

Let the lamp housing cool before removing the lamp.

**NOTE:**

You should wear gloves when replacing the lamp to prevent any oil or other material from getting on the lamp glass envelope. It is important that you never touch the glass on the lamp with your bare hands, as this can cause the lamp to fail prematurely or even crack.

1. Remove the door (see page 67).
2. Remove the front panel by unscrewing the captive screw in the top left corner of the panel (refer to Figure 24).



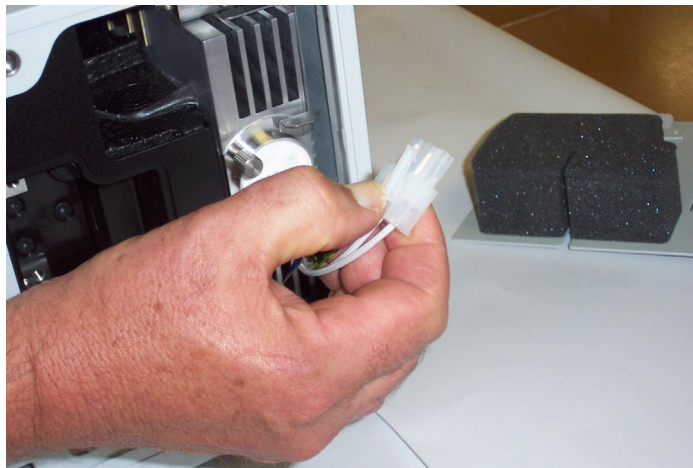
*Figure 24 Removing the front ProStar 325 panel*



3. Squeeze the small latch on the 3-way connector and pull the connector out (refer to Figure 25 and Figure 26).

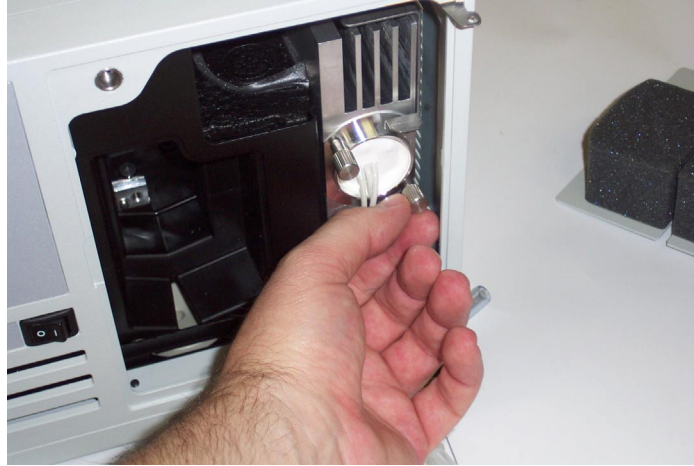


*Figure 25 Removing the lamp 3-way connector*



*Figure 26 Lamp 3-way connector removed*

4. Undo the first captive screw (refer to Figure 27).



*Figure 27 Undoing the first lamp screw*

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**NOTE:** Be sure to retain screw for re-installation.

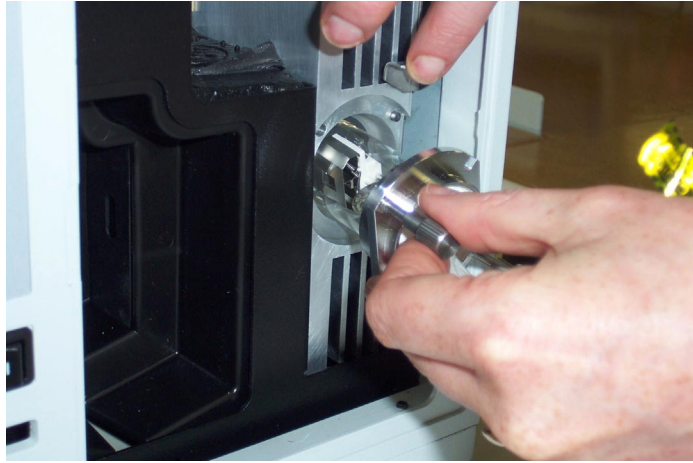
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5. Undo the second captive screw (refer to Figure 28).



*Figure 28 Undoing the second lamp screw*

6. Lift up the silver safety interlock latch on the right and remove the lamp, holding onto the thumbscrews (refer to Figure 29).



*Figure 29 Lifting the silver safety interlock latch and removing the lamp*

7. Remove the lamp assembly and discard. No part of the old assembly can be re-used.

### ***Installing the new lamp***

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NOTE:	You should wear gloves when replacing the lamp to prevent any oil or other material from getting on the lamp glass envelope. It is important that you never touch the glass on the lamp with your bare hands, as this can cause the lamp to fail prematurely or even crack.
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1. Lift the silver safety interlock latch, and carefully insert the lamp into the lamp housing.
2. Screw in the two thumbscrews.
3. Connect the 3-way connector into the socket.
4. Re-engage the safety interlock latch by sliding it down.

