

# ProStar 325

UV-Vis Variable Wavelength Detector

## Service Manual

Installation Category II

Pollution Degree 2

Safety Class 1 (EN 61010-1)

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**VARIAN**

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# 1 General Information

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This publication supplies information that allows a Varian-trained, Varian-qualified or Varian-authorized Customer Service Representatives to maintain and service the ProStar 325 detector. If the product is used in a manner not specified by Varian, the safety protection that is inherent in the design may be impaired.

The UV-Vis detector contains high voltages, and improper or unskilled use of it can cause death, serious injury or damage to equipment and property.

All users of the ProStar 325 detector must be familiar with the correct operating procedures. Site preparation and guidelines are described in the pre-installation section of this manual and in the Hardware Operation Manual publication number 85-102016-00.

The detector and accessory covers must not be removed by the operator under any circumstance.

## 1.1 How to use this manual

The safety practices and hazards section described below is provided to help the user operate the detector safely. Read these safety practices thoroughly before attempting to operate the detector, and always operate the detector in accordance with these safety practices.

The detector system uses interlocks and covers which are designed to prevent inadvertent contact with any potential hazards. It is good practice to develop safe working habits, which do not depend upon the correct operation of the interlocks for safe operation.

It is essential that interlocks are not bypassed, damaged or removed and all covers are properly installed when operating the detector.

All information contained in this publication is relevant to the ProStar 325 detector.

### 1.1.1 Finding Information

There is a comprehensive Table of Contents in the front section of the manual detailing each chapter.

Electronic and mechanical schematics including layouts and assembly drawings are included in the Schematics section of the manual.

Ordering information for spare parts is in the Spare Parts section

which lists a comprehensive list of spares and their part numbers. Where possible, pictures are used to illustrate a part for visual identification.

Service manual updates will be provided by Varian when necessary and will come in the form of diskette README file, Service Alerts or Service notes.

## 1.2 General Information

This section provides an overview of the ProStar 325 detector and contains important information on;

- Design features
- Fundamentals of the ProStar 325
- Safety practices and hazards
- Service philosophy

## 1.3 Design features

Design features include:

High performance photodiode detectors

Quartz over-coated optics

Deuterium arc ultraviolet source

Tungsten halogen visible source with quartz window

Double-beam, ratio recording, Czery-Turner monochromator

Choice of four precision flowcell varieties

Stackable module

Simple lamp replacement performed by the user

Flowcells can be easily replaced by the operator

Ethernet TCP/IP network configuration

Remote access

Pocket PC compatible using infra-red link

Fully compatible with current ProStar modules

Model upgradeable through firmware



## 1.4 Fundamentals of the ProStar 325 detector

The ProStar 325 detector is a variable wavelength UV/Vis detector that can be operated as a standalone HPLC detector with a Pocket PC (PPC) as the Controller, or it can be controlled remotely from a Star or Galaxy workstation. Using various combinations of flowcells and lamps, the detector can be adapted for applications from analytical to preparative levels. On the front panel there are no controls apart from the power ON/OFF switch and three LED indicators. The host computer is responsible for sending and receiving data and for performing all computations including the storage and display of results. The detector measures the sample absorbance at the user selected wavelength. The absorbance is output as an analog signal to an external chart recorder and/or data collection system, or as a digital signal to Star Workstation or Galaxie. Wavelength absorbance parameters are time programmable on the standalone unit. This manual instructs the user in the installation and operation of the 325 detector for non-Workstation operation, e.g. with the Pocket PC controller. The detector's advanced optical design, electronics, photo diode detectors and range of precision dual-path flowcells, make the ProStar 325 a versatile detector capable of operating in different modes. The detector can come in four different configurations;

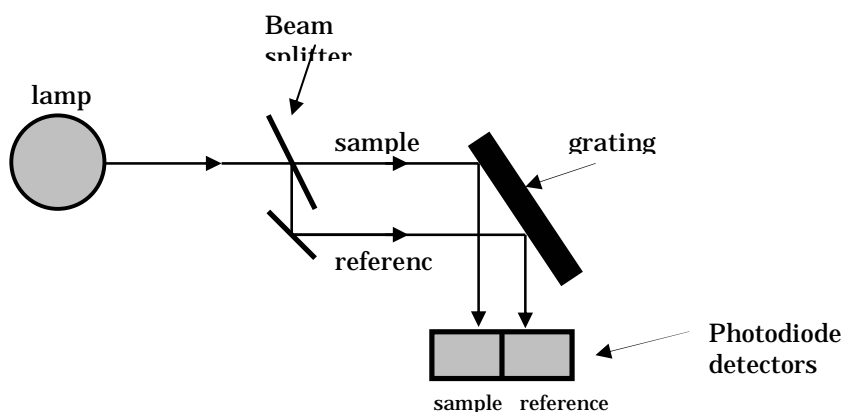
- single-wavelength with deuterium lamp
- single-wavelength with deuterium and quartz visible lamp
- dual-wavelength with deuterium lamp
- dual-wavelength with deuterium and quartz visible lamp

A single wavelength detector can be upgraded to dual wavelength detector by a firmware download as an optional extra at any time. This gives the detector its distinct advantage of having

variations of a common base model that can be configured for each individual application.

If fitted with the optional Vis lamp, the detector operates across the entire spectrum from 190nm to 900nm. Both lamps are continuum lamps and only one should be selected at a time. Wavelength selection is provided by a holographic grating driven by a stepper motor drive mechanism.

A silica glass beam splitter provides double beam operation. The two beams are individually passed through the optics system and into the monochromator and then to their respective photodiode detectors.



### ***Simplified Optical System***

For increased performance the two channels are separated and the photodiodes are connected to individual preamplifiers. The preamplifier output voltages are directly proportional to the light intensity hitting their active surfaces.

The outputs of the preamplifiers are digitised, processed, and either sent to a pc, or re-converted to analog. The analog circuitry produces a voltage directly proportional to the ratio of the sample signal to the reference signal. This voltage is supplied to the rear panel as the 1V/AU integrator output and as a recorder output.

For extra flexibility, the 325 detector can also be controlled via a hand-held PPC. You can use the PPC to download, build and store methods from the host computer, and have full functional control of the detector via an infra-red communications link. The detector is compatible with the current ProStar range of products and operates under the control of the Star or Galaxie software workstation software. Communication to the host PC is via an Ethernet TCP/IP link operating up to 100Mbps. This high-speed connection enables real time representation of the spectrum displayed on the workstation. Further more, it also allows the detector workstation to be integrated into a TCP/IP protocol LAN to enable remote access to any detector over an internet connection.

There are also four flowcell options for the detector at present;

9x0 Analytical  
9x1 Preparative  
4x0.15 Super Preparative  
4x0 Semi Micro

The flowcell bodies are constructed from titanium and are provided with quartz optics windows. Tubing connections are PEEK except for the Super Prep flowcell which uses TEFZEL TUBE 0.125 x 0.062.  
Each flowcell is easily interchangeable by the user.

## 1.5 Detector performance testing

Detector performance tests are provided in the Verify software application. The set of tests available include;

Short and long term signal-to-noise  
Short term dual wavelength signal-to-noise  
Stability  
Wavelength accuracy  
Wavelength repeatability  
Detector linearity (stray light)  
Refractive index sensitivity  
Spectral bandwidth  
Autozero precision  
Cell length ratio  
Cell precision

The results of all tests performed using the Verify package are automatically stored by the system in the software directory.

## 1.6 Safety practices and hazards

Information on safety practices appears throughout the documentation provided with your detector. Before using the detector you must thoroughly read these safety practices.

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Observe all relevant safety practices at all times.

### 1.6.1 Electrical hazards

The ProStar 325 detectors contain electrical circuits, devices, and components operating at dangerous voltages. Contact with these circuits, devices and components can cause death, serious injury or painful electrical shock.

ONLY Varian-trained, Varian-qualified, or Varian-approved Customer Service Representative (CSR) may open panels or covers, which are retained by screws on the detector. Consult the manuals or product labels supplied with the PC, monitor and printer/plotter to determine which parts are operator-accessible.

Operators and other unauthorized personnel are permitted access ONLY to the lamp sources for replacement. ALWAYS switch off the detector before changing a lamp.

Good grounding 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.

Note that the safety classification is given as Class 1 (EN 61010-1). The PC must comply with IEC 60950.

Application of the wrong supply voltage can create a fire hazard and a potentially serious shock hazard and could seriously damage the ProStar 325 system and any attached ancillary equipment.

Replace blown fuses with fuses of the size and rating as stipulated in the text adjacent to the fuse holder at the rear of the detector or, as specified in the manual.

Never use power cords with faulty or frayed insulation.

### 1.6.2 Lamp source

The UV and Vis lamps are enclosed in self-contained modules. Both operate at high temperatures and touching either of these may result in burns. Before replacing a lamp that has been lit, switch the detector off and ensure that you either wait for the lamp to cool, or protect your fingers from burns. The UV lamp module operates at high voltages.

When operating, these lamp sources emit high intensity UV and Visible light that can cause serious damage to eyes. To avoid eye damage, never operate a lamp outside the detector.



**NEVER** look directly at the UV source lamp. ALWAYS wear safety glasses manufactured to an approved standard and which are certified or otherwise warranted to protect the eyes from UV radiation when the UV lamp is operating.

---

### 1.6.3 Panels and covers

Only the panel that provides access to the lamp compartments and flowcell may be removed by the operator. All other panels or covers that are retained by screws on the detector may be opened only by Varian-trained, Varian-qualified or Varian-approved

Customer Service Representatives (CSR's). Consult the manuals or product labels supplied with your PC, monitor and printer/plotter to determine which parts are accessible.

Operators and other unauthorised personnel are permitted access only to the lamp compartments and Flowcell assembly. Always switch off the detector before changing a lamp.

#### 1.6.4 Other precautions

Do not block the rear ventilation grills on the ProStar 325. Make sure you provide adequate space behind the detector for air circulation, electrical, and communications cables.



**Warning:** The use of the ProStar 325 system may involve materials, solvents and solutions that are flammable, corrosive, toxic or otherwise hazardous. Careless, improper, or unskilled use of such materials, solvents and solutions can create explosion hazards, fire hazards, toxicity and other hazards which can result in death, serious personal injury, and damage to equipment and property.

ALWAYS ensure that laboratory safety practices governing the use, handling and disposal of such materials are strictly observed. These safety practices should include the wearing of appropriate safety clothing and safety glasses.

---

### 1.7 Service philosophy

#### 1.7.1 Varian customer support policies

Warranty	12 months, though this may vary according to location.
Hardware support period	5 years from date of last unit manufacture. After this time, parts will be provided if available.



### **1.7.2 Service policy**

In the normal course of field servicing, it is Varian's policy to troubleshoot and repair to a modular level at the detector's location.

Software diagnostic routines are available to aid in fault isolation. These are to be used in conjunction with conventional test equipment to effect on-site repairs.

In situations where minimizing downtime is the prime consideration board or module exchange should be considered, but only after preliminary attempts to repair have proven unsuccessful. Component level repair should not be attempted outside a designated service repair centre. Electronic assemblies such as the source lamp module and electronic boards with surface mount components are not field repairable.

### **1.7.3 Spare parts policy**

Operational spare parts for all Varian detectors and major accessories will be held in stock for a period of five years after shipment of the final production unit. Spare parts may be provided after this five-year period, but only on an "as available" basis. Operational spare parts are defined as those individual electrical or mechanical parts that are susceptible to failure through fair wear-and-tear during their normal operation. Examples include resistors, inductors, capacitors, semi-conductor devices, relays, lamps, temperature probes, detectors elements, motors, wiring board assemblies and the like.

General hardware (for example, sheet metal parts, structural members, assemblies and castings) will normally outlast the useful life of the detector and therefore will only be supplied on an availability basis after the final production unit is manufactured.

Proprietary items and components that are unique to the Varian equipment should be sourced from the Varian Service Centre. Other components may be sourced locally unless otherwise specified in this manual.

### **1.7.4 Warranty**

All Varian products are warranted against defects in materials and workmanship, but not against consequential damages. Full details relating to the terms of warranty are available from any Varian Sales and Service Office or Agency. No other warranty is expressed or implied. Consumable items such as (but not limited to) light sources, temperature probes and other glassware items are subject to a limited or pro-rated warranty. The Varian warranty provides for specific legal rights. There may also be other rights that vary from country to country, or region to region.

The warranty applies only to the installed Varian equipment, and cannot be extended to cover the associated miscellaneous

installations that remain the customer's responsibility. By the same reason, the warranty does not cover problems that may be caused by misuse of the equipment, wrong applications, operator's inexperience etc. Standard Warranty will cover 12 months, though this may vary according to location.

#### **1.7.5 OEM Warranty**

Personal Computers (PC's), printers, modems other PC accessories and OEM accessories used with the ProStar 325 are not covered by the Varian detector warranty. Generally this type of equipment is sourced locally and therefore local supplier or vendor warranties will apply.

#### **1.7.6 Contract maintenance**

After expiry of the warranty time, service and/or repair of Varian detectors and accessories are handled on a time and materials basis, in accordance with the Varian standard service or contract maintenance arrangements. Quotations for contract maintenance may be obtained from any Varian Sales Office or Service Centre.



## 2 Pre-Installation

---

The ProStar 325 UV-Vis detector has been fully tested and proven to specification before dispatch from the manufacturing plant.

This chapter contains general information that is relevant to the preparation of an installation site and details the facilities which must be provided to ensure that the system can be effective. Detailed operating procedures are provided in the operation manual that is supplied with the detector.

For installations that are to be done by Varian personnel, you should complete the Pre-installation Checklist contained in this section. Strike out any entries not appropriate to your system, and then send a copy of the checklist to the Varian Sales and Service Office or local Varian agent dealing with the supply of the equipment. On receipt of this document, the Varian Sales and Service Office or local Varian agent will contact you and arrange a convenient time for installation.

### 2.1 Information symbols

#### 2.1.1 Warnings and Cautions

Specific warnings and cautions appear in this manual which detail the hazard, describe how to avoid it, and specify the possible consequences of not heeding the warning or caution.

---

##### Warning

**A 'Warning' message appears in the manual or on the detector when failure to observe instructions or precautions could result in death or injury. Symbols depicting the nature of the specific hazard are also placed alongside warnings.**

---

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##### Caution

**A 'Caution' message is used when failure to observe instructions could result in damage to equipment (Varian supplied and/or associated equipment).**

---

A 'Note' is used to give advice or information.

Read all warnings and cautions carefully and observe them at all times.

A triangular symbol indicates a warning. The meanings of the symbols that may appear alongside warnings in the documentation or on the detector are;



Electrical shock



Eye hazard



Noxious gases



Hot surfaces



Fire hazard



Sharp object



Corrosive liquids



Moving part



Heavy weight  
(danger to feet)



Heavy weight  
(danger to hands)











Part can be ejected

The following symbol may be used on warning labels attached to the detector. 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.



## Information symbols

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

<b>I</b>	Mains power on
<b>0</b>	Mains power off
	Fuse
	Single phase alternating current
	Focus
	Vertical adjustment
	Horizontal adjustment
	When attached to the rear of the product, indicates that the product complies with the requirements of one or more EU Directives
	When attached to the rear of the product, indicates that the product has been certified as complying with the safety requirements of the CSA and UL
	When attached to the rear of the product, indicates that the product complies with the Australian EMC requirement

## Federal Communications Commission advisory

The following is a Federal Communications Commission advisory -

### Note

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 operated in accordance with the instruction manual, 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

### **CE-compliant products**

ProStar 325 detectors have been designed to comply with the requirements of the Electro-magnetic Compatibility (EMC) Directive and the Low Voltage (safety) Directive (commonly referred to as the LVD) of the European Union.

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

Proof that a 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 EN 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.

## 2.2 Pre-installation checklist

If you require installation by Varian Field Service, please complete the checks on this page and send a copy to your local Varian office.

<b>Preparation</b>	<b>Refer to section</b>	<b>Check</b>
Work area prepared and meets requirements		<input type="checkbox"/>
Power supplies meet requirements		<input type="checkbox"/>
The ProStar 325 detector and any accessories are on site and unpacked.		<input type="checkbox"/>
Computer meets requirements		<input type="checkbox"/>
Windows operating system installed		<input type="checkbox"/>
Operator training is required		<input type="checkbox"/>

All applicable preparations have been completed. Please arrange for the installation to be completed.

I fully understand that charges may be levied if the installation by Varian Service personnel is delayed due to facilities not being prepared in accordance with the information contained in this manual.

Company name and address:

\_\_\_\_\_

Signed:

\_\_\_\_\_

Name:

\_\_\_\_\_

Telephone: \_\_\_\_\_

Preferred installation date:

\_\_\_\_\_



### 2.2.1 Pre-installation complete

All preparations have been completed. To arrange installation of the detector, complete the details on the back of this sheet and return a copy of the form to the Varian Office shown below.

**Note:** The remainder of this manual contains the environmental requirements and technical specifications for the ProStar 325 detector, and should not be discarded. Keep this manual for future reference.

Varian office card to be attached here

## 2.3 Weights and dimensions



### Warning

Some of the packages are large and heavy. To avoid the chance of injury to personnel or accidental damage to the equipment, always use two or more people when handling the packages or lifting equipment into position. **Never** attempt to lift the packages alone

#### *Detector weight*

System Unit	Weight	Width	Depth	Height
Detector ProStar 325	15.5kg	296mm	475mm	212mm

#### *Shipping weight*

System Unit	Weight	Width	Depth	Height
Detector ProStar 325	21kg	460mm	775mm	385mm

## 2.4 Environmental conditions



No draughts



No corrosive fumes



No vibration

Sample preparation areas and materials storage facilities should be located in a separate room.

For optimum performance the area should have a dust-free, low humidity atmosphere. Air conditioning is recommended. The room should be temperature-controlled if your analyses are particularly sensitive.

The detector will deliver best analytical performance if the ambient temperature of the laboratory is maintained between 20–25 °C and is held constant to within  $\pm 1$  °C through the working day.

---

**Caution** The ProStar 325 detector is designed for operation in clean air conditions. The laboratory must be free of all contaminants that could have a degrading effect on the detector's components. Dust, acid and organic vapors must be expelled from the work area. The detector warranty will be void if the equipment is operated in substandard conditions.

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**Caution** Operating specifications for the PC, Monitor and Printer/Plotters and other peripherals may differ from those for the Varian ProStar 325 detector. You must check in the literature provided with these units and arrange the operating environment to suit the complete system.

---

### **Suitability**

The detector is suitable only for indoor use.