5. Replace the front panel and screw in the captive screw in the top left corner of the panel.
6. Re-install the door (see page 67).
7. Perform a lamp calibration (refer to page 105).

---

## Replacing the optional visible lamp

Your new replacement lamp is delivered to you pre-tested and requires no alignment procedures after it has been installed.

Follow the steps given below for removal of the old lamp, and installation of the new one.



### **WARNING:**

Turn off the lamp and let the lamp housing cool before removing the lamp.

1. Remove the door (see page 67).
2. Remove the front panel by unscrewing the captive screw in the top left corner of the panel (refer to Figure 30).



*Figure 30 Removing the ProStar 325 front panel*

3. Undo the visible lamp holding screw (refer to Figure 31).



*Figure 31 Undoing the visible lamp screw*

4. Holding the screw, remove the visible lamp housing (refer to Figure 32). This will then expose the lamp, which will still be connected.



*Figure 32 Visible lamp housing removed*

## CAUTION

**If you are just checking the visible lamp, and plan to re-install it, do not touch the glass with your fingers – use a protective sleeve, tissue or wear rubber gloves. In fact, rubber gloves aid lamp removal, as they make it easier to grip the lamp.**

5. The visible lamp has two prongs which slide into two connecting sockets. Using a protective sleeve or tissue to avoid touching the glass, gently grip the visible lamp between your thumb and finger and carefully pull the lamp towards you.
6. Remove the lamp and discard. No part of the old assembly can be re-used.

## ***Installing the new lamp***

### CAUTION

**Do not touch the visible lamp glass with your fingers – always use a protective sleeve or tissue.**

1. Using a protective sleeve or tissue, grasp the lamp between your thumb and forefinger.
2. Insert the two small prongs of the lamp into the two holes in the lamp compartment, and gently push the lamp in.
3. Attach the lamp housing, by inserting the screw into the hole and tightening the thumbscrew with your fingers.
4. Replace the front panel and screw in the captive screw in the top left corner of the panel.
5. Re-install the door (see page 67).
6. Perform a lamp calibration (refer to page 105).

---

## Calibrating the lamps

Lamp calibration minimizes noise by allowing the maximum gain settings to be used for each slit width. It also improves linearity by re-balancing the 0%T correction tables as lamps age.

A lamp calibration requires certain conditions. A cell should be fitted, with clean water being pumped (to keep it clear of bubbles) at 0.2 to 1 mL per minute.

If you are using a 9 x 0 or 4 x 0 flowcell, or a 9 x 1 flowcell at lower flow rates for microbore to analytical work, the back pressure restrictor assembly (part number 0110743300) that was supplied with your detector should be threaded into the outlet line from the flowcell. The back pressure restrictor provides approximately 40 psi back pressure on the flowcell. This prevents outgassing and bubbles from forming or being trapped in the flowcell, which can cause an unstable baseline. (Refer to page 65 for more information about the back pressure restrictor.)

Pump pulsations and overall stability are not important for this calibration, but the instrument should be on for at least half an hour to get the best linearity correction.

If a calibration is performed with a bubble in the cell, or no cell is fitted, the gain settings will be too high to cope with a cell present and full of water. Readings will be overrange, and will not respond to changes in absorbance. Noise will either be very high, or zero. If the gains are set just too high, chromatograms may show peaks that are cut off at the bottom.

To perform a lamp calibration using the HPLC Control software, ensure the detector has the conditions outlined above, then:

1. In the Toolbar, tap the **Calibration** icon.
2. Tap the **Lamp Calib** button. If the system is in the 'Not Ready' state, a message will appear stating that the system must be in the 'Ready' state.

The lamp calibration will then be performed. The process may take several minutes.

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NOTE: You can also perform a lamp calibration in the Star/Galaxie Chromatography Workstation software.

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## Fuses

Two fuses are located at the back of the instrument below the main power receptacle. To replace a blown fuse, disconnect the detector from the power supply, and replace the fuse with one of the type and rating indicated on the back panel.

The fuses have a code marked on the cap (e.g., T3.15AH250V). This refers to the fuse characteristic ('T' - time lag or 'F' - fast acting), the current rating ('x' amperes), the breaking capacity ('H' - heavy or 'L' - low) and the voltage rating ('y' volts). This code must correspond to the code appearing next to the fuse holders.

### WARNING:

To prevent reduced safety protection or unwanted fusing, **ALWAYS** ensure that the code on the fuse cap matches the information printed next to the fuse holders.

#### To check or replace a fuse:

1. Disconnect the detector from the mains power supply.
2. On the mains input connector (rear panel, refer to Figure 33), expose the fuse compartment by using a small, flat blade screwdriver to lift the fuse cap (refer to Figure 34). Then, slide out the fuse holder (lower red section; refer to Figure 35). Both fuses are located inside on either side of the fuse holder (refer to Figure 36).





Figure 33 Mains input connector and fuse compartment



Figure 34 Lifting the fuse compartment cap

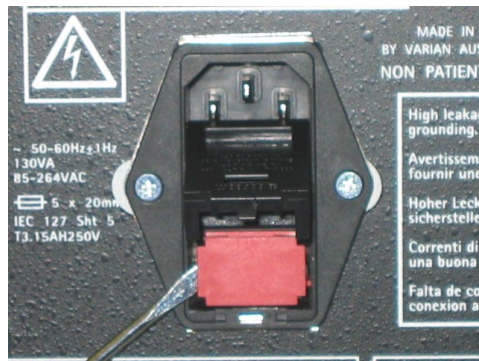
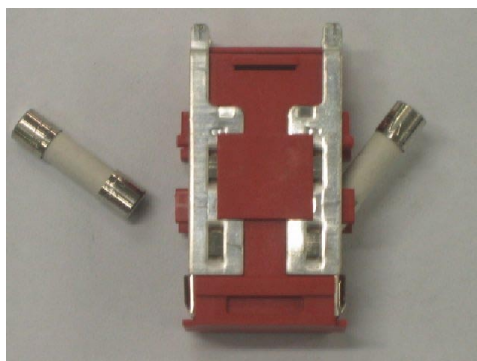


Figure 35 Sliding the fuse compartment out



*Figure 36 Fuse compartment and two fuses either side*

3. Check that the fuses are the correct type and are not damaged. If necessary, replace them.
4. Replace the fuses back in the red fuse holder. Push the holder back into the mains input connector and then lower the cap.
5. Reconnect the instrument to the mains power supply.

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NOTE:	If a fuse blows repeatedly, it may indicate other problems with the instrument. A service call may be required.
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## **Cleaning the instrument**

The exterior surfaces of the ProStar 325 should be kept clean. All cleaning should be done with a soft cloth. If necessary, this cloth can be dampened with water or a mild detergent. Do not use organic solvents or abrasive cleaning agents.

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## Diagnostics

The detector performs some self-diagnostics. For example, when the detector is turned on, start-up diagnostics are performed, whereby the integrity of the hardware is checked to ensure the detector is functioning properly. A self-calibration (zero order) is then performed, and detector levels are adjusted. (This can only be performed after the D<sub>2</sub> lamp is turned on. Refer to page 80). If a fault is detected, the error is displayed on the Log page of the HPLC Control program. To display the Log page, tap the Log icon at the bottom of the screen. Each error is identified by a unique number. A list of error codes is provided on page 117.

Extended diagnostics tests are available using the ProStar 325 Verify software, which is run on a desktop PC rather than a handheld PC. Extended diagnostics are those test procedures that may pinpoint component level electronic malfunctions or failures indicated by the error messages. These tests can be performed by the user, but for many cases, will require the services of a skilled technician or a Varian customer support representative. Information on using the ProStar 325 Verify software is not included in this manual. For assistance with using the ProStar 325 Verify software, refer to the online help.

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# Troubleshooting

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## Excessive noise and/or drift

Excessive noise and/or drift has two primary sources:

- ❑ A contaminated or leaking flowcell
- ❑ A worn out lamp

### To determine the source of the noise and/or drift:

1. Pump HPLC grade water through the flowcell at 250  $\mu$ L/min directly from the pump with no column in the system.
2. Set the detector wavelength to 240 nm and a Response time of 2 seconds.
3. Use the ProStar 325 Verify application to perform diagnostic tests to determine the source of the problem. For information on using the ProStar 325 Verify application, refer to the online help. Verify is desktop PC based software.

If the flowcell is the problem, clean it using the procedure given on page 96. If the cleaning procedure does not rectify the problem, it will be necessary to replace the flowcell assembly (refer to page 60). If the lamp is the problem source, it must be replaced with a new lamp (refer to page 97).

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# Appendices

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## Specifications

### *General specifications*

Diagnostics:	Built-in self-test and diagnostics
Time programming:	Time programmable wavelength, recorder attenuation, auto-zero, response time, peaksense, timeslice, pulse and external event relays. Response time is programmable at time=zero only. The hand held PC can store 9 methods.
Wavelength:	UV (Deuterium) lamp and optional visible (quartz halogen) lamp, 190–900 nm
Flowcell:	Optional 9 x 0, 9 x 1, 4 x 0, 4 x 0.15
Pressure:	1000 psi maximum on all flowcells
Response time:	0.05, 0.5, 1.0, and 2.0 sec
Spectral bandwidth:	5 nm
Recorder output:	1 V FS
Data system output:	1 V FS
Peak Sensing:	Peak Start, Peak End, Valley, Time Slice and Pulse will activate the Peak Sense relay and generate event marks on the recorder chart.
External communication:	To other instruments using synchronization cables.
Contact closure outputs:	Four time programmable external event relays, one Peak Sense relay, three synchronization signals: READY OUT, START OUT and FAULT OUT

Contact closure inputs:	Three synchronization signals: READY IN, START IN and FAULT IN. Plus LAMP OFF and AUTO-ZERO.
Bus communication:	The ProStar 325 Detector will communicate with the Star Chromatography Workstation by means of Ethernet.
Fuses	Fuse T3.15AH250V (5 x 20 mm) IEC 127 Sheet 5 Note: For safety reasons, any other internal fuse or circuit breaker is not operator accessible, and should be replaced only by Varian-authorized personnel. Fuse information on the rear of the instrument is the most up-to-date.