The detector is suitable for the following categories:

Installation category II

Pollution degree 2

Safety Class 1 (EN 61010–1)

### **Environmental conditions**

<b>Condition</b>	<b>Altitude</b>	<b>Temp (°C) t</b>	<b>Humidity (%RH) non- condensing</b>
Non-operating (transport)	0–2133m (0–7000')	5–45	20–80
Non-operating & meeting dielectric strength tests	sea level	40	90–95
Operating but not necessarily meeting performance specifications	0–2000m (0–6562')	5–31 31–40	$\leq 80$ $\leq [80 - 3.33(t - 31)]$
Operating within performance specifications	0–853m (0–2800') 853–2133m (2800– 7000')	10–35  10–25	8–80

## 2.5 Workbench

The workbench must be stable and strong enough to support the total weight of equipment to be used. The worktops should be large enough to permit a free circulation of air around each unit in the system. Remember to provide space for the computer, monitor and printer. The workbench should be about 90 cm (36 in) high. To avoid damage through spillage of the mobile phase solvents used and samples being analysed, the worktops should be covered with a material that is corrosion resistant and impervious to liquids.

Allow sufficient bench space to permit installation of recorders, workstations, and other peripheral LC equipment that may be installed near it. Allow at least two inches of space on both sides, and six inches at the rear of the LC system to permit free air circulation. Power cord, signal output, and I/O connections are located at the rear of the instrument. Power switches are located on the front panel on most modules, but are generally on the rear for autosamplers.

## 2.6 Electrical specifications

### 2.6.1 Mains supply

The installation of electrical power supplies must comply with the rules and/or regulations imposed by local authorities responsible for the supply of electrical energy to the workplace.



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**Warning**

Good electrical grounding is essential to avoid potentially serious shock hazards.  
A 3-wire outlet with ground connection must be provided for the detector.  
Make certain that power outlets are earth-grounded at the grounding pin.

---

All power supplies must be single-phase AC voltage, three-wire system (active, neutral, earth) and should be terminated at an appropriate power outlet receptacle that is within reach of the detector power cord assembly. For safety reasons, a separate power outlet receptacle should be provided for each unit in the system. Do not plan to use extension cords or outlet adaptors.

All ProStar 325 detectors are supplied with a 2metre (6' 6") long power cord and three-pin plug assembly that is compatible with common standards applicable in the local area.

Avoid using power supplies from a source that may be subject to electrical or RF interference from other services (large electric motors, elevators, and welders for example).

System Unit	Required Supply Voltage	Power Rating (typical)
Detector ProStar 325	100-240VAC $\pm 10\%$ , 50-60Hz $\pm 1$ Hz	130 VA
Computer	100, 120, 220, 240 VAC 50/60 Hz	300 VA
Printer	100, 120, 220, 240 $\pm 10\%$ VAC 50/60 $\pm 1$ Hz	100 VA

#### *Mains voltage requirements*

**Note** For non-Varian products, the table above is indicative only. Refer to the literature provided with the computer, printer etc. for details of individual power requirements.

## 2.7 Fuses

### ProStar 325

T3.15AH250V, IEC 127 sheet 5, 5 x 20mm

**Note** For safety reasons, any other internal fuse or circuit breaker is not operator accessible, and should be replaced only by Varian-authorized personnel.

**Note** Fuse information on the rear of the detector is the most up-to-date.

## 2.8 External connections

### Mains inlet coupler

3/2A 120/250 VAC 50–60 Hz IEC type

### Mains power cord

Australia	10A 250 VAC	Complies with AS3112
USA	10A 125 VAC	Complies with NEMA 5–15P
Europe	6A 250 VAC	Complies with CEE7 sheet vii or NFC61.303 VA

### 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

## 2.9 Equipment on-site

### 2.9.1 Insurance

As the carrier's liability ceases when the equipment is delivered, Varian recommends that the detector owner arrange a separate insurance to cover transportation from the delivery point to the installation site. The delivery point will vary according to the carrier, the shipping method and in some cases the terms of sale. Some carriers will deliver only to their own distribution centre while others may deliver to your off-loading bay. Very few carriers will deliver to the actual installation site.

## 2.9.2 Inspection for transit damage

Transit damage can be obvious or concealed and in either case will be admitted by the carrier only if it is reported within the terms of the carrier's agreement. For any claims against damage in transit, the following general rules apply:

- ☐ Before accepting delivery, you must inspect the packages for signs of obvious damage. The nature of any obvious damage must be noted on the carrier's waybill, which then must be countersigned by a representative of the carrier.
- ☐ Within the time limit stated in the terms and conditions of carriage, a further inspection must be made for concealed damage. If any damage is found at this stage, the carrier must be notified in writing. You must retain all packaging material for subsequent inspection by a representative of the carrier.
- ☐ A copy of any damage report must be forwarded to the Varian Sales Office dealing with the supply of your equipment.

After accepting delivery, take the equipment to the installation site, then unpack and check the contents. Varian detectors are inherently robust, and the packaging is designed to prevent internal damage. However, the contents form part of a precision measuring system and all packages should be handled with care. In transit, sharp jolts must be avoided and the packages should not be inverted or tilted unnecessarily.

Markings on the shipping cartons generally indicate which side of the package should be kept on top. In-house transit routes must be carefully considered. Vertical, horizontal and turning clearances should be calculated from the shipping carton dimensions of the detector.

Unpacking of the equipment is your responsibility and instructions are provided with the detector. As the packages are opened, the contents should be checked against the enclosed packing lists and any differences from the original order should be referred immediately to your Varian Sales Office. All contents of the shipping packages should be assembled together when installation is to be carried out by Varian Service personnel. Do not discard any packaging components or filler materials.

## 2.10 Computer interface

### 2.10.1 Computer requirements

The minimum configuration represents the absolute minimum you can run the software on. This PC configuration may be out of

manufacture, but you may want use a PC you already have. The recommended configuration is that which you would buy new.

<b>Minimum</b>	<b>Recommended</b>
IBM compatible	IBM compatible
Intel Pentium III processor	Intel Pentium III processor
64 MB RAM	128 MB RAM
150 MB free space on hard disk	1GB MB free space on hard disk
3.5" 1.44 MB floppy drive	3.5" 1.44 MB floppy drive
Video card supporting 800 x 600 resolution, high color (16 bit) mode	Video card supporting 800 x 600 resolution, high color (16 bit) mode
Super VGA screen	Super VGA screen
4 x CDROM drive	16 x CDROM drive
Windows 101 key keyboard	Windows 101 key keyboard
Microsoft or compatible mouse	Microsoft or compatible mouse
Microsoft Windows®2000® (including Service Pack 2 or later), Windows NT service pack 6 or Windows XP®	Microsoft Windows®2000® (including Service Pack 2 or later), Windows NT service pack 6 or Windows XP®

Varian can supply a PC for the ProStar 325 in the recommended configuration. Consult your local salesperson for details. The operating system software will be pre-loaded. All software disks and manuals are to be supplied to the customer.

PCs supplied with Letter of Credit orders will be an international brand and will be the 'Recommended' configuration or better.

Better PC components can be substituted for those listed above e.g. processor type, amount of memory, screen size and resolution, operating system version etc.

For the latest information regarding compatible pc configurations, please contact Varian.

### **2.10.2 Ethernet**

The ProStar 325 detector requires an Ethernet connection to the PC via a shielded twisted pair Ethernet crossover cable Category 5 or better (provided with the detector).

If connection is required to an Ethernet network, then a shielded twisted pair Ethernet non-crossover cable Category 5 or better will be required (not supplied).

Most PC's come pre-configured with an Ethernet connection either built into the motherboard or with an Ethernet network card installed. Check that the intended PC has this configuration and if not, a network card will have to be fitted. Refer to the installation chapter for details.

If the user is supplying their own PC, then they are responsible for installing and configuring the card. They 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 users.

### **2.10.3 Recommended printer/plotter**

You can use any printer supported by your Microsoft Windows® operating system.

The monitor, keyboard, printer/plotter and detector are connected to the PC via cables that plug into the back of the PC. Please consult your monitor and printer manuals for details of their individual cabling requirements.

## **2.11 Setting up your PC**

### **2.11.1 ProStar 325 Verify software**

The ProStar 325 Verify software, compatible with Windows 2000® or Windows XP®, is to be installed on your PC. For instructions on installing this, please refer to Section 3.8 Software Installation.

Ensure that you have your Display Desktop area set to a minimum 800 by 600 pixels or greater and that the Color palette is set to High color (16 bit).

Check that your sound card and CDROM drive are working.

Your Varian representative will install the ProStar 325 software during his/her visit but installation of a Windows® operating system is not included as part of the standard detector installation.



## 2.12 Operator training

If the ProStar 325 detector is installed by Varian Field Service, the Varian Customer Service Representative (CSR) will demonstrate the basic operating procedures while conducting the installation performance tests during the installation procedure. The CSR however, is not necessarily experienced in complex analytical routines and is not authorized to conduct extensive training.

In some areas it may be possible to arrange for operator training to be carried out after the installation, using your own detector. To check this possibility, please contact your local Varian Sales and Service Office.

As a guide to the time required for installation by Varian service, a typical ProStar 325 system will be completed and ready for use within four hours. The installation time can be kept to a minimum by ensuring proper preparation of the site and arrangement of all units to allow for easy access.

The initial Verify software installation and elementary performance tests will take around thirty minutes. There is then a period of two hours that must be allowed for warm-up before the detailed detector tests for conformance to specification can be carried out, and during this time the CSR will demonstrate some of the basic system operating procedures. (If you will be installing the detector yourself you should use this time to become familiar with the software).

An automated software process that takes around one hour to complete, performs the detailed tests for detector performance to specification.

If your system computer was purchased from Varian, it will be configured, formatted, partitioned and loaded with its operating system. The ProStar 325 Verify software will be loaded during installation.

Please note that you must have a working knowledge of the computer operating system, as this type of instruction is not provided by Varian. The literature supplied with the detector provides step-by-step instructions for setting up the system and detailed operating instructions for the analysis procedures—it does not include instructions for operation of the computer.



## **3 Installation**

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### **3.1 Introduction**

This section provides instructions for installing and maintaining the ProStar325 detector. Where procedures differ for the various detector models they will be clearly identified. The detector is supplied with the following documentation -

- ProStar325 Hardware operation manual (85 102015 00)
- Declaration of conformity
- Factory test certificates

Instructions for installing the ProStar 325 detector and verifying its performance using the Verify software, together with an overview of the system, are included in this section. Detailed operating procedures are provided in the Hardware Operation Manual and also included in the on-line help.

It is the customer's responsibility to have the operating system installed but the CSR should install the Star Workstation and Verify software.

It is also the customer's responsibility to set up and maintain their own LAN (Local Area Network).

Installation instructions for any ProStar accessory are given in the manuals accompanying those accessories. The installation instructions in this publication are provided for the guidance of Customer Support Representatives (CSRs) who have completed the appropriate product training courses and are employed or otherwise authorized by the Varian Sales and Service organization.

Installation by unauthorized personnel is not permitted and will immediately void the detector warranty. Unskilled, improper or careless installation can create the risk of fire, explosion, electric shock and various other hazards that can cause death or serious injury to personnel. All users of these systems must be familiar with correct operating procedures and safety practices as explained in this manual and in the Hardware Operation Manual.

Internal modules, covers and panels must not be removed except by Varian-trained, qualified or authorized Customer Support Representatives, unless otherwise specified.

## 3.2 Pre-Installation

Before receiving the ProStar detector the customer will have been provided with a Hardware manual (part number 85 102015 00); which describes the environmental and operating requirements of the ProStar system and details the facilities which must be provided to ensure that the system can be effective. The laboratory must be in accordance with these instructions before the detector can be installed. The customer should keep this manual for future reference. It contains safety information and may be needed if the detector is moved to a different location. Detailed operating procedures are provided in the Hardware Operation Manual that is supplied with the detector.

Record any irregularities and inform the customer of any necessary corrective action. Postpone the installation until this is complete.

**Note:**

You should not attempt installation until the detector has been unpacked and placed on its intended workbench. This is your customer's responsibility.

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**Warning**

The ProStar325 detector weighs approximately 15.5 kg. To reduce the risk of injury to personnel, two people should be used for lifting and the lifting should be done with the knees and not with the back or arms.



Heavy weight  
Heavy weight  
(danger to feet)  
(danger to hands)

---

Check the supplied equipment for any sign of damage during transit and remove all internal packaging material.

- All items have been checked as undamaged.
- Any action required to replace parts has been taken before continuing

Record any irregularities on the Installation Checklist and inform the customer of any required actions. If required, postpone the installation until corrective action has been taken.

If there are any faults during the installation and testing sequence, you must take corrective action before continuing the installation.

### 3.3 Installation times

Standard installation times (including detector installation, commissioning/testing/handover and basic customer training) for the ProStar systems are as follows:

Four (4) hours for the base detector

Initialize PC	5 min
Load hard disk	10 min
Power-up	1 min
Detector warm-up	120 min
- software tuition	
Validation and Conformance Tests	50 min
Finish	<b>Total 206 min</b>

### 3.4 Before you start

Confirm that the pre-installation preparations have been completed. You should not attempt detector installation until the detector has been unpacked and placed on its intended workbench. This is the customer's responsibility.

A copy of the pre-installation manual is in Section 2 Pre-installation. A removable sheet summarizes the state of site preparation. The customer should return this sheet to your Sales and Service Office. You should examine this sheet **before** committing to an installation date. Record any irregularities and inform the customer of any necessary corrective action. Postpone the installation until this is complete.

Unskilled, improper or careless installation may create the risk of fire, explosion, electric shock and other hazards that can cause death or serious personal injury and damage to property.

All users of the ProStar system must be familiar with the correct operating procedures and in particular with the safety practices as described in the operating manual.

Only the lamps and flowcell assembly can be removed by the operator. All other panels and covers may be removed only by Varian-trained, qualified or authorized Customer Support Representatives.

## 3.5 Installation

A quick reference guide for CSR's to install the ProStar325 detector is given below to ensure that you complete each step of the installation procedure. You may need to refer to this information if you re-locate the instrument.

At the end of this section there is an Installation Acceptance Checklist which you must complete during installation of the detector.

### 3.5.1 Installation guide

- ☐ Installation Acceptance Checklist has been completed. A copy of this checklist is at the end of this chapter. Make copies as required.
- ☐ Packing list checked as consistent with order
- ☐ All items consistent with packing list
- ☐ Detector is unpacked and placed on its intended workbench by the customer as described in the Unpacking Instructions included in the packing crate
- ☐ All items checked as undamaged
- ☐ Suitable PC and printer configured correctly, as described in the pre-installation manual.
- ☐ The monitor, printer/plotter and keyboard connected to the PC, and the PC connected to the mains power supply.
- ☐ Software installed as described in this manual
- ☐ Ethernet connection is configured in the PC as described in this section
- ☐ READ.ME file(s) checked for the latest release information

- ☐ Instrument fuses checked as suitable for local mains supply voltage.



**Warning**

**Application of the wrong supply voltage can create a fire hazard or a potentially serious shock hazard and could seriously damage the instrument and any attached equipment.**

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- ☐ Detector is connected to the PC and the system connected to the mains power supply.
- ☐ Instrument is turned on and allowed to stabilize for two hours. During this time you can unpack any accessories and familiarize yourself with the software.
- ☐ Instrument tests done as described in this section
- ☐ Accessories supplied with the instrument unpacked and checked for completeness against the packing lists enclosed in the packing crate and inside each accessory box
- ☐ All items checked as undamaged
- ☐ Installation section of the operation manual has been read for each accessory to determine the order in which they need to be installed (depending on your software the accessory manuals may be on-line) and the accessories installed according to the instructions

### 3.6 Installation of Door Cap

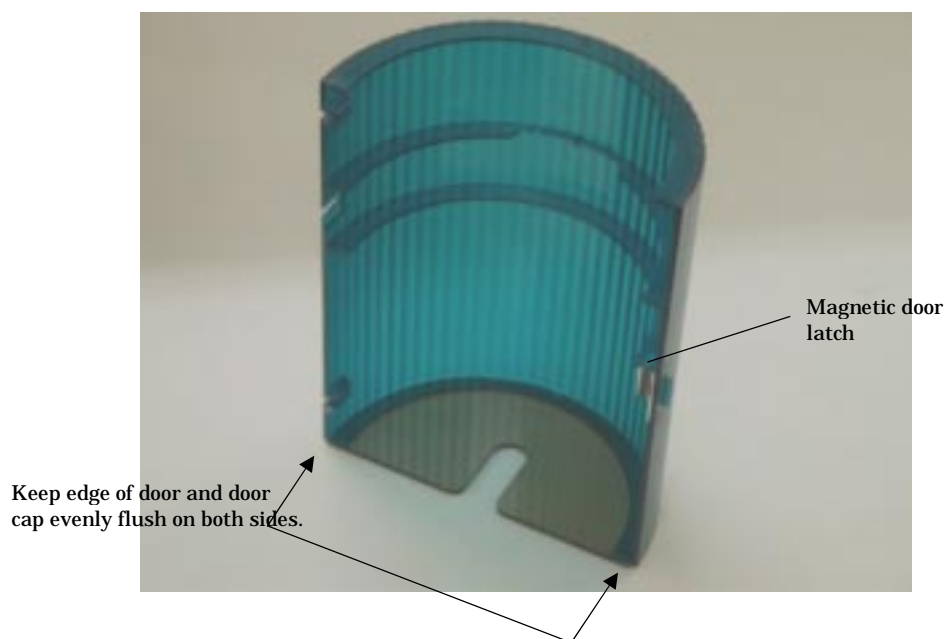
If the ProStar 325 is the top module in the stack, the door cap should be installed prior to installing the door on the module. If the ProStar 325 is not at the top of the stack, do not install the cap and proceed to the next section describing door installation.

Take the cap from the accessory kit and remove the protective paper exposing the adhesive that will attach the cap to the door. Orientate the door and cap as shown in Figure 1 with the door standing on a flat surface. Insert cap into door and press adhesive onto inside of door lip as shown in Figure 2. Be sure to keep door edges and cap edges flush.