### ***External connections***

Mains inlet coupler:	3/2 A 120/250 VAC 50–60 Hz IEC type
Mains power cord	Australia 10 A 250 VAC Complies with AS3112 USA: 10 A 125 VAC Complies with NEMA 5-15P Europe: 6 A 250 VAC Complies with CEE7 sheet vii or NFC61.303VA
Rear connectors	J1 Comm: Ethernet TCP/IP RJ-45 type connector (system connection) J14 Analog out: female 9-pin D-range connector J4 Relay out: female 15-pin D-range connector P9 Sync signals: male 15-pin D-range connector J10 Sync signals: female 9-pin D-range connector



**Physical specifications**

Dimensions:	Width Packed: 460 mm (18.1 in) Unpacked: 296 mm (11.7 in) Depth Packed: 775 mm (30.5 in) Unpacked: 475 mm (18.7 in) Height Packed: 385 mm (15.2 in) Unpacked: 212 mm (8.3 in)
Weight:	Packed: 21 kg (46.3 lbs) Unpacked: 15.5 kg (34.2 lbs)
Electrical source requirements:	100–240 VAC $\pm$ 10%, 50/60 Hz $\pm$ 1 Hz single phase
Power consumption:	130 VA max
Environment:	Your instrument is designed for indoor use only. It is suitable for the categories stated on the front of this manual. Operation within specifications from 10 to 35°C, without failure from 0 to 50°C, and non-operational storage from -20 to 65°C. Operates in relative humidity from 5% to 95%. For optimum analytical performance, the ambient temperature of the laboratory should be between 20 and 25 °C and be held constant to within $\pm$ 2 °C throughout the entire working day.

**Performance specifications**

Refer to your specification data sheet.

**Handheld PC specifications**

Pocket PC 2000 or Pocket PC 2002 operating system  
Strongarm 206 or better CPU  
Requires 32 MBytes RAM  
Screen 320 x 200 (standard), color  
Sync cable, software and cradle  
Charger  
Varian HPLC Control software

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## Options and spare parts

The following spare parts are available for use with your ProStar 325 detector. Always use Varian-supplied spare parts, unless otherwise indicated.

0110728800	ProStar 325 detector door
0110743900	ProStar 325 visible lamp field upgrade
0110715400	Assy D <sub>2</sub> lamp (pre-aligned) 325/335
0110723100	ProStar 325 dual wavelength option (field upgrade)
0110723400	Ethernet cross-over cable
0110744200	Assy loom LC analog signal cable 325/335
0110744100	Interconnect cable (open-ended, for adaptor board, one signal per cable)
0110743800	Relay interface cable (for relay interface board, one relay contact per cable)
0210186590	Assy PWB sync. interface 325/335
0210187590	Assy PWB relay interface 325/335
0210181800	Flowcell 9x0, inert (analytical)
0210181900	Flowcell 9x1mm, inert (prep)
0210182000	Flowcell 4x0.15, inert (super prep.)
0210182100	Flowcell 4x0, inert (semi-micro)
0910206600	Door cap
1910010700	Fuse 3.15 A
5610136500	Lamp miniature quartz halogen 325/335
8510201500	ProStar 325 software CD-ROM

## Error codes

When an error is detected, the error is recorded in the Error log of the HPLC Control software. Each error has a unique code. The following table gives the meaning of each error code.

Error code	Description
9001	Command is not valid in the POWER ON state.
9002	Command is not valid in the NOT READY LAMP OFF state.
9003	Command is not valid in the NOT READY LAMP ON state.
9004	Command is not valid in the INITIALIZE state.
9005	Command is not valid in the MONITOR state.
9006	Command is not valid in the READY state.
9007	Command is not valid in the RUNNING state.
9008	Command is not valid in the STOPPED state.
9012	INTERNAL: A detector buffer used in a function was too small to complete the function. (Log as firmware bug, recording the command (function) which caused the error to appear).
9013	Attempt to change state of an invalid relay.
9014	Command is not valid in the CALIBRATION state.
9015	The Fault must be reset before turning the lamp on or off.
9051	Supplied encrypted code does not match this detector. See Varian sales staff for further information.
9052	Internal error that occurs when some task was not able to successfully send mail to a mailbox.

Error code	Description
9053	Write access to some of the NonVolatile storage locations is not permitted. This error indicates an attempt to write to one of those protected locations.
9054	Detector needed to check the serial number for some de-encryption procedure. The read of the serial number from EEPROM failed.
9055	Detector needed to write configuration options to EEPROM. The write to EEPROM failed.
9056	Request to normalize the run data for a cell, other than the 9x0 cell. The only cell that is able to be normalized (for demo purposes) is the 9x0.
9057	The "normalize" parameter in the SetGlobals command is not valid (client application bug).
9057	The "normalize" parameter in the SetGlobals command is not valid (client application bug).
9058	The "Enable Ready" parameter in the SetGlobals command is not valid (client application bug).
9059	The "Lamp action" parameter in the SetGlobals command is not valid (client application bug).
9060	The "Sync Signal" parameter in the SetGlobals command is not valid (client application bug).
9061	Notification to client application that the detector has just received a "Fault In" signal on the sync inputs. The detectors response to this Sync signal will depend on the settings of "lampAction" and "syncSignals" fields of the cmdSetGlobals.

Error code	Description
9063	It seems that this firmware suits the ProStar 325 detector and the model detection (based on detector type) is indicating that the detector is a ProStar 335. To prevent damage, this detector should be reprogrammed with the correct firmware as soon as possible.
9064	The CPU detected low battery voltage at start-up. The CPU is not capable of detecting a missing battery. This signal will only be flagged if a battery is installed and running low. Ironically to date (11 Aug 2004) we have not seen a battery flat, but we have seen this message on occasions when the battery has been inserted incorrectly into the battery holder, and the battery contacts have been squashed onto the underside of the battery.
9065	During the time of writing values to the phases to the motor, an unrecoverable error has been detected. The motor would not be running smoothly.
9101	Informs the client application upon request for run data that run data is not available at this time.
9102	Informs the client application that there is no more run data, and the method just finished.
9103	Should not occur, if this error message is returned (log as firmware bug).
9104	Received a Diagnostic command with an unknown sub-command (client application bug).
9105	Generic message that the client application did not encode the command (and associated length) correctly (client application bug).
9106	Request to clear an unknown instrument log (client application bug).

Error code	Description
9107	The magic code in a command to reboot the instrument does not match. This is either an application error, or an error in decoding the TCP/IP stream (possibly an error of excessive bytes in the previous message).
9108	Notify the client that during the reading phase of a method, an external source has changed the method. It is the client applications responsibility to restart the reading of the method.
9109	The BootPSName field in SetIpParams is invalid (client application bug).
9110	The gateway specified in SetIpParams has to be on the same subnet as the detector IP specified in the same command.
9111	Error message associated with Diagnostic functions only. Indicates the user has entered a wavelength that is not in the valid range for moving the motor to a wavelength.
9112	The command/response comes/goes to an invalid requestor. This should NEVER be visible to a client, as if the requestor is invalid, then cannot send the message to client (firmware bug if client receives this).
9113	Some commands (such as GetErrorCodeStrings, GetRunLogStrings, GetMethodLinesByChunk) are a multi-request sequence. Detector needs to lock access to command and remember the current state and position. If client takes too long between reads, detector will release the lock and free itself for other clients to query.
9114	Inform client he has retrieved all the RunLog or ErrorCode strings available in the detector.
9116	Invalid parameter in command issued. Application will need to let user know what command issued this error.

Error code	Description
9117	Received a request for the current flash table, but as lamp not turned on, there is no current table.
9118	INTERNAL: Buffer given for returning the Xtlk table is too small (log as firmware bug).
9119	The detector could not find any valid calibration times to return.
9120	The internal circular buffer used to store run data until the client has retrieved it has overrun the tail. This means there will be some missing data. Data collected previously and the data retrieve now is intact, just there will be a time gap between the two.
9121	When trying to run in V1.x compatible mode, the function encountered data for a mode not supported by the V1 data structure. Therefore it has no way to return the data to the client. Update the client to a V2.x aware client.
9150	Flash Programming Info
9151	Flash Programming Error: Either sector specified is greater than the number of sectors in device, or the status of flash is bad.
9153	Flash Programming Error: Failed to commit data to Flash. Possible cause: Flash device not identified, or status of programming data is not valid.
9154	Flash Programming Error: INTERNAL. Firmware cannot find Flash for programming.
9155	Flash Programming Warning: Application did not send password to unlock Flash.
9156	Flash Programming Info: Commit to Flash was successful.
9162	Flash Programming Error: The address as specified by the download program is outside the RAM image area.

Error code	Description
9163	Flash Programming Error: The starting address of location to Flash and the image size of the data to Flash ends on an address higher than the top of Flash memory.
9165	Flash Programming Error: The block specified to be Flashed is unknown by the firmware.
9166	Flash Programming Error: Request to read too many bytes from the Flash, so the returned data has truncated the bytes the the maximum allowed.
9167	Flash Programming Error: Request to read data from the Flash, but the requested length is 0. Must have at least 1 byte.
9168	Flash Programming Warning: Separate parameter block in Flash file system is full. Cannot store any more parameters until the file system has been erased.
9169	Flash Programming Error: Stored CRC does not match calculated CRC, could not find stored CRC from index and tag, or the returned location from index and tag is outside valid area.
9170	Flash Programming Error: Error writing params due to not find device or other Flash status error.
9171	Flash Programming Warning: Request to overwrite an existing parameter without the overwrite flag turned on.
9172	Flash Programming Warning: Request to read a parameter that does not exist in the file system.
9173	Flash Programming Error: Failed to delete param, due to device not found or some other Flash status word problem.
9174	Flash Programming Error: Failed to erase the entire block due to a sector being outside allowed range or some other Flash status word problem.