**Figure 1 Door and Door Cap Orientation**

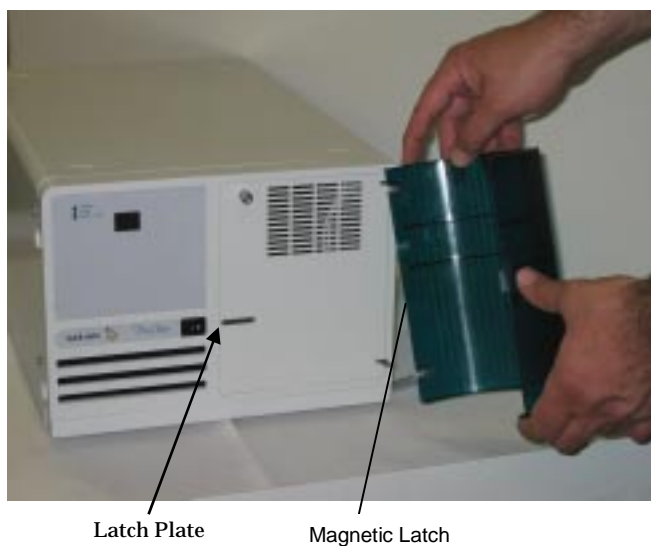




**Figure 2 Door and Door Cap Assembly**

### 3.7 Installation and Removal of Door

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



**Figure 3 Door Installation**

Orientate the door so that the magnetic door latch lines up with the latch plate. Insert the top hinge pin into the top hinge. Gently press down on the top of the door (as shown in Figure 3) and slide the lower hinge pin into the lower hinge and stop pressing. The door should now pivot on the pins and close against the magnetic latch.

To remove the door, gently push down on the door and slide the lower hinge pin out of the lower hinge. Now lift and slide out the top of the door.

## 3.8 Software Installation

This section assumes that the Microsoft Windows operating system has been installed on your PC. For instructions on installing the required Microsoft Windows operating system please refer to the documentation supplied with the Windows operating system software.

It is the customer's responsibility to have the Windows operating system installed where required, but the CSR should install the Star Workstation and Verify software.

All software is on a self-loading CD that will automatically run when inserted into the CD ROM drive. Follow the prompts to complete the installation.

**Note:** you must be logged in as an Administrator (or as a user with Administrator privileges) to install the software.

### **Verify installation**

A quick reference guide to installing the Verify software is shown here.

To install the software:

- Turn on your PC.
- When the PC has booted up, insert the ProStar325 Verify CD into the CDRom drive.
- Select the "Install Software" button in the window that appears.
- Follow the instructions appearing on the screen. During the installation you will be asked to specify, amongst other things, the drive on which to install the software.

When the installation is complete you should have a ProStar program group on the desktop containing a Verify icon. The installation also places a ProStar folder in the Start/Programs menu.

- Read the "Readme.txt" (late-breaking news) document supplied with the software for the latest release information about the software release.
- Pass this document on to the customer.

- Reboot the PC so that any new settings can take effect.

### **Verify Software**

ProStar325 detector performance tests are run under Varian's Verify software. It will consist of some or all of these tests -

Short and long term signal-to-noise  
Short term dual wavelength signal-to-noise  
Stability  
Wavelength accuracy  
Wavelength repeatability  
Detector linearity (stray light)  
Refractive index sensitivity  
Spectral bandwidth  
Autozero precision  
Cell length ratio  
Cell precision

A selection of these tests will be grouped together under the "Installation" suite of performance tests and should be used to verify the performance of the detector during installation.

## **3.9 Ethernet connection**

Most new PC's come with a pre-configured network interface so there is nothing you need to do. If, however, you have a PC that has no network interface, you will need to install an Ethernet Network Interface Card (PCI bus) with a RJ-45 type connector. The PC must have a spare PCI slot for the installation of this device.

Each detector will come pre-configured with a unique MAC (Media Access Control) address. You will be required to enable communications between the detector and pc and allocate IP addresses for each detector. The detector however will allow only one TCP/IP connection at a time.

### **3.9.1 Networks**

Since the ProStar 325 Detector communicates with the Workstation over a standard Ethernet connection, your system can easily be expanded from a single ProStar Detector/single Workstation configuration, to multiple ProStar Detectors/multiple Workstations, to a fully networked lab with a virtually unlimited number of Detectors and Workstations. The term Ethernet refers to the cables and interface cards that are used to connect devices on the network. Several types of Ethernet cables exist, and if you are connecting your ProStar 325

Detector to an existing Ethernet network, you will need to know which type of cable you are using.

The ProStar 325 Detector uses TCP/IP (Transmission Control Protocol / Internet Protocol) to communicate over the Ethernet network. The term TCP/IP refers to the software protocol that allows various devices to communicate with each other. Communications over the Internet and the World Wide Web use TCP/IP. Since the ProStar 325 Detector uses TCP/IP to communicate with the Star Workstation, the Workstation PC and the ProStar 325 Detector need to be given unique IP addresses—the addresses that are used to identify each networked TCP/IP device. This manual describes the process by which you give the PC and Detector unique IP addresses.

You may connect your Workstation and ProStar 325 Detector directly to each other.

We refer to this type of special purpose network as an isolated network (one that does not have IP addresses prescribed by a Network Administrator).

You may also connect your Workstations and ProStar 325 Detectors to an Ethernet network used for purposes other than instrument control (such as Internet access or file server access).

We refer to this type of multi-purpose network as a company network, and a Network Administrator in your company will typically manage it. If this is the case, then follow the instructions for configuring your ProStar 325 Detector and Workstation for use on a company network.

The ProStar 325 Detector is provided with its IP address either by the Star Workstation or by software running on your network. The software used to send IP addresses to TCP/IP devices is called a BOOTP Server (Bootstrap Protocol Server). You will see the term BOOTP Server mentioned in this section. If you are connecting your ProStar 325 Detector and Workstation to a company network, your Network Administrator should be made aware that the ProStar 325 Detector will require a BOOTP Server for IP address assignment.

### **3.9.2 Where to Begin**

Before beginning the configuration process, you should know whether you will be attaching your Workstation and ProStar 325 Detector to a company network (as described in the previous section) or an isolated network only used for instrument control. If you have a Network Administrator on site, you may wish to ask which configuration is recommended.

If an Ethernet card has not been installed and configured on your PC, read *Installing and Configuring the Ethernet Card* in Your PC and one of the following:

- No Company Network: *Configuring TCP/IP Parameters with No Company Network.*

- Company Network: *Configuring TCP/IP Parameters for a Company Network.*

### 3.9.3 Installing and Configuring the Ethernet Card in Your PC

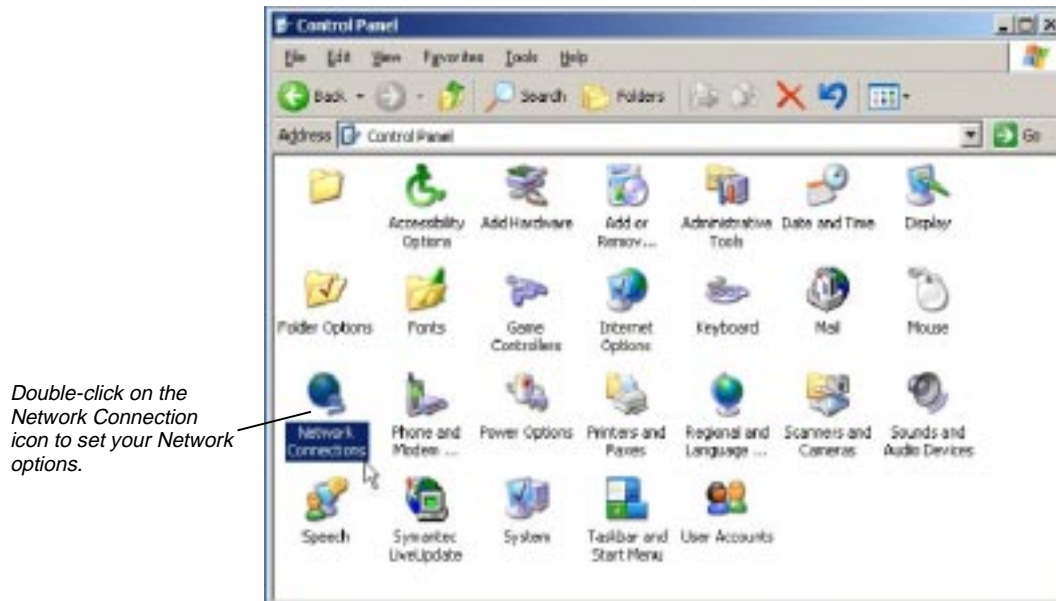
**NOTE:** The following section describes a procedure specific to Windows 2000. If you are running Windows NT Service pack 6 or WINDOWS XP, the windows and dialog boxes shown will differ slightly from those you see on your system, but the procedure described here is essentially the same as the one for Windows NT Service pack 6 and WINDOWS XP.

Refer to the installation instructions packaged with your Ethernet card for information on installing the Ethernet card in your computer and configuring the card in Windows. Before proceeding, your Ethernet card should be recognized by Windows (the appropriate driver has been loaded and can be configured from the Windows Control Panel). When done, the Network Neighborhood icon should appear on your Windows desktop.

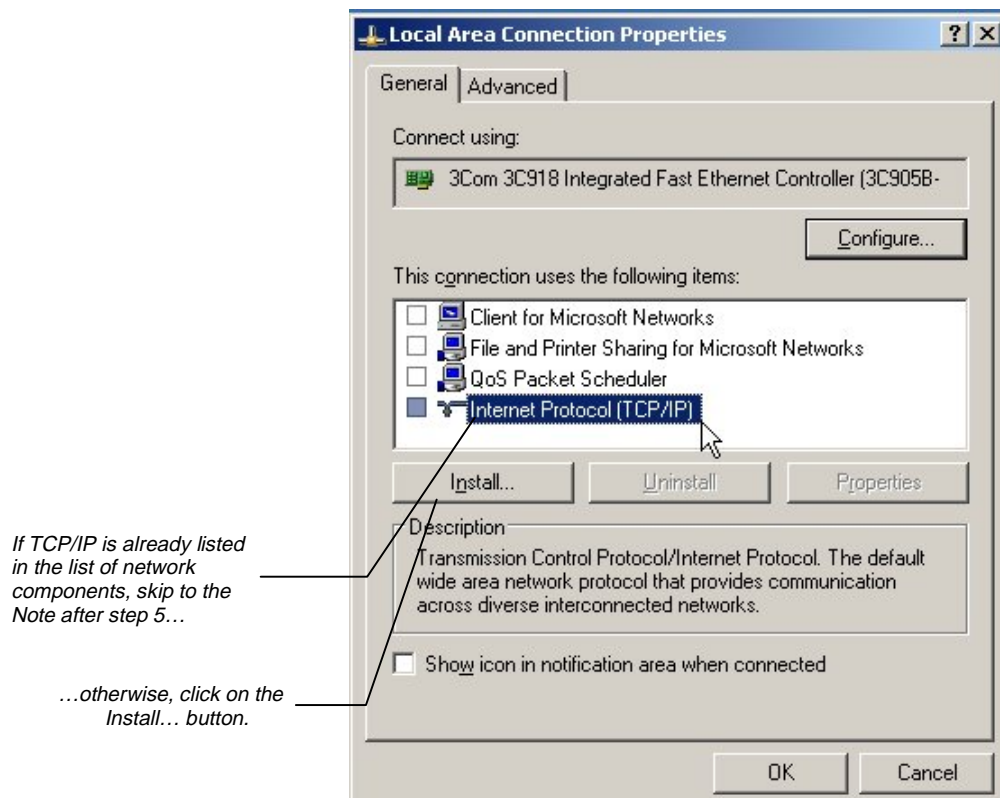
**NOTE:** For the following procedure, the use of disks other than the ones that were used for the original Windows installation may result in an Ethernet driver version mismatch that will prevent Windows from starting. Should this occur, it might be necessary to remove the Ethernet Board from the computer to remove the incorrect Ethernet drivers.

You must configure your computer's network settings to allow communication with the ProStar 325 Detector. You do so by running the Windows Control Panel.

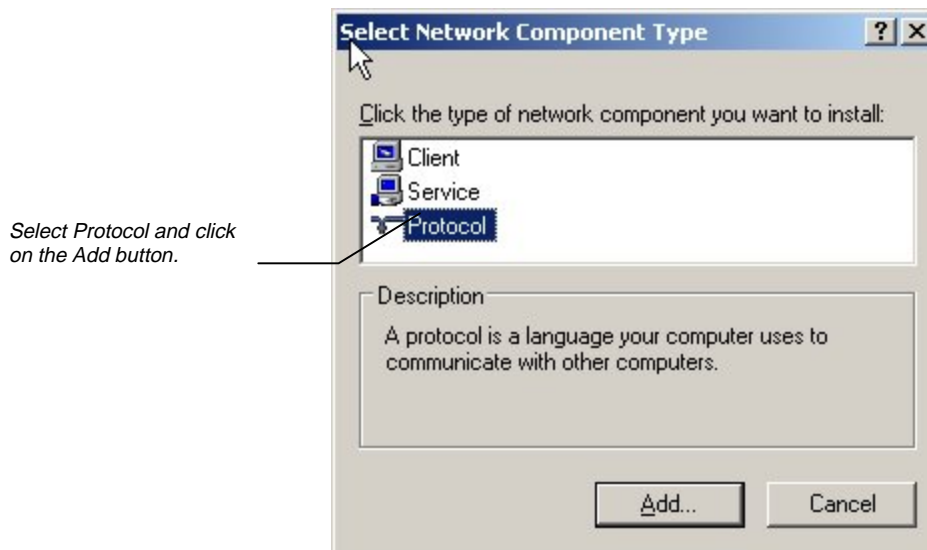
1. Run the Windows Control Panel by selecting it from the Start menu (under *Settings*).
2. The Control Panel window is displayed.



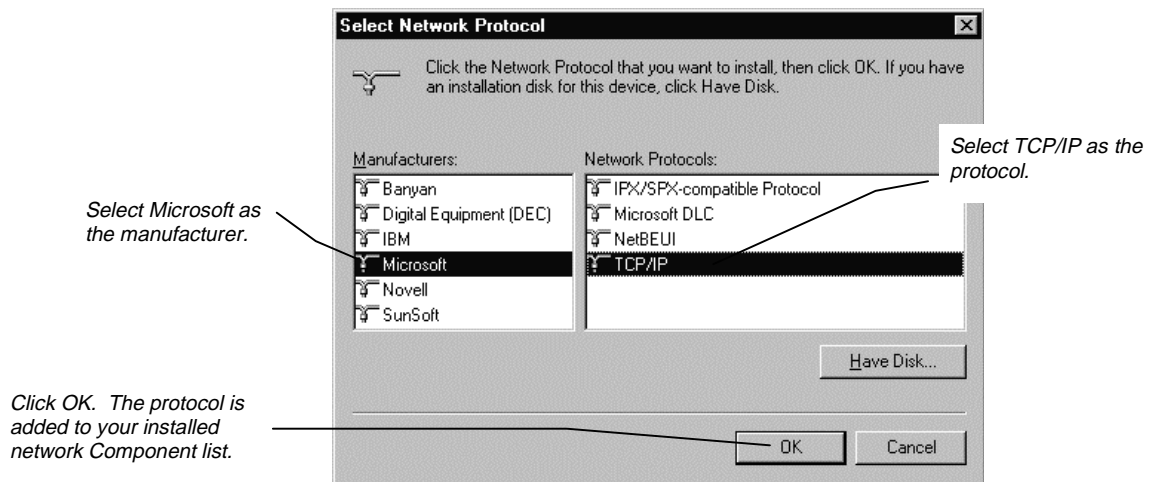
3. Double click the LAN icon and the following *LAN Connection Properties* dialog box is displayed.



4. The *Select Network Component Type* dialog box is displayed.



5. The *Select Network Protocol* dialog box is displayed.



**NOTE:** If you *are not* connecting your Workstation to a company network (that is, you *are not* assigning an IP address by a Network Administrator), follow the next three steps. If you *are* connecting your Workstation to a company network, skip to *Configuring TCP/IP Parameters for a Company Network*.

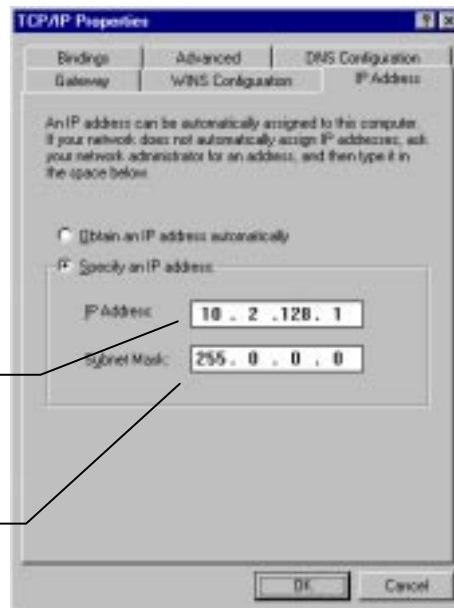
### 3.9.4 Configuring TCP/IP Parameters with No Company Network

The following three steps assume you have completed steps 1 through 5 from the previous procedure.

1. Select TCP/IP from the network component list and click on the Properties button. The *TCP/IP Properties* dialog box is displayed.

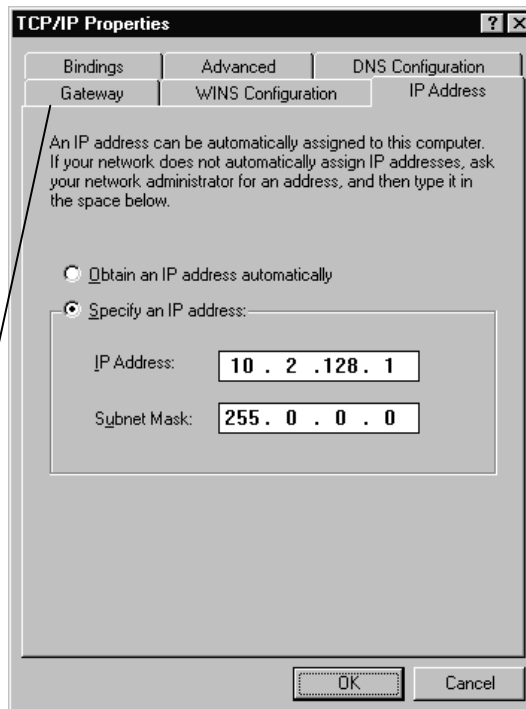
Enter in an IP address. Note that if you are adding more than one Workstation to this network, **each Workstation PC must have a unique IP address within this range.**

The Subnet Mask will be automatically set. **Do not change this value.**





Ensure that no entries have been made in your Gateway, and that Domain Name Server (DNS) and WINS Configuration have been disabled. **These entries are not used in an isolated network and may cause problems if they are present.** Delete any settings that may have been entered from a previous configuration.