Error code	Description
9175	Flash Programming Error: Bytes requested does not match number of bytes stored.
9176	Flash Programming Error: Request to copy parameters to Flash, but the pointer to the params is NULL. No copy performed.
9177	Flash Programming Error: Request to read params that goes past the top of memory.
9178	Flash Programming Error: Block size in bytes of the parameter is too large to write.
9179	Flash Programming Error: Tag number of block to write or read is outside defined range.
9200	Extended range cells 9x1 and 4x.15 as well as a Special development cell have expectations of valid cell ratios. This indicates to the client application, and to the user that the numbered entered in Cell ratio is outside allowed range for cell type (if cell not within these defined ratios then cell is not within cell specs).
9201	Error message associated with Diagnostic functionality: The command cmdSetProtoParams has an 'invalid filter length' field.
9202	Error message associated with Diagnostic functionality: The command cmdSetProtoParams has an invalid 'number of stages' field.
9203	INTERNAL: During a OT calibration, an internal array used for calculations overflowed. This should never happen (log as firmware bug).
9204	During a OT calibration, the value from the reference wavelength would have caused a divide by zero error. Check cell positioning, lamp source, and make sure cell has only solvent in it.

Error code	Description
9205	During power up, a sample is taken of the OT reference wavelength. This sample is used to scale the OT table for the current lamp intensity. This error code signifies that the ratio between the start-up value and the stored value is outside set limits.
9206	Attempt to change the gain to an illegal value.
9207	Attempt to request the AZ values while in a mode that doesn't support AZ values.
9208	Information message associated with Diagnostic functionality: Firmware detected the start and/or end wavelength of the scan range of a wavelength scan were out of range and has fixed the offending wavelength to the WL limit.
9209	Information message associated with Diagnostic functionality: Firmware detected the start and end wavelength of the scan range of a wavelength scan were swapped, and has swapped them back.
9210	Error message associated with Diagnostic functionality: Wavelength scan does not support the functionality of a wavelength scan with start and finish wavelengths the same.
9211	Information message to client application. The cell normalize feature that was turned on has been reset to off due to changing to a cell that does not support normalization.
9212	Error message associated with Diagnostic functionality: SamplesBtnFlips cannot be changed on a non dual-wavelength machine.
9213	Error message associated with Diagnostic functionality: The number of specific samples is illegal.

Error code	Description
9214	At start-up, failed to find the Zero Order peak. When this happens the mono will set the ZeroOrder to a default position. There will be some offset in nm to all subsequent measurements taken while the detector is in this state. Check cell seated correctly, and only solvent is in the cell at time of start-up.
9215	The gain calibrate routine relies on positive values to calculate the correct gain, when the routine gets a negative value, the gain calibrate fails at that point.
9216	OT calibration error. The attempt to write the new D2 table to Flash has failed, reason of failure unspecified
9217	OT calibration error. The attempt to write the new Vis table to Flash has failed. Reason of failure unspecified.
9218	OT calibration error. The attempt to write the new D2 and Vis table to Flash has failed. Reason of failure unspecified.
9219	OT Algorithm thinks that the ratio between Long path and Short path indicates the long path is partially blocked. Possible causes are a blocking card still in light path (after OT calibration) or a bubble in cell.
9220	OT calibration error. A OT calibration was started, but too long has passed before client initiated phase 2, so the detector has timed out waiting and returned to normal operation.
9221	OT calibration error. The lamp state has changed between phases of the OT calibration.
9222	OT start-up error. The stored WL for the reference does not match the correct optimum wavelength at which it should be taken.
9254	The scaling factor provided is not within the valid range of scaling factors.

Error code	Description
9261	The cell type in SetCellParams is invalid (client app bug).
9270	Lamp calibration needs to be re-performed due to changes in the firmware structure or algorithm.
9271	Lamp calibration needs to be re-performed due to changes in the firmware structure.
9272	Lamp calibration needs to be re-performed, as an overrange signal was detected.
9293	The D2 0T table needs to be calibrated/recalibrated, as there has been an error reading it.
9294	The D2 and Vis 0T table needs to be calibrated/recalibrated, as there has been an error reading it.
9295	The Vis 0T table needs to be calibrated/recalibrated, as there has been an error reading it.
9298	The number of ADC counts for wavelength 1 on the LP/SP cell is so low, it is assumed that the sample concentration is too high and there is insufficient transmission.
9299	The number of ADC counts for wavelength 2 on the LP/SP cell is so low, it is assumed that the sample concentration is too high and there is insufficient transmission.
9301	This error indicates a request to perform a wavelength calibration when the ZeroOrder position has not been found. Protects against the detector from having bad WL cal coefficients stored as a successful calibration.
9302	Wavelength calibration procedure determined that calculated slope is outside predefined limits.
9303	Wavelength calibration could not find a D2 peak (656.1 nm) to use as the second calibration point.