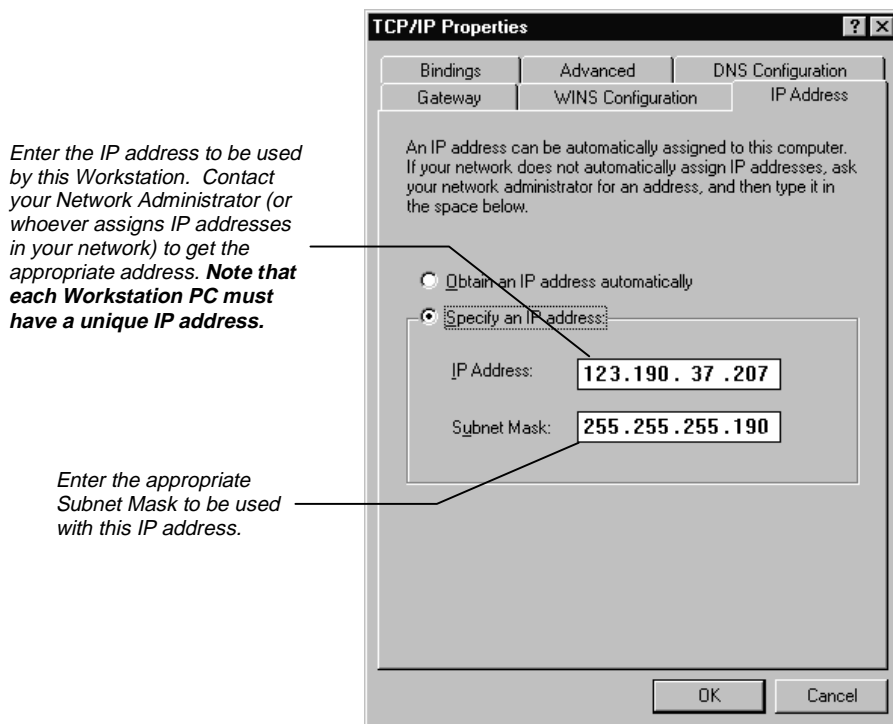


2. Click on OK, and you will need to reboot Windows for the changes to take effect.

### 3.9.5 Configuring TCP/IP Parameters for a Company Network

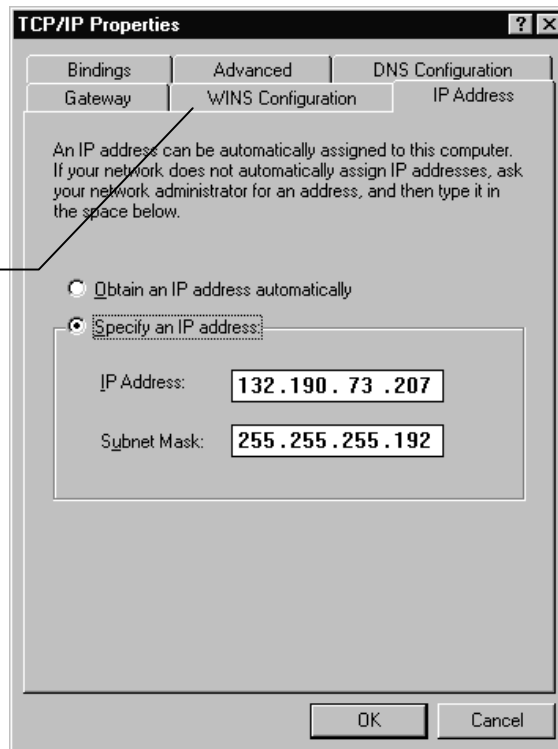
The following three steps assume you have completed steps 1 through 5 from the procedure *Installing and Configuring the Ethernet Card in Your PC*.

1. Select TCP/IP from the network component list and click on the Properties button. The *TCP/IP Properties* dialog box is displayed.



2. Your Network Administrator may instruct you to obtain an IP address automatically by selecting the appropriate radio button.

Contact your Network Administrator to see what the appropriate settings are for your Gateway, and whether Domain Name Server (DNS) and WINS Configuration are needed.



3. Your Network Administrator may also instruct you to specify parameters in the *Bindings* and *Advanced* tabs.
4. Click on OK in the *Network* dialog box. You will need to reboot Windows for the changes to take affect

### 3.10 Hand Held PC connection

The ProStar325 detector has the capability of being controlled by a hand held pc via its inbuilt infra-red link. The detector's receiver window is located next to the three LED's on the front panel.

The infra-red communications link (IrDA) can override control at any time as if it was an attached front panel.

If IrDA overrides the TCP/IP control (IrDA host sends a message to take control) then the TCP/IP host will get an indication in the status that there is an IrDA device controlling the detector and the TCP/IP host will be locked out from controlling the detector. There will be a status message in the software indicating the state of the IrDA host control.

The hand held pc can control multiple detectors without conflict. This is made possible because each detector has a unique IP address. Simply point it at the detector to establish communication. It needs to be line of sight and has a working range of approximately one meter.

IrDA host control is automatically halted if the IrDA is not sensed by the detector. The IrDA host can cancel control by sending a message to the detector at any time.

Up to nine methods can be stored in the hand held pc's memory. This memory is volatile. Therefore, if its battery goes flat, the method information will be lost.

]

## 3.11 Instrument setup

### Cabling

The monitor, printer/plotter and detector are all connected to the PC by cables that plug into the back of the PC. Consult your monitor and printer/plotter manuals for details of their cabling requirements.

**J1 Comm:** RJ-45 type connector used to interface the ProStar325 to the PC by using a 100ohm shielded twisted pair Ethernet crossover cable Category 5 or better.

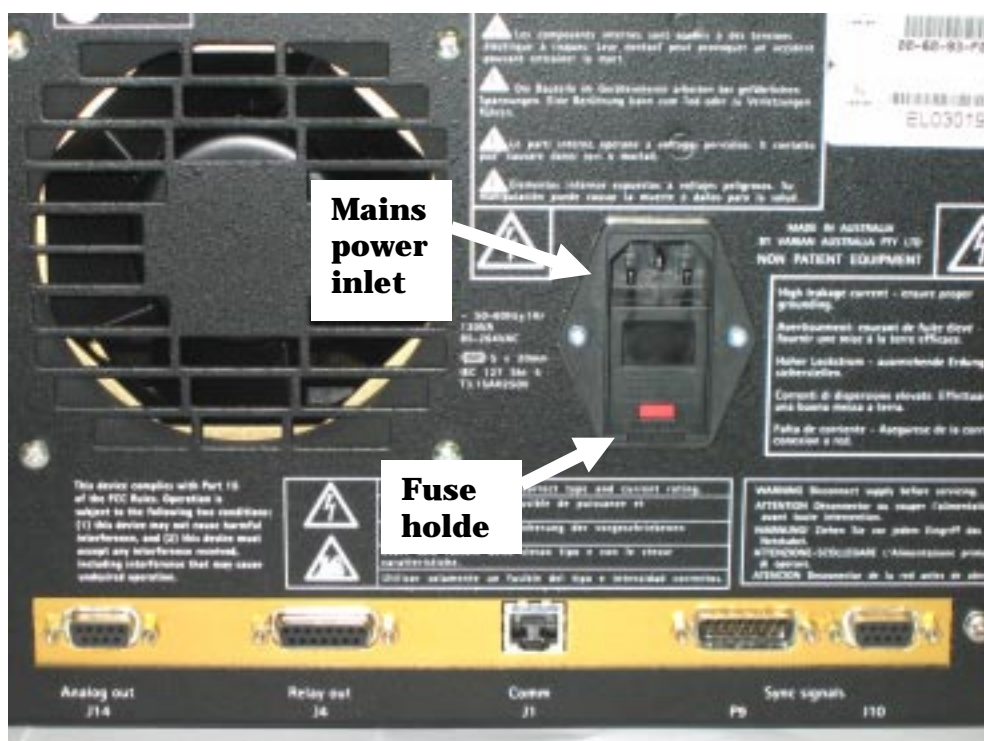
**J10 Sync signals:** female 9-pin "D" range connector used with synchronization signal cables.

**P9 Sync signals:** male 15-pin "D" range connector used with synchronization signal cables.

**J4 Relay out:** female 15-pin "D" range connector used to control the four programmable external event relays and peak sense relay.

**J14 Analog out:** female 9-pin "D" range connector for Analog output channels A & B.

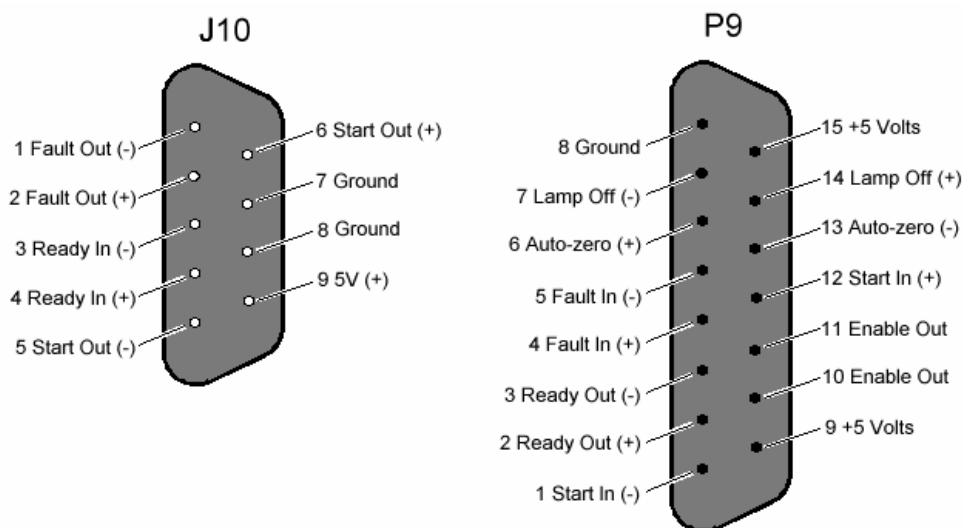
**Electrical connection:** the universal mains power inlet connection is located at the rear of the instrument.



### 3.12 Synchronization Signals at P9 and J10

These signals are used to synchronize the operation of a group of instruments that are not interfaced to a Workstation via a GPIB interface.

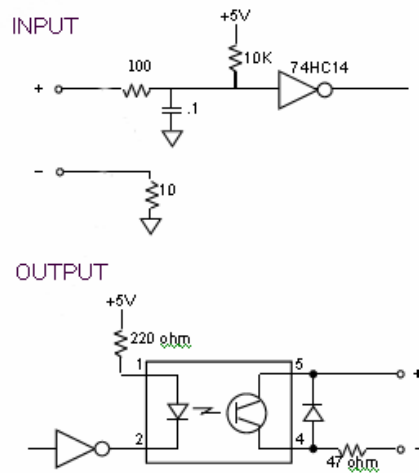
P9 and J10 pin designations are shown below. The SYNC signals come in four pairs and define how the detector will operate in an HPLC system. These signals are important for controlling timing and synchronization of the detector with the other devices in the system. SYNC signals are closely tied to the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



#### Pin Designations for P9 and J10

An input is activated or said to be present when its two signal wires are connected together. This is quite often 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. See Figure 4 below.

**Figure 4 Input/Output Schematics**

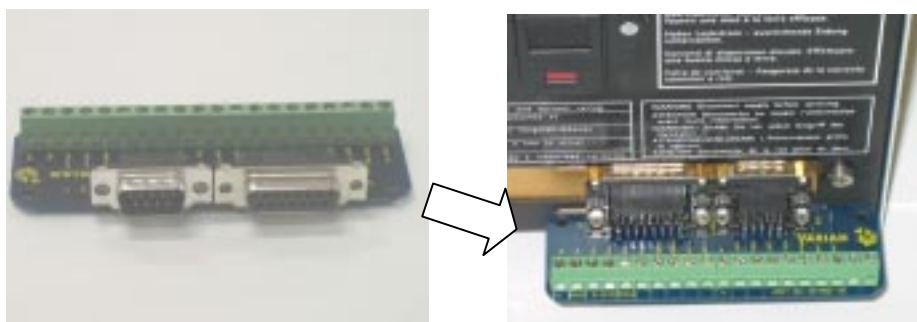
- Enable Out:** A non-polarized constantly active output (a short). This output can be used to activate Enable In on the next instrument.
- Ready In:** When Enable In is set (software switch) this polarized input signal must be present before the ProStar 325 can go to the READY state. Specifically, when 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 detector goes to the READY state. It must stay active until the ProStar 325 starts. Ready In will be ignored in all other states.
- Ready Out:** This polarized output signal indicates that the ProStar 325 is in the READY state and is ready to start a time program.
- Start In:** This polarized edge triggered input signal will start the active method if the ProStar 325 is in the READY state.
- Start Out:** This polarized output signal will be activated for 600 milliseconds when the ProStar 325 starts a time program.
- Fault In:** 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 source lamp can be programmed to either remain on or turn off upon receiving a fault signal.
- Fault Out:** This polarized output signal will activate for 600 milliseconds when either of the following conditions occurs:
1. The ProStar 325 discovers an internal fault condition that warrants aborting the run.
  2. The ProStar 325 receives a Fault In signal and it has no internal fault condition itself.
- Autozero:** This edge-triggered contact closure causes an autozero adjustment.

**Lamp Off:** 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.

### 3.13 Rear Panel Accessory Interface PWB

To connect open-ended wires to the Sync signals available at P9 & J10, use Rear Panel Accessory Interface PWB (p/n 02-101865-90) .

Simply plug this PWB into the rear panel connectors as shown.



### 3.14 Rear Panel Relay Interface PWB

To connect open-ended wires to the relay signals available at the rear panel connector J4, use Assy PWB Relay Interface (p/n 02-101875-90).

Simply plug this PWB into the rear panel connector.

### 3.15 Electrical connection

Before connecting the instrument to the power supply, ensure that both the instrument and the power supply are turned **off** (the power switch **O** is pressed). The power switch is a rocker type switch located on the front panel that connects directly to the power receptacle on the rear panel.

Press **I** for on, **O** for off.

Note: Do not connect the instrument to the mains power supply until you have made sure that the two line fuses on the rear panel of the instrument are of the correct type and rating.

The ProStar 325 UV/Vis Detector can be operated with any line voltage in the range of 100-240Vac +/-10%, 50-60 Hz. +/-1Hz.

Plug one end of the power cord into the power receptacle on the back panel and the other end into your AC power source.

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.





**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.**

---

### 3.16 Fuses

The ProStar325 contains two fuses which are located at the back of the instrument. To replace a fuse, disconnect the detector from the power supply, and replace the blown fuse with one of the type and rating as indicated in the Specifications section of this manual or on the silk screening adjacent to the fuse holder.

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

**Note:** Always check the information printed on the rear of the detector for the most up-to-date details regarding the fuse type.

For details on checking and replacing fuses see Electronics section.

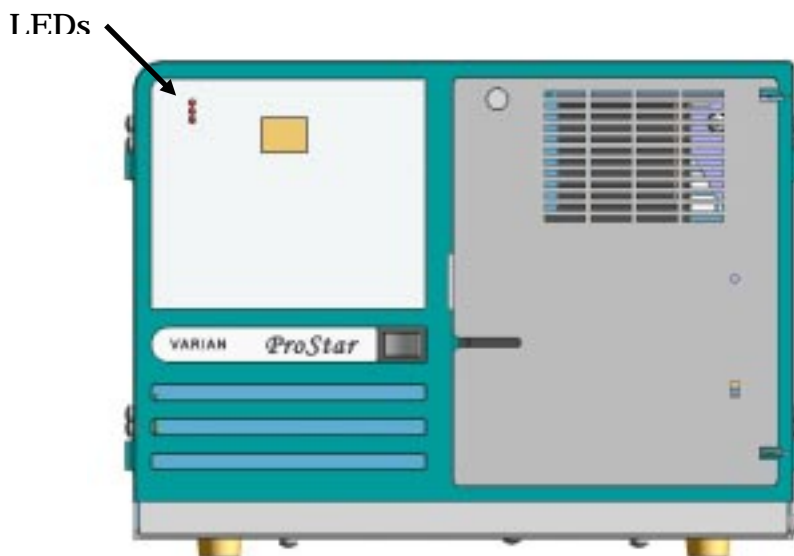
### 3.17 Power Up

After connecting the detector to AC power, press **I** on the power rocker switch. The detector will switch on and execute its start-up routine.

If your instrument fails to power up when the power switch is turned on, check that the power cord is properly connected, that the fuses are ok and that there is power at the wall receptacle. Please refer to the Electronics section of this manual for details on the initialization routine.

### 3.18 Front Panel LEDs

The front panel has 3 dual colour LEDs that indicate the detector's status during its stages of initialisation and operation. The color coding for each one is defined in the table below.



Led	Status	Color
Power	Initializing	Yellow flashing
	Power On	Green
Lamp	Lamp On	Green
	Fault	Red
Ready/Run	Not Ready	Off
	Ready/Stopped	Green
	Method Running	Yellow

### 3.19 Detector States

The detector has 6 states NOT READY, INITIALISING, MONITOR, READY, RUNNING and STOPPED. Transition between the states will depend on the current state and a number of signals, specifically SYNC signals, and/or a number of internal events which can also cause state transitions.

**NOT READY LAMP OFF** – Detector is not ready for a run, but is useable. It will be in this state after POWER-UP, or when all lamps are turned off, or after a fatal fault is received and the option is to turn lamps off after fault. It will not leave this state unless it receives one of the following;

- LampOn command received or auto lamp on
- A request to change into diagnostic state is received

**NOT READY LAMP ON** – Detector is not ready for starting a run. It will be in this state after a lamp on and EnableIn is high, and SyncInReady is also high. It will not leave this state unless it receives one of the following;

- LampOn command received or auto lamp on (2nd lamp)
- A request to change into diagnostic state is received
- It receives a low on SyncInReady
- A lamp off (or AutoLampOff) is received. (2nd or both lamps off now)

**INITIALISING** – Warm up time for the D2 lamp in preparation for striking near the end of this state.

**MONITOR** – A post-setup autozero and collection, of the noise level required by the user/host for peak sense. A message interface command through user software is needed to disable the monitor data collection (does not disable any AutoZeros or other parts of the monitor).

This data collection is separate from the method collect data as it is a fixed time length. When data is collected, the detector will calculate relevant Peak Sense control information.

**READY** – Detector is now useable. Once the detector receives a START IN, or command “Start” it will progress to RUNNING state.

**RUNNING** – Method is currently being run and the method clock is on.

**STOPPED** – Method clock has been stopped and the run method can be restarted through START IN or method “Start” command.

**DIAGNOSTIC** – This is a special state that allows some actions to happen out of sequence or without certain pre-requisites being met, i.e. can start collecting data when no lamps are on for instance.

In this state the detector cannot perform actual user data collection. It is intended for faultfinding purposes only.

It will only exit this state when a Diagnostic command to exit Diagnostics state is received.

**POWER ON** – This state is the initial power up. Detector is loading up its internal systems before it begins its start up phase. It loads the FPGA, checks the hardware and configuration. During this state all user intervention is disabled.

Shown below is a table of detector states and the status of SYNC signals for each state;

Detector State	SYNC signal outputs				SYNC signal inputs				
	Enable Out	Ready Out	Start Out	Fault Out	Enable In (Now Software switch)	Ready In (Enable In active)	Ready In (Enable In not active)	Start In	Fault In
NOT READY LAMP OFF	active	not active	not active	not active	ignore	ignore	ignore	ignore	ignore
NOT READY LAMP ON	active	not active	not active	not active	detect level	detect level	ignore	ignore	ignore
INITIALISE	active	not active	not active	not active	detect level	detect level	ignore	ignore	ignore
MONITOR	active	not active	not active	armed (Pulse)	detect level	detect level	ignore	ignore	detect transition
READY	active	active	not active	armed (Pulse)	Detect level	detect level	ignore	detect transition	detect transition
RUNNING	active	not active	Pulse on entry	armed (Pulse)	Ignore	ignore	ignore	ignore	detect transition
STOPPED	active	not active	not active	armed (Pulse)	detect level	ignore	ignore	detect transition	detect transition
DIAGNOSTIC	settable	settable	settable	settable	monitor	monitor	monitor	monitor	monitor

### 3.20 Instrument performance tests

The ProStar325 software contains a Verify application that is used to verify that the system is performing according to specification. Refer to the Verify software on-line help. You should compare your results with those obtained at the factory. The results obtained during factory testing are included in the packing crate with the instrument.

Instrument performance tests carried out at installation are as follows;

Short and long-term signal-to-noise  
Short-term dual wavelength signal-to-noise

Wavelength accuracy

Wavelength precision (repeatability)

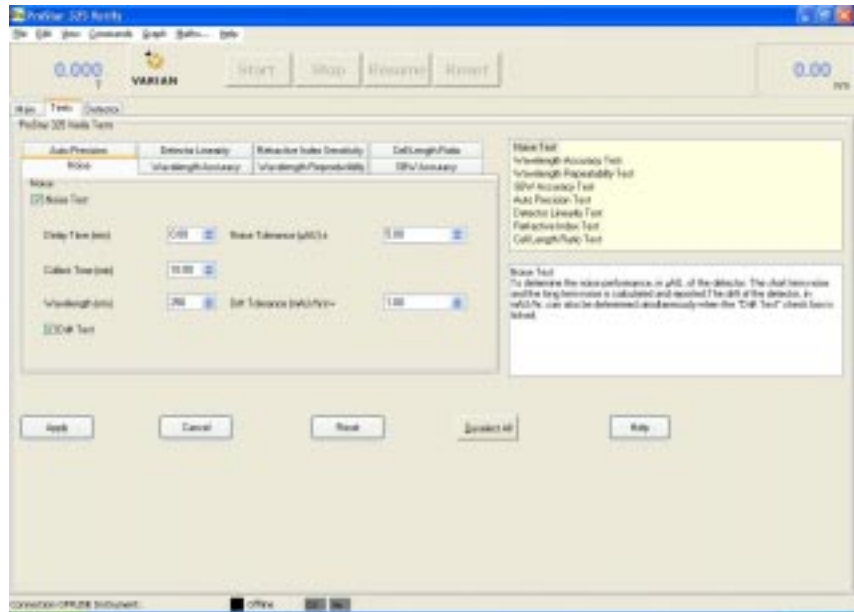
If any of the tests fail to meet the specifications you can refer to the Troubleshooting and Diagnostics Chapter of this manual to help diagnose and correct the problem.



To start the installation tests using the Verify software:

- Click on the Windows "Start" button.
- Point to Programs and select ProStar325 from the flyout menu.
- Select the Verify application from the second flyout menu. After the initial ProStar flash screen appears, the Verify application will open.
- Select **Tests** and then select the **Instrument Performance Tests** radio button.

The verify software will be automatically loaded with the selected tests.



- Click **OK** to continue.
- Click **START** to start tests.
- Enter in the customer details and instrument serial number and type.

Each test will be run in succession, and the results for each test are displayed in the Report area immediately after the test is completed.

At the end of the Verify run, the ProStar system automatically generates a report file. The report file is stored in the ProStar directory and saved with the following format:

DATE TIME.RVO

For example,

16 Apr 97 3:57:48 PM.RVO

The date and time will appear in the same form that is set in the Windows Regional Settings Properties dialog box that is accessed from the Windows Control Panel.

This feature will aid in keeping a history of the instrument's performance.

Print two copies of the Reports page.

- One copy is for the customer
- One is for you to attach to the Installation Service Report.

If you are using these routines to test an instrument after the installation date, the reports need not be kept.

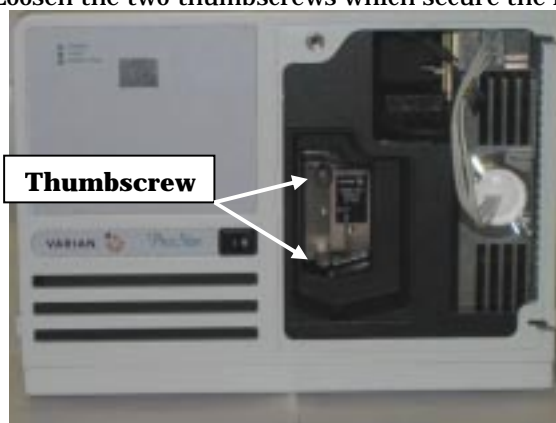
### 3.21 Flowcell

The ProStar325 can be fitted with any one of four flowcells (ordered separately). The customer's chosen flowcell type is packed internally in the detector. The four types are;

Part Number	Description	Volume
02 101818 00	FLOWCELL 9x0 ANALYTICAL	15ul
02 101819 00	FLOWCELL 9x1 PREP	15ul
02 101820 00	FLOWCELL 4x0.15 SUPER PREP	15ul
02 101821 00	FLOWCELL 4x0 SEMI MICRO	1.6ul

All flowcells can be removed and re-installed as follows:

- The flowcell should be removed with the connecting tubing fitted. These must be removed outside the detector compartment.
- Access the flowcell compartment by removing the green front door.
- Remove the flat panel by loosening the single screw on the top left hand corner.
- Loosen the two thumbscrews which secure the flowcell.



- Holding the flowcell by these two thumbscrews, carefully remove it from its position.



- The replacement procedure is the opposite of this. Use care to align the flowcell on locating pins.

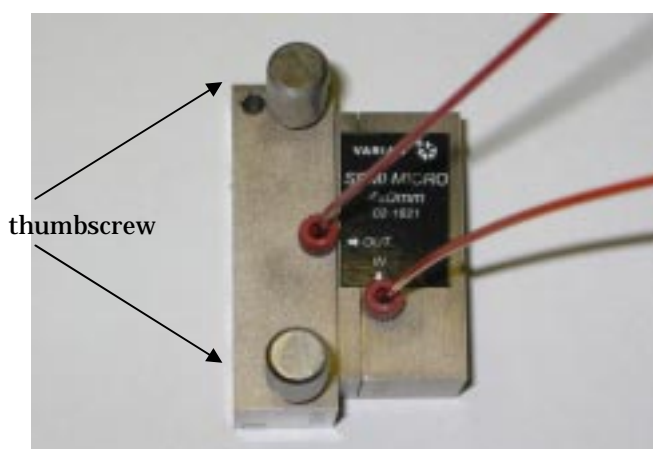
### 3.21.1 Tubing

Each flowcell comes with a set of nuts & ferrules that are fitted to peek tubing and connected to the flowcell as shown.

	Part number	Description
Used on all types except 4x0.15	16 101265 00	Fitting 1/16 tube nut/ferrule flat bottom (Pack of 10)
Used on flowcell 4x0.15 only	16 101269 00 16 101264 00	Fitting 1/8 tube nut flat bottom (each) Fitting 1/8 tube ferrule (Pack of 10)

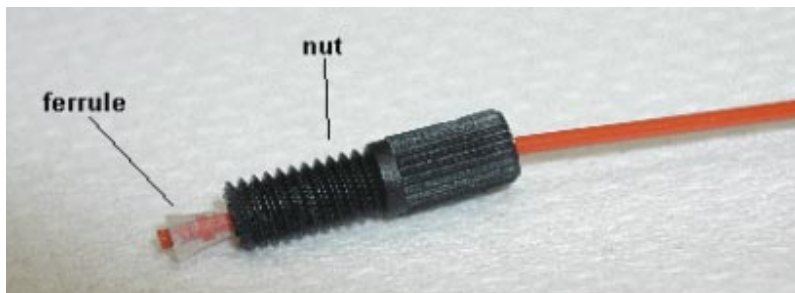
The flowcells are constructed from titanium and are provided with quartz optics windows. Tubing connections are PEEK type except for the Super Prep flowcell which uses TEFZEL TUBE 0.125 x 0.062.

Each flowcell is easily interchangeable by the user.

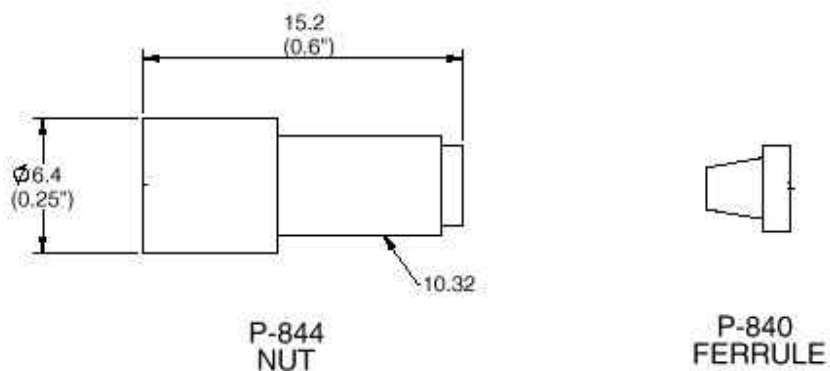




Fit the nuts and ferrules on the peek tube as shown below. Screw these two tubes into the body of the flowcell. Do not over tighten as this will damage the threads. Each flowcell has an inlet and outlet connection.

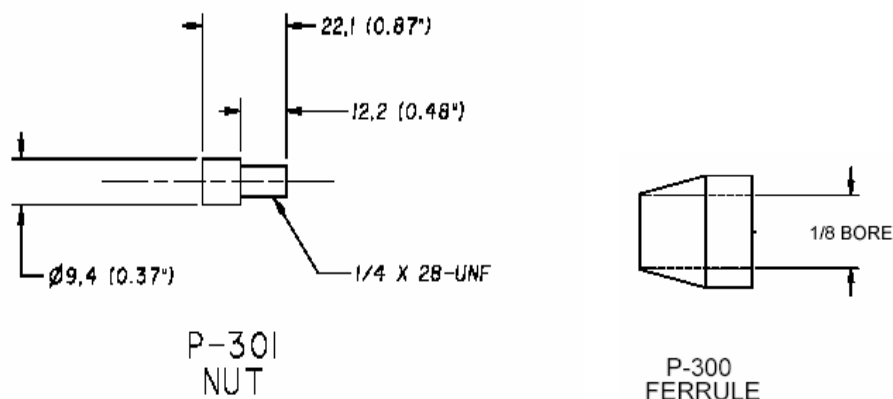


### **Fitting 1/16 tube nut - ferrule, flat bottom**



Vacutight - 1/16 tube short  
headless, nut 10.32 with ferrule

### **Fitting 1/8 tube ferrule, flat bottom**



### 3.21.2 Flowcell storage

Prior to storage flush out the flowcell with Methanol or IPA. Leave the solvent inside the flowcell during storage by connecting a short length of tube between the inlet and outlet connections of the flowcell. To avoid possible degradation in performance due to dust, store flowcells in sealed plastic bags whenever the flowcell is not installed in the detector. Whenever the flowcell is removed, set the flowcell with the faceplate upward and avoid touching the inside of the flowcell recess. Cover the flowcell opening with a piece of 3 x 5 card, or always place a flowcell in the flowcell opening.

### 3.21.3 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-situ (in place) quite successfully by using the following procedure;

1. Flush the system thoroughly using HPLC grade water 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 50ml of the 25% acid through the cell at 1-2 ml/min, rinse by pumping 100 to 200ml 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 for cell cleaning depends upon the cleanliness maintained during routine operation.

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 actually connected. Thread lubricants should never be applied to compression fittings.

The external windows of the flowcell can be cleaned with a dry, clean source of compressed air or nitrogen. Remove the flowcell and carefully blow any dust or contamination from the external windows. Replace the flowcell, ensuring that the sample and reference beam windows are not obstructed.

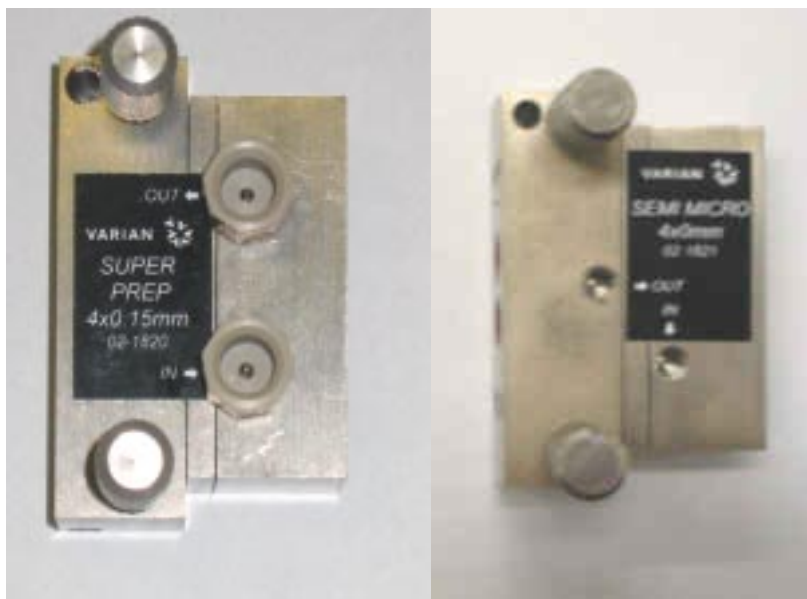
### 3.21.4 Flowcell types

There are four flowcell varieties available for the ProStar325 detector. Each one has an inlet and outlet connection, quartz optics cell window and each type is easily identifiable.



*9x1 Prep*

*9x0 Analytical*



*4x0.15 Super  
Prep*

*4x0 Micro*

### 3.22 Back pressure restrictor

The outlet port of the analytical and semi micro flowcells should be connected to a back pressure restrictor (provided in the ship kit). Also, the prep 9x1 prep flowcell should also be connected to a back pressure restrictor when it is used for analytical measurements.

The back pressure restrictor provides approximately 40psi 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 which 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.

Some 1/16" tubing is supplied at both the inlet and outlet of the restrictor. The inlet tubing is provided with a 1/16" plastic 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 pressure of the restrictor is not adjustable. If it fails or becomes blocked it will need replacing (p/n 01-107433-00).

### 3.23 Extended range

The ProStar325 detector can extend the working Absorbance range by calibrating the path length ratio between the long and short path cells.

Extended range calculations are standard with all detectors.

For cell configurations that do not support dual path operations, an error will be reported based upon the cell ratio calculated to be above 100. In this case the extended range option will be automatically disabled.

The extended range ratio is set in the software (either in the hand held pc or the workstation). It can be found listed on the flowcell. The exact ratio shown on the flowcell should always be used.

### 3.24 Source lamps

All ProStar325 detectors come with the source lamps pre-aligned from the factory so there is no alignment necessary.

Instructions on how to change both the Visible and UV lamps in the detector are included in the Optics section of this manual.

A new UV replacement lamp is delivered tested and pre-aligned on a mounting bracket. It is designed for direct exchange installation, and requires no alignment after it has been installed.

Follow the steps given in the Optics section of this manual for removal of the old lamp, and installation of the new one.

After replacing any source lamp, calibration will be required. Please refer to the Diagnostics section for details.

For both lamps the following safety precautions should be observed:



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**Warning**

Lamp surfaces and mounting brackets will become hot during operation and will remain hot for some time after being switched off.

The temperatures are sufficient to cause burns.

The UV lamp operates at high voltage. Contact with this voltage can cause death, serious injury, or painful electric shock.

Before changing either the UV or Visible lamps, always switch the instrument off, remove the power supply cable

and allow the lamps to cool.

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**Caution**

Care must also be taken when removing lamps. Touching the glass envelope of either the UV or Visible lamp will reduce its efficiency.

**Never** touch the glass surfaces of new lamps.

**Always** handle a lamp by its base.

---

### 3.25 Cleaning

Any spills should be wiped up immediately, and any deposits on the windows should also be removed.

The exterior surfaces of the ProStar325 detector 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.

### 3.26 Excessive Noise and/or Drift

Excessive noise and/or drift have two primary sources: a contaminated or leaking flowcell or a worn out deuterium lamp. To determine the source of the noise and/or drift, pump HPLC grade water through the flow cell at 1mL/min directly from the pump with no column in the system. Set the detector wavelength to 240 nm and a time constant of two seconds. Adjust the recorder attenuation to 0.001 AUFS. Record 10 to 15 minutes of detector output at a chart speed of 1cm/min. Now stop the pump and continue to record detector output. NOTE: It may be necessary to autozero initially to keep the trace on the chart paper.

If the noise and/or drift problem disappears after stopping the pump, the source is flow related and the flow cell is the cause. If the noise and/or drift problem is still present after stopping the pump, it is not flow related and the deuterium lamp is the source.

If the flow cell is the problem, clean it using the procedure given in this section. If the cleaning procedure does not rectify the problem it will be necessary to replace the flowcell assembly (see Optics section).

If the deuterium lamp is the problem source it must be replaced with a new lamp (Optics section).

If you suspect that the deuterium lamp is the source of the noise and/or drift problem, check the elapsed lamp hours and lamp intensity. Compare these values with those you have previously recorded.