Error code	Description
9304	Wavelength calibrate can only work with the D2 lamp as the only light source. If it is off, or the visible lamp is on, the wavelength calibrate cannot proceed.
9305	Wavelength calibrate needs to work out the new slope based on the old slope. If reading the value out of EEPROM fails, the wavelength calibrate cannot proceed.
9306	Error writing the new mono slope to the EEPROM.
9307	Error writing the new mono offset (as offset is not used, a 0.0 is trying to be written).
9308	Request to Exit diagnostic state, when not in diagnostic state.
9309	Request to perform a calibration when one is already running. This is explicitly disallowed.
9310	Request to resume method when it has ended.
9311	This command could only be carried out when only the D2 lamp is on.
9350	During start-up and mono initialization, the slope value read out of EEPROM is outside the allowed ranges. In this case, a slope value of 1.0 is used.
9351	During start-up and mono initialization, the offset value read out of EEPROM is outside the allowed range of -10~10. In this case, an offset value of 0.0 is used. Note: Currently the ZeroOrder search provides the correction for offset—the mono start-up routine does not use this offset value.
9352	The mono will issue this error message if error code 9351 is issued. This highlights that the wavelength values from the detector could be inaccurate.
9402	MethodHeader error: the field "Wavelength mode" contains an invalid value. Possible cause client application.

Error code	Description
9403	MethodHeader error: the field "Signal mode" contains an invalid value. Possible cause client application.
9404	MethodHeader error: the field "Analog1 Source" contains an invalid value. Possible cause client application.
9405	MethodHeader error: the field "Analog1 PeakTicks" contains an invalid value, possible cause client application.
9406	MethodHeader error: the field "Analog2 Source" contains an invalid value. Possible cause client application.
9407	MethodHeader error: the field "Analog2 PeakTicks" contains an invalid value. Possible cause client application.
9408	MethodHeader error: the field "PeakSense Relay Mode" contains an invalid value. Possible cause client application.
9409	MethodHeader error: the field "PeakSense Relay Duration" is below the minimum allowed value. Possible cause client application.
9410	MethodHeader error: the field "PeakSense Relay Duration" is above the minimum allowed value. Possible cause client application.
9411	MethodHeader error: the field "PeakSense Relay Delay" is below the minimum allowed value. Possible cause client application.
9412	MethodHeader error: the field "PeakSense Relay Delay" is above the minimum allowed value. Possible cause client application.
9413	MethodHeader error: the field "Response Time" contains an invalid value. Possible cause client application.
9414	MethodHeader error: the field "Bunching Size" contains an invalid value. Possible cause client application.

Error code	Description
9415	MethodHeader error: the field "Noise Monitor Limit" is below the minimum allowed value. Possible cause client application.
9416	MethodHeader error: the field "Noise Monitor Limit" is above the minimum allowed value. Possible cause client application.
9417	MethodLine error: the field "Run Time" is below the minimum allowed value. Possible cause client application.
9418	MethodLine error: the field "Run Time" is above the minimum allowed value. Possible cause client application.
9419	MethodLine error: the run time of the current line is less than or equal to the run time of the previous line. Method lines MUST be sent down in run time order. Check client application if lines are sent out of run time order.
9420	MethodLine error: one of the line parameters has an error (the parameter is not specified). The response message tells which line has the error.
9421	Method error: unspecified parameter is below the minimum allowed value. Possible cause client application.
9422	Method error: unspecified parameter is above the minimum allowed value. Possible cause client application.
9423	MethodLine error: The "end action" of the line is invalid.
9424	MethodLine error: A parameter tag for one of the parameters on the line was invalid.
9425	MethodLine error: A line contains more than the maximum allowed parameters (client application bug).
9426	MethodHeader error: Cannot load a dual wavelength method into a detector that has not been dual wavelength enabled.

Error code	Description
9427	MethodLine error: The special line for method end can only have the single parameter on it. This error indicates there is more than a single a parameter (client application bug).
9428	Client tried to change the end time of a running method to a time that has already passed. No change to the pre-existing end time was performed.
9429	Command to change the End time of a running method is only valid in the RUNNING state.
9430	The downloaded method has more method lines than the maximum allowed.
9432	Sent for each method line when the proceeding MethodHeader failed in some way. The entire method will need to be resent again. (If errors persist, check the values of each field in the Method header.)
9433	The first Method line is expected to have a certain number of parameters.
9434	Method download is not valid in the current state. Change to Ready or Stopped states and re-download the method.
9435	Due to design, the detector cannot have the same value for Wavelength1 and Wavelength2 while in Dual Wavelength mode. Code prevents this from happening.
9436	MethodLine error: the field for AutoZero1 in the method line is not valid. Possibly a messaging error.
9437	MethodLine error: the field for AutoZero2 in the method line is not valid. Possibly a messaging error.
9438	Time Slice period in method lines must be greater than the PeakSense duration in the method header.
9458	MethodLine error: Relay1 has an invalid value.
9459	MethodLine error: Relay2 has an invalid value.