# INSTALLATION ACCEPTANCE CHECKLIST

☐ GC ☐ HPLC ☐ GC/MS ☐ LC/MS ☐ DH ☐ Options/Accessories

SYSTEM IDENTIFICATION			
CUSTOMER NAME		OPERATOR NAME	
PHONE	EMAIL	S.O. #	
COMPANY NAME AND ADDRESS		INSTRUMENT MODEL #	INSTRUMENT SERIAL #
CUSTOMER SUPPORT REPRESENTATIVE		DATE INSTALLATION STARTED	DATE INSTALLATION COMPLETED
SETUP AND INSTALLATION			
REFER TO THE OPERATION OR INSTALLATION MANUAL FOR DETAILED INSTALLATION PROCEDURES.			
LIST MISSING ITEMS AND SHIPPING DAMAGE TO INSTRUMENT OR PACKAGING:			
CSR INITIAL	DATE	CUSTOMER INITIAL	DATE
INSTRUMENT VERIFICATION			
<input type="checkbox"/> All installation performance tasks successfully completed.			
COMMENTS:			
OPERATIONAL FAMILIARIZATION			
<input type="checkbox"/> Basic Operation	<input type="checkbox"/> Recommended Spare Parts	<input type="checkbox"/> Warranty Coverage Explained	
<input type="checkbox"/> Maintenance Procedures	<input type="checkbox"/> Recommended Operating Supplies	<input type="checkbox"/> Service Contract Availability	
<input type="checkbox"/> How to Contact Service & Support	<input type="checkbox"/> Availability of Training Courses	<input type="checkbox"/>	
CUSTOMER ACCEPTANCE			
<p>_____ confirms that the _____ have been accepted,  <small>CUSTOMER NAME</small> <small>VARIAN PRODUCTS</small></p> <p>are subject to applicable warranty provisions, and that final payment for them is now due.</p>			
CSR SIGNATURE	DATE	CUSTOMER SIGNATURE	DATE

INSTALLATION TIME Labor Hours: \_\_\_\_\_ Travel Hours: \_\_\_\_\_

White: Country/Regional Manager Yellow: Field Service Representative Pink: Customer

03-914825-00 Rev. 2 / SPEC. 03-914815-00-23:dd



## **4 Electronics**

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### **4.1 Introduction**

The electronics system in the ProStar 325 detector provides the interface between the optical measurement system, including any accessories. Communications is either through an external host computer connected via Ethernet or Pocket PC communicating through a standard IrDa interface running as a Star workstation. The instrument electronics control all necessary parameters of the optical system to enable a photometric reading to be made at a specified wavelength. Results are then transmitted to the host computer for analysis.

The power supplies for the detector are delivered from two main OEM power modules and from the main Processor PWB. All processing of digital and analogue signals (including accessory signals) are also handled by this PWB

Mains supply for the instrument enters through a Corcom filter network and varistor combination, which help to suppress transient disturbances. Overcurrent protection fuses 1FS1 and 1FS2 are mounted on the rear panel. The fuses are T3.15AH250V and are contained in the input module.

The two OEM supplies are universal mains switchmode supplies with an input range of 85 – 264VAC at 50–60Hz +/-1Hz.

### **4.2 OEM power supplies**

The two main power supplies in the detector supply the following voltages;

Power Supply #1: +24V, 65W

Power Supply #2: +5V, +/-12V, 40W

#### **4.2.1 Low voltage power supplies**

The +24V power supply is used to feed the switch mode supply circuits for the two lamps and supply the grating drive motor circuit.

The +5V supply is used to generate the +2.5V and +3.3V necessary for all the digital logic circuits.

The +12V and -12V are used to generate the +9V and -9V used for the analog circuit supply.

The Processor PWB assembly contains a number of independent power supply circuits for regulating the voltage supplies needed by the instrument. Most of these supplies use linear regulators. Consequently the Processor PWB only requires low voltage input supplies for producing all the necessary voltages.

The supplies for the D2 and visible source lamps use switch mode regulation techniques for supplying their respective lamps.

#### **Linear regulators**

U52, U53, U54 and U55 provide the necessary dc voltages to the rest of the Processor board.

### **4.2.2 Deuterium (D<sub>2</sub>) lamp power supply**

The deuterium lamp supply provides power for the filament and the arc in the lamp. It allows the flexibility of maintaining some filament drive when the arc is struck. It consists of a current limit foldback circuit and a current source. The sequence of operation to start the lamp is: Assert D2FILON# (this turns on the filament supply at full voltage and the arc supply with the current source turned off), Wait 10 seconds for the filament to warm up, assert D2ON. During the warmup time the arc supply is charging C226 to approximately 475V to provide the strike voltage. When D2ON is asserted the current source transistor, Q8, turns on and tries to sink 300mA. This places 475V across the lamp via R194 and R241. The lamp starts conducting and is carried into the negative resistance region by the current from C226. The voltage on the anode drops below the voltage on D14 anode and the current starts to flow from the run supply. The current builds up to 300mA and the current source starts to regulate causing the voltage on Q8 drain to go up and the controller to reduce the pulse width due to the action of D15.

#### **Filament supply**

The filament supply is an isolated flyback converter running at approximately 220 kHz. Feedback is provided by the network from D24 to R219 which senses the voltage pulse on the primary reflected from the secondary. R221 changes the output voltage for warmup and run modes of operation. D22 turns off the filament supply when D2FILON is negated. D23 is a snubber to reduce the spike on the transformer primary due to leakage inductance of the transformer. U43 senses the average voltage on R226 and outputs D2FILOK# to the processor board when it is above a threshold.

#### **Arc supply**

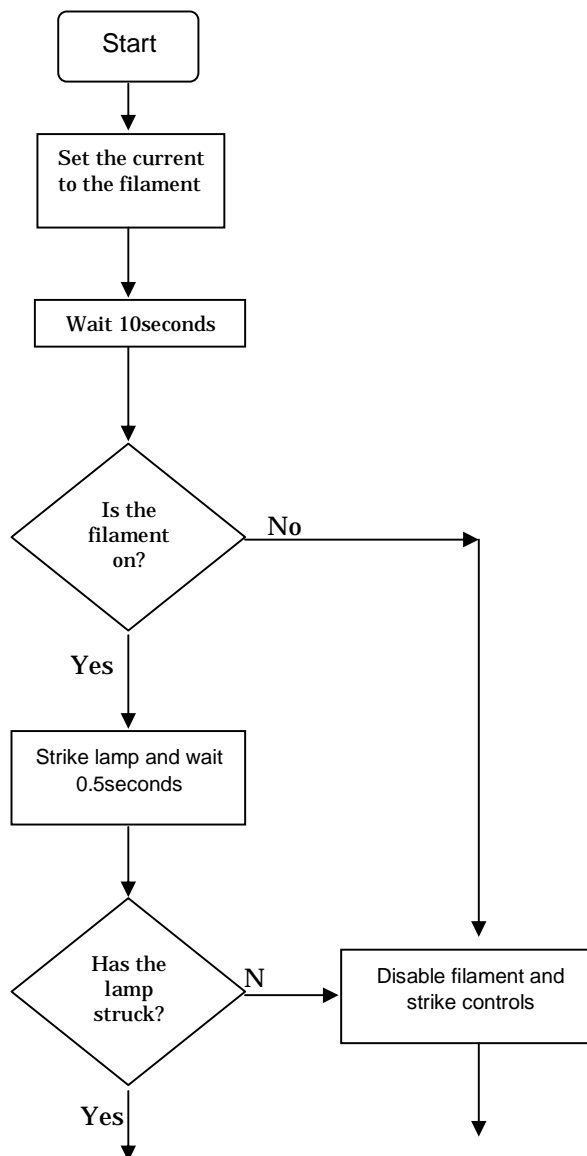
The arc supply is a discontinuous current boost converter with an extra tap on the transformer running at 180kHz. It has 2 modes of operation. During filament warmup it operates with Q8 off and generates 475V on D2ANODE and the filament terminals can float up to a high voltage so the arc is not started. During run

mode Q8 is regulating the current and the voltage feedback is from the D2 lamp's cathode via D15.

**Warning**

If the polycarbonate safety cover is removed, the D2 supply voltage is exposed. Contact with this voltage may cause electric shock or death. Minimize this risk by keeping the cover in place.

The following is the sequence of events when the D2 lamp striking:



OK

Return an error

### 4.2.3 Visible lamp power supply

The visible lamp supply is a continuous current buck converter operating at 200kHz. One side of the lamp is connected to +24V and the other side is regulated to be 12V down from that supply. U56 is a current mode controller. Q10 is turned on by the controller, causing the current in L5 to increase. Q10 is turned off by either a maximum current (as sensed at pin 3 across shunt R352), or a voltage over 2.5 volts on pin 2. When Q10 switches off, the flyback spike is clamped to +24V by D39.

U45 is a differential amplifier that provides the correct feedback voltage to U56. This results in a lamp voltage of 12.1 VDC.

Diode D40 couples the VISON# signal to the feedback pin (U56 pin 2) to force the device to the off state when VISON# is not asserted.

U46 compares the average current in shunt R352 to a fixed reference. This is used to report that filament current is flowing (lamp lit).

## 4.3 Processor PWB

The Processor PWB contains all necessary photometric signal processing and I/O devices to control the instrument and any accessories.

Operating conditions and results are transferred between the instrument and host computer by an Ethernet TCP/IP interface. The computer has ultimate control over the system and is responsible for issuing commands to the instrument and accessories. The instrument interprets these commands, carries out the required actions, and reports the results.

The Processor PWB is a fibreglass board with eight layers of tracks and power planes, using surface-mount technology (SMT). Component-level repair is generally not possible and is not recommended.

If you have a need to attempt to unsolder/solder components, use caution as damage to any of the through-holes ("vias") would be very difficult to repair.

There are SMT components on the rear of the board that may be damaged if they catch on objects when the board is being handled.

### **Electro-magnetic compliance (EMC) issues**

The use of an eight-layer PWB ensures that radiation from the printed tracks is reduced, because the tracks act as microstrip transmission lines relative to the contiguous groundplane.

Small ferrites have been fitted to many signal lines that leave the Processor PWB. These inductive devices and the capacitance on the lines filter out higher frequency components, reducing emission of offending radio frequency spectra. Ferrites on input lines also improve input noise reduction and immunity from external interference.

To reduce edge transition speeds (and subsequent radiated noise levels) on the digital lines, the slew rate and drive currents on the Field Programmable Gate arrays have been set to the minimum required for the design to work properly.

#### **4.3.1 Processor PWB functions**

The Processor PWB is based on a 32-bit microcontroller type AMD Elan SC520, 133MHz with 4MB field upgradeable flash memory. Also on board is 128MB of SDRAM. Software contained in the flash memory gives the microprocessor multitasking capabilities which enable a number of operations to be carried out simultaneously.

A thumbwheel switch and two seven-segment displays are provided for diagnostic control and reporting.

These tasks are executed by the processor PWB -

- Wavelength drive
- Photometric signal measurement
- Data buffering
- Timing control for MUX, ADC and preamp integrators
- Source lamp selection and control
- Ethernet TCP/IP communications
- Real time synchronization of dual channel analog outputs
- Service diagnostic tests
- Programmable Sync I/O signals
- Controls four programmable relays & peak sense relay
- Display detector status through front panel dual colored LED's
- Setting the Programmable Gain Amplifier

##### **4.3.1.1 *Microcontroller***

The Processor PWB is controlled by a 32-bit microcontroller U11, clocked at 33MHz by crystal oscillator Y1. It works off 3.3Volts with a core Vcc=2.5V.

The microcontroller is responsible for the following;

- ROM/Flash memory/EEPROM control
- Clock, Reset and timing signals

JTAG output port  
IrDA interface  
Diagnostic functions  
Serial ports, I/O RS232

The memory is addressed by the 18 address lines from the Central Processing Unit (CPU). Additional “chip select” lines are internally decoded in the microcontroller to address individual blocks of memory. The input/output devices are provided by a Field Programmable Gate Array (FPGA) and are memory-mapped also.

The WR# and RD# lines are used to strobe data to and from the addressed memory or I/O location.

FLASH memory occupies the top of the memory map and contains a boot block, instrument firmware, and gateware for the Xilinx FPGAs.

The boot block is written to the Flash memory using the JTAG port (P1). Once installed, the other firmware is loaded via the Ethernet TCP/IP interface.

#### 4.3.1.2 *Ethernet TCP/IP interface*

Most of the functions of the Ethernet TCP/IP interface are provided by an Ethernet Controller integrated circuit U12 operating at 33MHz. It contains all the necessary buffers and handshake logic needed to correctly interface with this data transmission protocol through the Microcontroller IC U1.

The microcontroller has a 3.3V PCI bus interface which is compatible with the 3.3V I/O from the Ethernet Controller chip.

#### 4.3.1.3 *JTAG port*

The Processor PWB is equipped with a JTAG accessible through connector P5. It serially connects the Microcontroller CPU and FPGA. This gives any device connected to the port access to all the digital lines on these devices. It effectively makes a long (hundreds of bits) serial shift register with one bit at each digital line on the two devices. Values can be shifted into this register to force levels on the device pins, and values can be read back from the pins also.

The JTAG port loads the operating code into FLASH memory. Any further updates of the operating code is done later through the Ethernet interface. The JTAG port can also test RAM and processor bus integrity without having the Microcontroller running.

#### 4.3.1.4 *Field-Programmable Gate Array (FPGA)*

The Processor PWB contains a FPGA Xilinx U11 which is used to provide the I/O ports for the microcontroller and also to generate some other logic timing required in the detector. This device has the equivalent of 30,000 logic gates that can be configured and connected as needed.

When the instrument is powered up, the outputs of the Xilinx are all open circuit and have weak pullup resistors. The Xilinx need to be configured by downloading them with code called "Gateware". When the microcontroller starts its boot sequence, it downloads the gateware along serial port lines.

Xilinx (U11) sits directly on the microcontroller bus and Its functions include -

Data transmission to/from Microcontroller

ADC/DAC timing, control, and accessing

Diagnostics functions

Front panel LED's

Back panel I/O signals

Timing signals

Grating motor drive

**ADC** is accessed through the Xilinx. A read from the ADC will present the data onto the processor data bus. Signal processing in the firmware is interrupt-driven. On completion of a conversion, the ADC causes a signal interrupt (i.e. fresh data is ready to read).

**Stepper motor drive** for the grating is driven from a simple port in the Xilinx. It is direct drive with current controlled microstepping and provides accuracy of  $\pm 1\text{nm}$ .

**Lamp control and reporting** source lamp supplies are turned on or off by the Xilinx according to user requirements. A logic low on either the D<sub>2</sub> ON or VIS ON signals enables the respective supply, although the D<sub>2</sub> lamp also requires a warm up period prior to striking hence the need for the D<sub>2</sub> WARM UP signal. VIS FILAMENT and D<sub>2</sub> ARC signals feed information back to the processor to inform of any possible lamp failures.

The VISFITTED signal is pulled low by a wire loop on connector J16. This signals to the processor that a Vis lamp option is fitted.

**Digital I/O** for various internal and external signals is done by a simple port on the Xilinx.

## 4.3.2 Non Volatile Data Storage

The detector stores the following data in non-volatile memory (EEPROM and/or flash memory). This information is retained when the detector is powered off.

The storage is in two sections, CMOS (battery backed) and EEPROM.

### 4.3.2.1

#### CMOS

- Lamp(s) hours of "on time", resolution at least 0.1 hours
- Date lamp(s) last changed
- Dual path flow cell ratio and type

- Equipment name / Detector alias

The contents of the CMOS can be read and changed through user software interface.

In order that the CMOS memory is not lost when the battery is replaced, then replace the battery with the mains power on.

#### 4.3.2.2

#### EEPROM

The EEPROM contains the following information;

- Instrument serial number
- MAC address
- Wavelength calibration factors, slope and offset
- IP address
- Gateway
- Lamp timer (on/off date and times)
- Detector installation date
- Last maintenance date
- Error log
- Dual Wavelength Configuration selection
- Extended Range Configuration selection
- Lamp Configuration

The contents of the EEPROM can be read and changed through user software interface or by invoking the appropriate test through the diagnostics thumbwheel selector switch (refer this chapter and Diagnostics).

### 4.3.3 Signal processing and A to D conversion

Output signals from the Dual Photodiode Pre-amp PWB are fed into the ANALOG INPUT circuitry. This circuit then performs a number of functions;

Multiplexing between the two channels  
buffering  
level shifting  
amplification

The signals are then sampled and held in preparation for the 16-bit A/D conversion to take place.

### 4.3.4 Relay Outputs

There are 4 general purpose output relays and one dedicated peak sense relay. Each output uses a DIP relay that is capable of handling 500mA of contact current.

At reset or power up, the output relay contacts are set to the default parameters. After loading a method they will be set as defined in the methods  $T_0$  parameters.

The peak sense 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 at the time interval equal to the “peak sense duration” parameter as stored in the method.

The peak sense relay can be activated from any of the following sources (only one source can be active at any one time).

Peak Sense event – any of the peak sense events (start peak, end peak, or peak valley) will activate the relay.

Level Sense event – The relay will be activated whenever the absorbance value crosses over the threshold (in AU) which is set by the user in the method.

Time slice event – Once timeslice has been turned on, it will provide a periodic activation of the peak sense relay at an interval defined in “TimeSlice period” within the method. Time slice can be turned on and off from either runtime, peak sense, or level sense.

Pulse event – Run timed programmed activation of the peak sense relay as defined in the method.

#### **4.3.5 Peak Sensing**

The detector is able to perform peak sensing functions on the data in real time. The purpose of the peak sensing function is to control a fraction collector via the peak sensing relay.

The peak sensing functions will trigger the following events;

The start or end of a peak

A valley point

These events will either trigger the peak sense relay directly or start a time slice function depending on the current method definition. It will also mark the selected analog output with tick marks.

Peak sense is applied after all data calculations, and before bunching.

Peak sense does not account for filter delays. These are a user responsibility in the method (relates to tube lengths).

#### **4.3.6 Analog Output**

Both of the analog outputs are for connection to a chart recorder. This is particularly useful with the dual wavelength option so you can monitor both channels. The parameters that can be modified on the output include the AU represented by full scale deflection.

Tick marks are short positive and negative (up and down) spikes generated at the recorder output that are used as event marks for points of interest. Tick Marks on the recorder output are about 0.5 sec in duration to give comparable height on all chart recorders. Tick marks occur at the following peak events:

- Inject (method start) – positive spike (up)
- Peak Start – positive (up)

- Peak Valley – negative (down)
- Peak End – positive (up)
- Pulse – negative (down)
- Time Slice – positive (up)
- Level - positive (up)

A tick mark will appear at the analog output in real time immediately after the event is detected, whereas peak sense relay activation will occur only after the time interval of the “peak sense duration” parameter.

The analog output is driven by a 16-bit converter with an output range of

0-1V FS with +11%/-20% over-range.

This gives an analog output resolution (at 1AU/Volt) =  $1V \cdot 131\% / 65535 = 20\mu V = 20\mu AU$ .

The Full Scale ranges are:

<b>Full Scale (AU)</b>	<b>Resolution (uAU)</b>
0.0005	0.01
0.001	0.02
0.002	0.04
0.005	0.1
0.01	0.2
0.02	0.4
0.05	1.0
0.1	2.0
0.2	4.0
0.5	10.0
1.0	20.0
2.0	40.0
5.0	100.0
10.0	200.0
20.0	400.0
50.0	1000.0
100.0	2000.0

## 4.3.7 Calibration

The electronics on the Processor PWB do not require any manual calibration. The instrument does however perform self-calibration at power-on.

### 4.3.7.1

#### *Gain Calibration*

A Gain calibration is performed by the detector at power on. It is applied across the entire wavelength range at 2nm intervals. This calibration routine relates to the photometric signal level present at the output of the signal amplifier circuit. This op-amp has a possible 15-stage gain arrangement which is selected electronically depending on signal strength. The detector scans the spectrum and sets an electronic gain for each wavelength interval which will correspond to 80% full-scale deflection on the ADC circuit. Upon completion the detector will perform an Autozero.

The gain versus wavelength information is stored in volatile memory and cleared when power is removed and recalculated again during detector initialization. The calibration data can be downloaded as a CSV file and be plotted and used for diagnostic purposes.

Refer to the diagnostics section for more details.

### 4.3.7.2

#### *Wavelength Calibration*

When the detector receives a command to calibrate the wavelength, it goes through the following sequence of events;

- Switch on the D2 lamp
- Scan and find zero order and 656.1nm peak
- Calibrate the wavelength with a linear calibration from zero through to 656.1nm
- Store the calibration into EEPROM

In any event of failure to complete the calibration, the previously stored calibration will remain valid.

If the D2 has an error or is not available, calibration will not proceed and an error will be returned.

Refer to the Diagnostics section on how to perform a wavelength calibration.

## 4.3.8 Dual Wavelength

The detector provides a command to enable the dual wavelength configuration (an option provided through a customer "installation program"). The detector will then save the dual wavelength configuration in EEPROM. The detector then provides a command to enable dual wavelength operation for the method collection. The dual wavelength mode is enabled only if the configuration allows it and the method allows it.

The detector will provide a command to specify the second wavelength. When enabled, the detector collects data from wavelength#1 and wavelength#2 "concurrently" (read at wavelength#1 and then immediately slew to wavelength#2 and

read at that wavelength).

The results from wavelength#2 optional collections are available in the status message as well as the method run data stream.

Autozeroing can be requested at both wavelengths, however, peak sense is not valid in Dual Wavelength mode.

Bunching of data is also not available in dual wavelength collection.

## 4.4 Initialization Sequence

The detector goes through the following routine when it is powered up;

Initialize all ports, interrupts & PCI bus

Test on-board SDRAM

Self check CRC of boot block

Check CRC of flash memory main code

Clear relay outputs and SYNC signal outputs

Check the position of the diagnostic rotary switch and perform the test

Perform normal start up checks

Perform power supply check

Activate READY\_OUT SYNC signal

## 4.5 LEDs and diagnostic display

The Processor PWB is fitted with various LEDs to indicate functions and provide diagnostic information to CSRs.

Under normal circumstances four green LEDs should be lit -

LED5 +5V OK

LED6 +9V OK

LED7 -9V OK

LED8 +24V OK

CPU reset status indicated by a red LED

LED1 Reset line is active (processor halted)

Ethernet communications is indicated by a green LED

LED4 Flashing during communications

### 4.5.1 Seven segment displays

There are two seven segment displays LED 2 & 3 which provide the status of firmware and fault indication which varies according to the instrument status. During initialisation, the following numbers will appear on the two seven-segment displays;

LED 3	LED 2
0	0
0	2
0	4
0	5
1	0
1	1
1	3

## 4.6 Diagnostic select switch

A 16-position thumbwheel switch is used to select service diagnostic routines.

#	DESCRIPTION
0	NORMAL INSTRUMENT OPERATION
1	FLASH MEMORY CRC/ CHECKSUM BOOT BLOCK Continuously checks the boot block program. Display '10' if OK Display '11' if ERROR
2	RAM INTEGRITY test Continuously loops through all SDRAM Display '20' if OK Display '22' if ERROR
3	ADC/DAC test Continuously checks the main ADC operation
4	ACCESSORY OUTPUT test Checks all SYNC and relay outputs by toggling in a two second period. Display '40' during this test
5	Not used at present
6	MONOCHROMATOR MOTOR test Initializes the stepper motor and sets the monochromator to somewhere near theoretical zero order. It then continuously cycles at full speed back and forth of this position with a 1second interval between direction changes. Display '66' while the motor is resetting Display '60' while it is being cycled

#	DESCRIPTION
7	DEUTERIUM LAMP test Enables the filament and then switches on the lamp. Displays '76' during filament on Display "70" when lamp is operating
8	VIS LAMP test (if fitted. This test will do nothing if there is no Vis lamp option present) Displays '86' prior to enabling lamp Displays '80' while it is running
9	Not used at present
10	EEPROM PARAMETER ERASE The entire contents of the EEPROM will be erased. Does not affect the program resident in the Flash memory. Displays '06' while erasing Displays '00' if erasure OK Displays '02' if ERROR
11	FLASH MEMORY test Continuously tests CRC/checksum read/write in the main program in the flash memory. Displays '00' if OK Displays '01' if ERROR
12	Not used at present
13	Not used at present
14	Not used at present
15	Not used at present

#### 4.7 Dual Photodiode pre-amp PWB

The Preamplifier PWB takes the small diode currents supplied from the photodiode detectors and converts them to a useable signal voltage. The cable from the Processor PWB is a shielded twisted pair type used to minimize any induced interference.

This PWB contains the pre-amplifier, integrator, integrator reset circuits, dual supplies and dual photodiode detectors. The sample and reference channels have their own unique electronics to eliminate crosstalk between the two.

The integrator circuits operate off +/-9Volt supplies generated on the main processor PWB. The pre-amp circuits operate off +0.5V/-4.5V generated on board by U6 and U7 using the +/-9Volts.

## 4.8 LED – IrDA display PWB

The LED/IrDa display PWB contains a small IrDa Transceiver incorporating a photodiode when receiving data and an LED when transmitting data. There are three bi-color LEDs that indicate detector status. These are controlled by signals from the FPGA.

Led	Status	Color
Power	Initializing	Yellow flashing
	Power On	Green
Lamp	Lamp On	Green
	Fault	Red
Ready/Run	Not Ready	Off
	Ready/Stopped	Green
	Method Running	Yellow

## 4.9 Removal & replacement procedures

### 4.9.1 Processor PWB

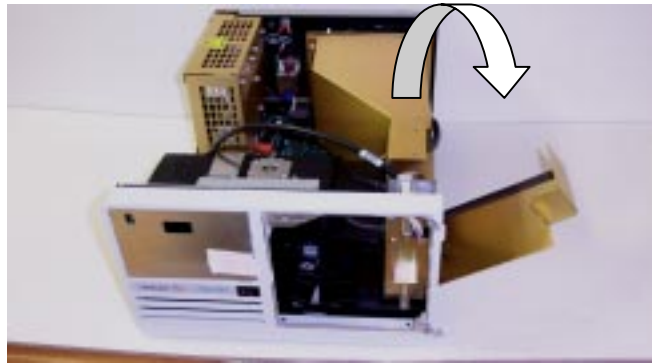
Switch off detector and unplug mains cable.

#### **Removal**

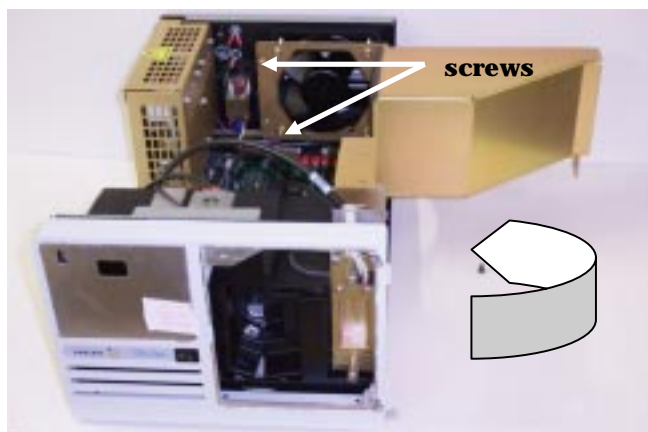
- Remove the detector's top main cover which is held by two screws on each side.
- Remove the two screws securing the small side panel and lower it down as shown.

remove





- Locate and remove the two screws at the rear of the detector used to secure the fan baffle. Then, swing the baffle to the right as shown.





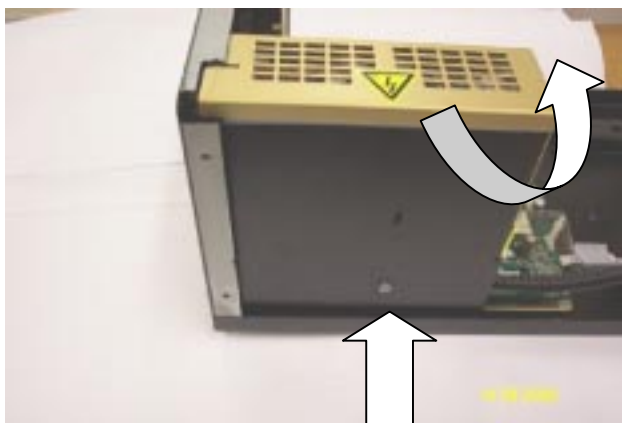
- Locate and remove the two screws on the rear panel



- Remove the optics module as described in the Optics section of this manual.
- Remove the earth lug screw located on the Processor PWB.



- Remove the single screw holding down the power supply module. This is located on the outer edge of the detector adjacent to the power supply module.



- Disengage the safety cover and slide the power supply module toward the front of the detector. At this stage the

mains supply input cables are still connected. Place the power supply module in the service position as shown below, and fasten in this position using the screw which originally held it in place.

The Processor PWB will now be exposed.

- Disconnect all cables from the Processor PWB.
- The PWB can now be removed along with its mounting bracket.



### **Replacement**

When a new replacement Processor PWB is received, it will be accompanied by two labels;

- MAC address
- Detector serial number

These labels need to be stuck over the existing ones located on the rear panel of the detector as shown below.



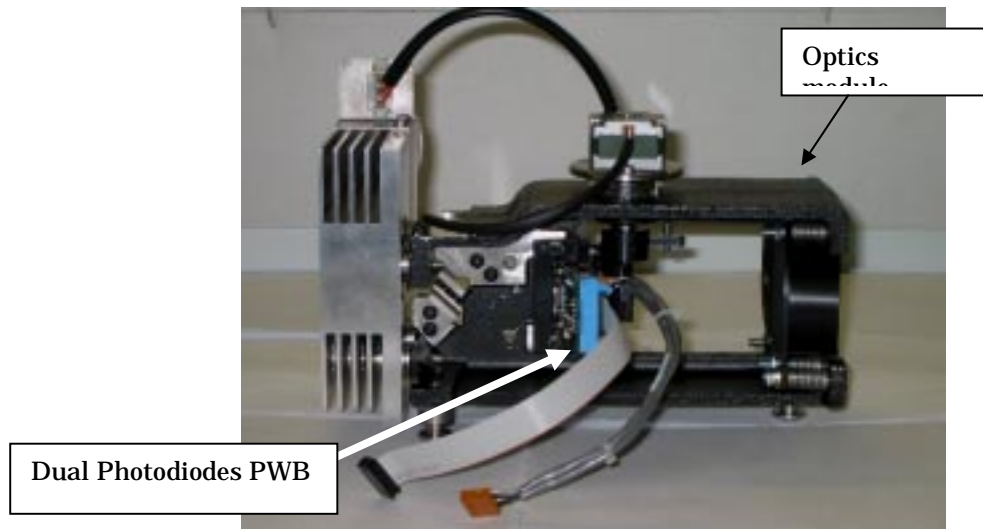


The Processor PWB replacement procedure is the opposite of the removal procedure.

**Note:** Whenever this PWB is replaced, you are required to perform a wavelength & 0%T calibration. Refer to the Diagnostics section for details.

#### 4.9.2 Dual Photodiode PWB

- Remove the Optics module as described in the Optics section of this manual.

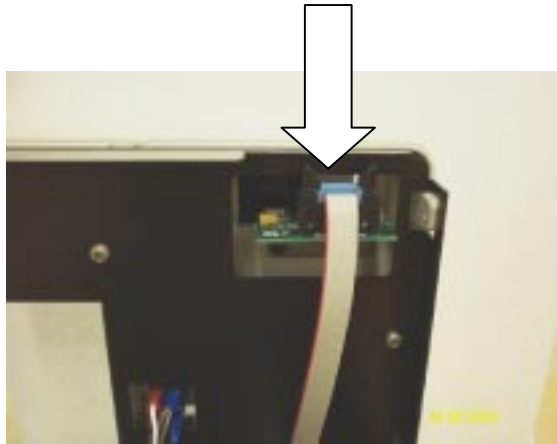


- Remove the two hexagonal head type screws which fasten the photodiode PWB. This will enable removal of the PWB.

**Note:** Whenever this PWB is replaced, you are required to perform a wavelength & 0%T calibration. Refer to the Diagnostics section for details.

### **4.9.3 LED – IrDA PWB**

- Remove the detector's main cover.
- The LED – IrDA PWB is located behind the front panel in the top left hand corner as you face the detector.
- Disconnect the ribbon cable to this PWB.



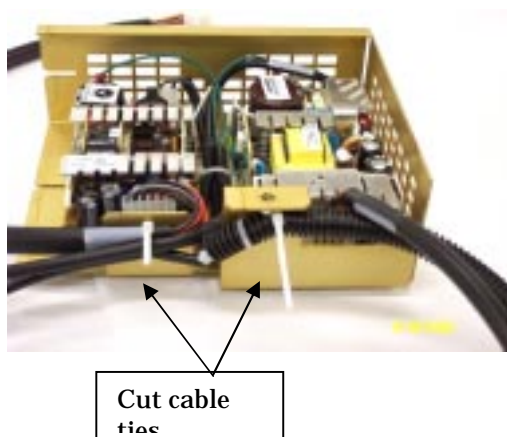
- Locate and remove the two screws holding the PWB and its mounting bracket. The PWB can now be removed.



### **4.9.4 Power Supplies**

- Remove the main detector cover.
- Remove the single screw holding down the power supply module.  
This is found on the outer edge of the detector adjacent to the power supply module.

- Disengage the safety cover and slide the power supply module toward the front of the detector (as described above in the Processor PWB removal procedure).
- Remove the plastic protective cover and cut all cable ties around the internal cables in the supply module as shown.
- Disconnect the two main cables from the supply.



#### 4.9.5 Fan replacement

- Remove the fan baffles as described above in the Processor PWB replacement procedure.
- Place the power supply module in the service position as described above.
- Disconnect plug P3 from the Processor PWB.
- Remove the four screws from the rear panel of the detector which secure the fan.

Note: For cooling purposes, it is important when replacing the fan that the orientation is correct. The air flow must enter the detector through the rear and flow through the fan baffles. There is an arrow marked on the fan which must point towards the front of the detector.

#### 4.9.6 Fuses

The ProStar325 contains two fuses which are located at the back of the instrument. To replace a fuse, disconnect the detector from the power supply, and replace the blown fuse with one of the type and rating as indicated in the Specifications section of this manual or on the silk screening adjacent to the fuses.

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

**Note:** Always check the information printed on the rear of the detector for the most up-to-date details regarding the fuse type.

To check a fuse -

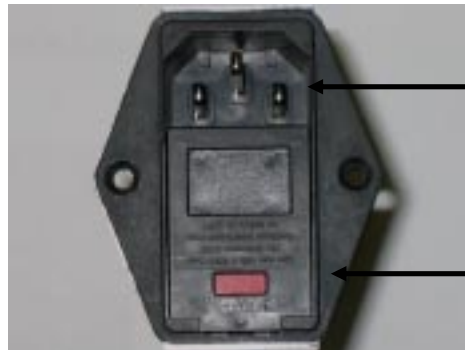
- 1/. Disconnect the detector from the mains power supply.
- 2/. On the mains input connector (rear panel), lift the fuse cap and pull out the fuse holder (lower red section).
- 3/. Both fuses are held in this red fuse holder.
- 4/. Check that the fuses are the correct type and are not damaged. If necessary, replace them.
- 5/. Place the fuses into the red fuse holder, push the holder back into the mains input connector and then lower the cap.
- 6/. Reconnect the instrument to the mains power supply.



## **WARNING: FIRE HAZARD**

**To avoid fire hazard replace fuses ONLY with fuses of the same rating and type. Always switch off the AC power and unplug the power cord before replacing a fuse.**

---



Mains  
input

Fuse  
compartment

To expose the fuse compartment, lift the cap using a small flat blade screwdriver.



Slide the fuse compartment out.



The two fuses are located on either side of the compartment.



## 5 Optics

---

### 5.1 Introduction

The photometric performance of any detector is largely determined by the quality of the monochromator. With UV-Vis detectors, the monochromator design is aimed at providing a desired wavelength resolution while maintaining high light throughput and low stray light.

The optics must;

- Efficiently couple light from the lamps to the mono
- Split the light into sample and reference beams without excessive light loss
- Focus these beams into the flowcell compartment
- Collect the light from the monochromator and direct it to the photodiode detectors.

The ProStar 325 optics is designed around a Cerzy-Turner style monochromator. This is a single-pass monochromator, using quartz over-coated optical components. The detector is capable of operating in the range from 175-900nm. Dual silicon photodiode detectors provide an output for measurement by the electronics system.

It is not possible to perform any optical alignment or replace any optical components within the ProStar 325. The optics module is designed to be replaced as a complete assembly.

### 5.2 Optics module

The optics module contains the UV and Vis source lamps, source optics, beam splitter, entrance & exit masks, monochromator and mirror assemblies that form the sample and reference beams. This module is located towards the front of the detector and can be easily removed and replaced if necessary as described later in this section.