Error code	Description
9460	MethodLine error: Relay3 has an invalid value.
9461	MethodLine error: Relay4 has an invalid value.
9462	MethodLine error: The Peak Sense Relay has an invalid value.
9463	MethodLine error: The Peak Sense width parameter has an invalid value.
9464	MethodLine error: The TimeSlice trigger parameter has an invalid value.
9465	MethodLine error: The signal to noise ratio parameter is below the minimum allowed value. Possible cause client application.
9466	MethodLine error: The signal to noise ratio parameter is above the maximum allowed value. Possible cause client application.
9467	MethodLine error: The timeslice period parameter is below the minimum allowed value. Possible cause client application.
9468	MethodLine error: The timeslice period parameter is above the maximum allowed value. Possible cause client application.
9469	MethodLine error: The peak sense threshold parameter is below the minimum allowed value. Possible cause client application.
9470	MethodLine error: The peak sense threshold parameter is above the maximum allowed value. Possible cause client application.
9471	MethodLine error: The Analog 1 attenuation parameter is below the minimum allowed value. Possible cause client application.

Error code	Description
9472	MethodLine error: The Analog 1 attenuation parameter is above the maximum allowed value. Possible cause client application.
9473	MethodLine error: The Analog 2 attenuation parameter is below the minimum allowed value. Possible cause client application.
9474	MethodLine error: The Analog 2 attenuation parameter is above the maximum allowed value. Possible cause client application.
9475	MethodLine error: The WaveLength 1 parameter is below the range specified in the method header.
9476	MethodLine error: The WaveLength 1 parameter is above the range specified in the method header.
9477	MethodLine error: The WaveLength 2 parameter is below the range specified in the method header.
9478	MethodLine error: The WaveLength 2 parameter is above the range specified in the method header.
9490	MethodHeader error: The Source selection (Wave2 or Ratio) for analog 1 is not allowed in single WL mode.
9491	MethodHeader error: The Source selection (Wave2 or Ratio) for analog 2 is not allowed in single WL mode.
9550	Attempts to turn on a visible lamp that is not fitted failed. If lamp is present, check connection of the lamp to the main PWB.
9551	Failure to successfully strike the visible lamp. Suggests a faulty lamp is fitted. Replace the lamp.
9552	Attempt to turn on the visible lamp when it is already on. No action taken.

Error code	Description
9553	Failed to sense correct anode current after attempt to strike ARC.
9554	Attempt to turn on the D2 lamp when it is already on. No action taken.
9555	Failed to sense D2 warming filament operation after turning on Warming filament.
9556	Attempt to turn on an invalid lamp.
9557	Attempt to turn on both lamps when both lamps are already on.
9558	Attempt to turn off a lamp that is already off.
9559	Calibration sequence running and the lamp is off when it should be on.
9560	D2 lamp failed during operation.
9561	Visible lamp failed during operation.
9600	Attempt to read or write data to EEPROM with the incorrect size of bytes. Each VID has an associated number of bytes. Both client and detector need to agree on the size of the VID.
9601	INTERNAL: This indicates that the address values used for the VID are incorrect. If this occurs it is a firmware bug.
9602	INTERNAL: This indicates that if this VID is written it will overwrite the Checksum, if this occurs it is a firmware bug.
9603	Attempt to write to a VID that is not known by firmware.
9604	Attempt to read or write data to CMOS storage with the incorrect size of bytes. Each VID has an associated number of bytes. Both client and detector need to agree on the size of the VID.

Error code	Description
9605	INTERNAL: This indicates that the address values used for the VID are incorrect. If this occurs it is a firmware bug.
9606	Attempt to write the checksum to CMOS storage failed with an unspecified error.
9607	Attempt to write data to CMOS storage failed with an unspecified error.
9608	Attempt to write to a VID that is not known by firmware.
9609	INTERNAL: this indicates that if this VID is written it will overwrite the CMOS Y2K area. If this occurs it is a firmware bug.
9631	INTERNAL: The control byte of the Error log could not be read (log as firmware bug).
9632	INTERNAL: The control byte of the Error log could not be written (log as firmware bug).
9633	INTERNAL: The status byte of the Error log is corrupt, possible EEPROM corruption (log as firmware bug).
9634	INTERNAL: Indicates when log is empty that the Head and Tail pointers are not correctly the same value.
9635	Error writing error code and time stamp to Error log.
9636	INTERNAL: Error log full, actual implications of receiving this message are still to be evaluated.
9637	INTERNAL: The buffer used to read the Error log is too small (log as firmware bug).
9638	INTERNAL: This error code will never be seen at client application level.
9640	Attempt to read an empty Run log. This is the only possible response that firmware can give to the client when there is no data in the Run log to report.

Error code	Description
9641	INTERNAL: The buffer used to read the Run log is too small (log as firmware bug).
9642	INTERNAL: The function used to read the Error log was not passed a valid buffer (log as firmware bug).
9643	Reading the Run log is a multiple message sequence to prevent lock up commands. The detector has a watchdog timer on the request to read the Run log. this error indicates that the client took too long between phases of reading the Run log.
9644	Used as a marker in the Error log to timestamp when the Error log was last cleared.

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