#### 5.2.1 UV lamp assembly

The lamp assembly consists of the Deuterium lamp which is rigidly cemented onto its mounting bracket. This lamp assembly is pre-aligned in the factory. There are two securing thumbscrews on the bracket which also locate the assembly in its proper position. This ensures that the lamp is properly aligned when it is mounted to the optics module.

When lamp replacement is necessary, it is easily performed by the user as all lamps come pre-aligned, and no alignment



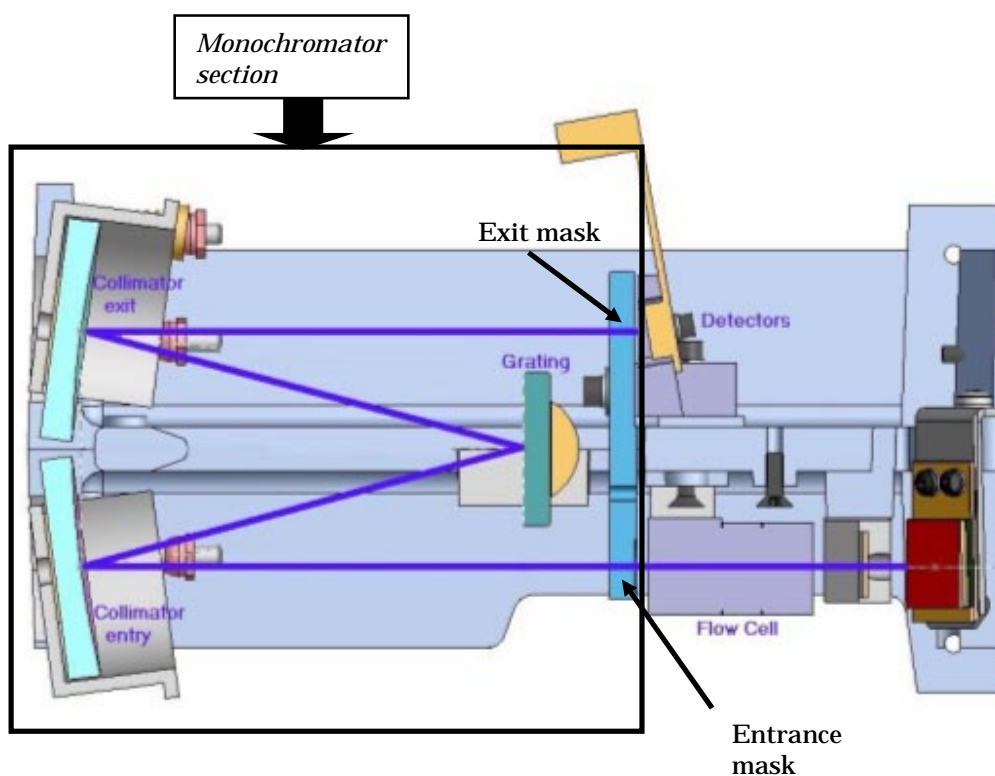
procedures are necessary. Removal and replacement procedures are described in this section of the manual.

### 5.2.2 Visible lamp assembly

When this option is fitted, the visible lamp mounts on top of the optics module and is held in place by two screw terminal connections. These are in a fixed position therefore allowing replacement of the lamp without the need for alignment. Removal and replacement procedures for this lamp are described in this section.

### 5.2.3 Monochromator

The monochromator is a sealed unit that supplies a single wavelength beam of light directed through the flowcell and conforms within 1nm to a specifically selected wavelength. The entrance mask produces a defined beam of polychromatic UV and visible light before it gets collimated by the first collimating mirror. The beam is then directed onto a holographic grating that disperses it into a continuous spectrum. A stepper motor provides direct drive with micro stepping to rotate the grating and obtain the desired wavelength. The beam is then directed onto the exit collimating mirror before passing through the exit mask and onto the detectors. The exit mask produces a very narrow bandwidth of light.



### **Top view of optics module**

#### **Grating details**

Grating size: 35mm x 30mm x 6mm

Blaze angle: 8.5°(UV)

Blaze wavelength: 250nm (UV-Vis)

Lines per mm: 1200 lines/mm (UV-Vis)

## **5.2.4 Optical path**

Light coming from either source lamp is passed through a focusing lens before hitting the beam splitter. The sample path consists of mirror N1 and the reference path consists of mirrors N2 & N3.

The two beams then 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 then hits the exit collimating mirror before leaving the monochromator through the exit mask. From here the beams are passed onto the dual photo-diode detectors.

#### **Exit and entrance masks**

The masks used throughout the optical system, determine the optical resolution of the detector. They have a nominal spectral bandwidth of 6nm.

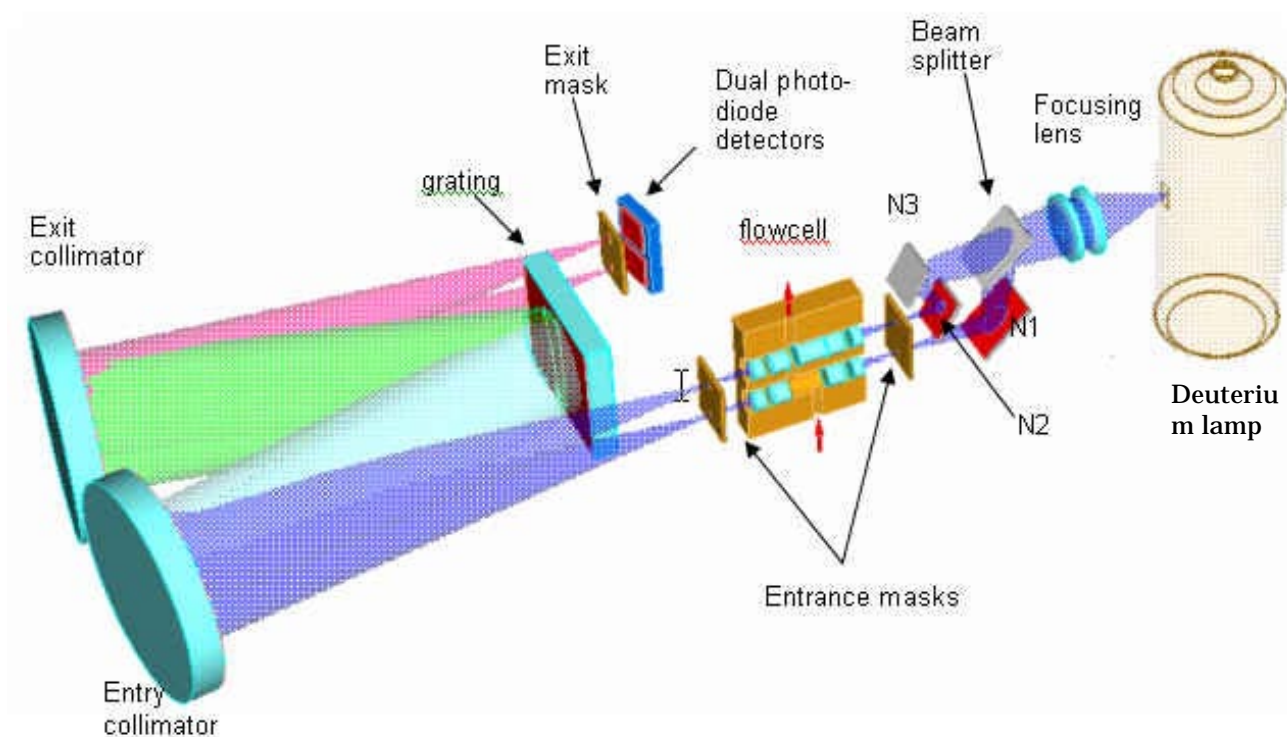
#### **Beam splitter**

The beam splitter is a silica plate which divides the beam into 50% sample light and 50% reference light.

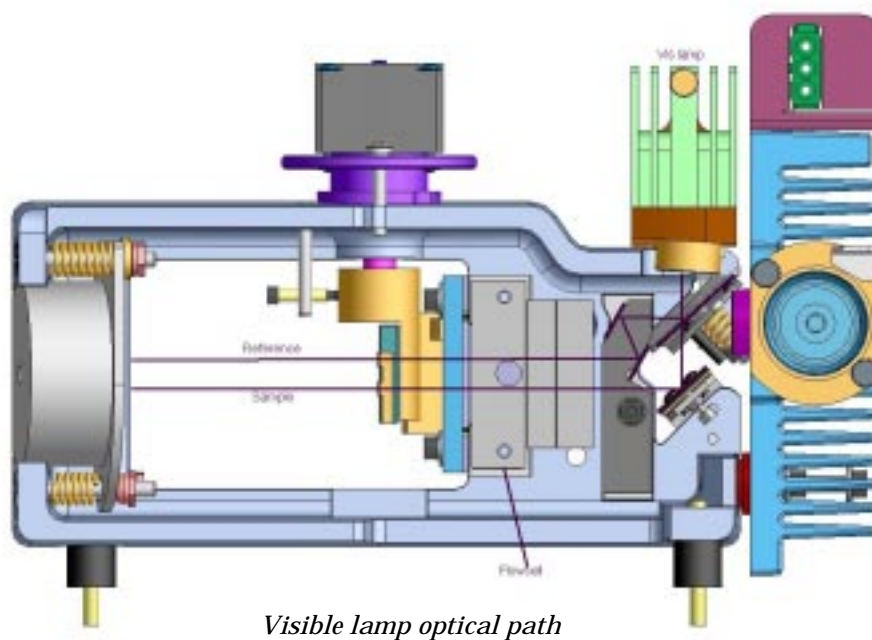
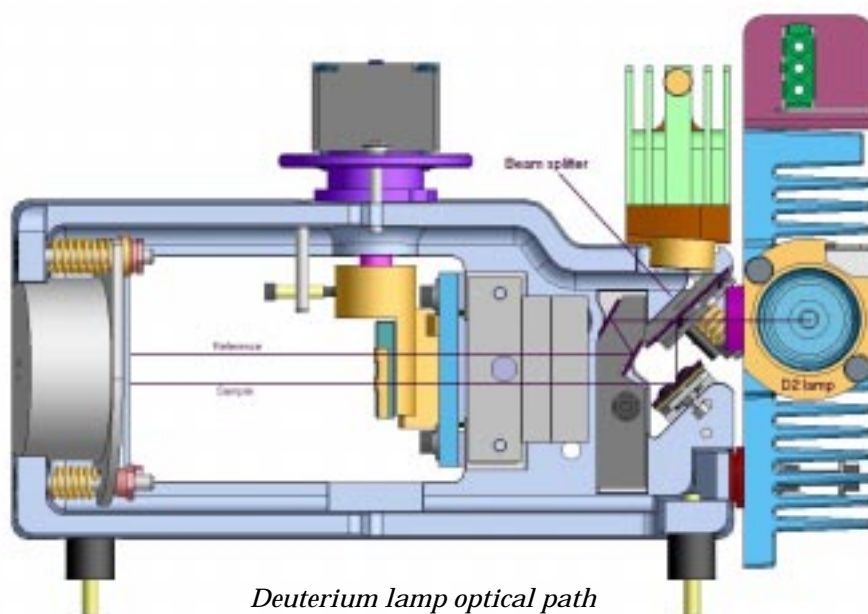
#### **Flowcell assembly**

The function of the flowcell is to direct light from the lamp sources through a sample/solvent flow path and then into the monochromator. Focusing is achieved by quartz optics lenses fitted to the flowcell. The body of the flowcell is made from titanium and has a working pressure range of approximately 1000psi.

The flowcell is designed for removal, installation and replacement by the user. Instructions for the removal and replacement are given in the Installation section of this manual.



*Optical ray trace diagram*



## 5.3 Removal and replacement procedures



---

**Warning**

Lamp surfaces and mounting brackets will become hot during operation and will remain hot for some time after being switched off. The temperatures are sufficient to cause burns.

The UV lamps operate at high voltage. Contact with this voltage can cause death, serious injury, or painful electric shock.

Before changing either the UV or Visible lamps, **always** <sup>N2</sup> switch the instrument off, remove the power supply cable and allow the lamps to cool.

---

---

Entry  
collimator

**Caution**

Care must also be taken when removing lamps. Touching the glass envelope of either the UV or Visible lamp will reduce its efficiency. Never touch the glass surfaces of new lamps. Always handle a lamp by its base, or use a tissue or cloth.

---

**Warning**

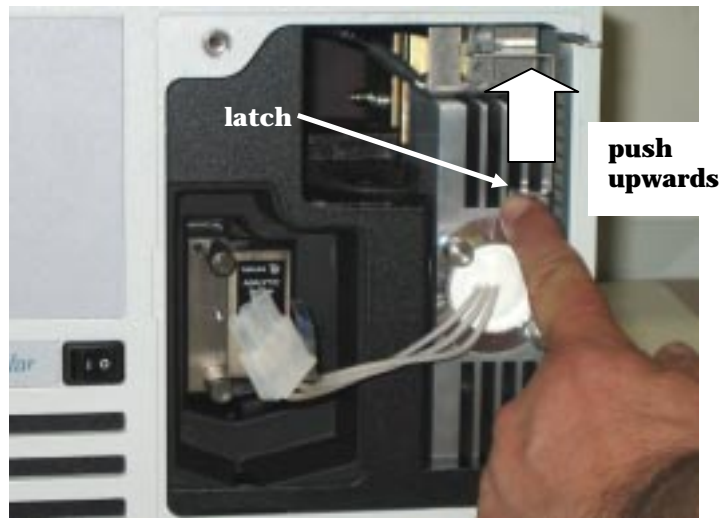
Hazardous UV radiation is emitted by the UV lamp. This radiation can cause serious damage to human eyes. Never operate a UV lamp outside of its correct position in the lamp turret

---

### 5.3.1 UV lamp source

**Removal**

- Remove the front green door which will then expose a flat panel.
- Remove this flat panel by loosening the holding screw on the top left hand corner. This will expose the UV lamp housing which is located on the right hand side of the opening.
- Disconnect the lamp from the 3-way connector.
- Locate the safety interlock latch and push it upwards as far as it goes.



- Loosen the two thumbscrews located at the front.



- Holding the lamp module by these thumbscrews, carefully pull out the assembly.



### **Replacement**

The replacement procedure is the opposite of the removal procedure.

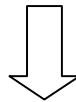
- Carefully place the lamp assembly into position
- Tighten the two thumbscrews
- Re-connect the three way connector
- Engage the safety latch by sliding it back down.

## **5.3.2 Vis lamp source**

### **Removal**

- Remove the front green door which will expose a flat panel.
- Remove this flat panel by loosening the holding screw on the top left hand corner.
- Locate the Vis lamp housing.
- Loosen the thumbscrew and carefully remove the housing.

thumbscrew





- Note that the Vis lamp does not come away with the housing.
- Using a cloth to handle the lamp, gently pull it forward until it comes away from its terminations.

#### **Replacement**

- Holding the replacement lamp with a cloth, slide the two pins on the Vis lamp into the connector terminals as far in as possible.
- Replace the lamp housing and tighten the thumbscrew.

**Note:** Once this is complete, check that the new Vis lamp is not causing any over range errors. Please refer to Diagnostics section, page 120.

---

**When handling the new lamp assembly, DO NOT TOUCH the lamp glass; oil from your fingers will permanently etch onto the lamp surface.**

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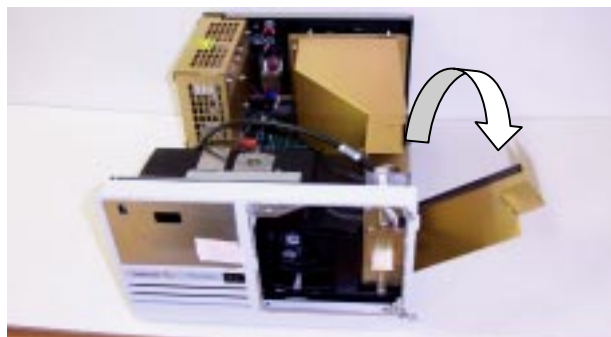
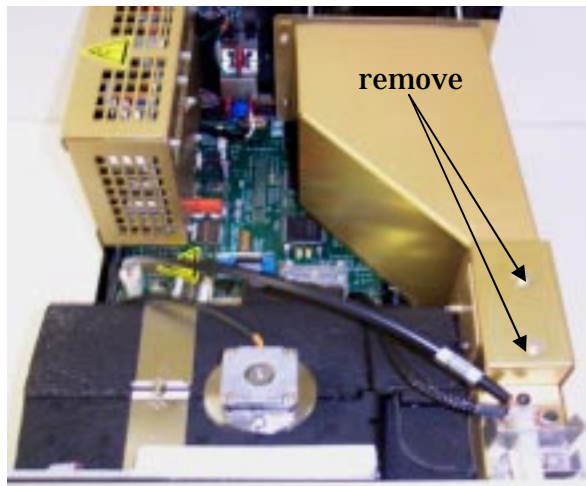
### 5.3.3 Optics module

It is not possible to perform any optical alignment or to replace any optical components within the ProStar 325. The optics module consists of the monochromator and all other optical components. It is designed to be replaced as a module.

**Note:** Whenever the optics module is replaced, you are required to perform a wavelength & 0%T calibration as detailed in the Diagnostics section.

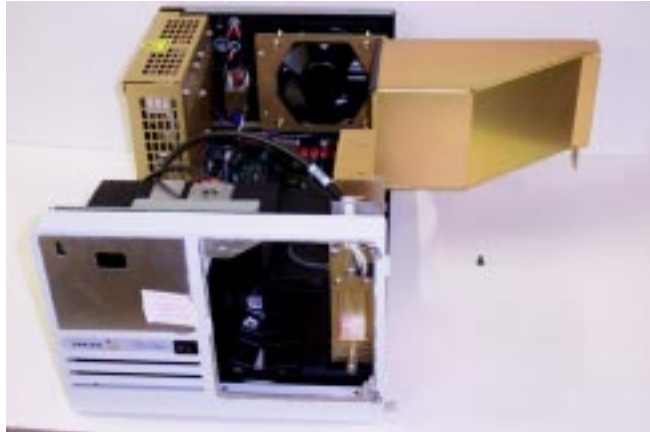
#### Removal

- Remove the detector's top main cover. It is held by two screws on each side.
- Slide the detector forward on a bench to enable access to three locating holes underneath. These are found towards the front of the detector. Using a 4mm nut driver, remove the three screws and washers found in these locating holes. These are holding the optics module to the main detector chassis. Once removed, slide the detector back fully onto the bench.
- With the detector sitting flat on a bench, remove the two screws securing the small side panel and lower it down.



- Locate and remove the two screws used to secure the fan baffle. These are at the rear of the detector near the fan. Swing the baffle to the right. (These steps are also

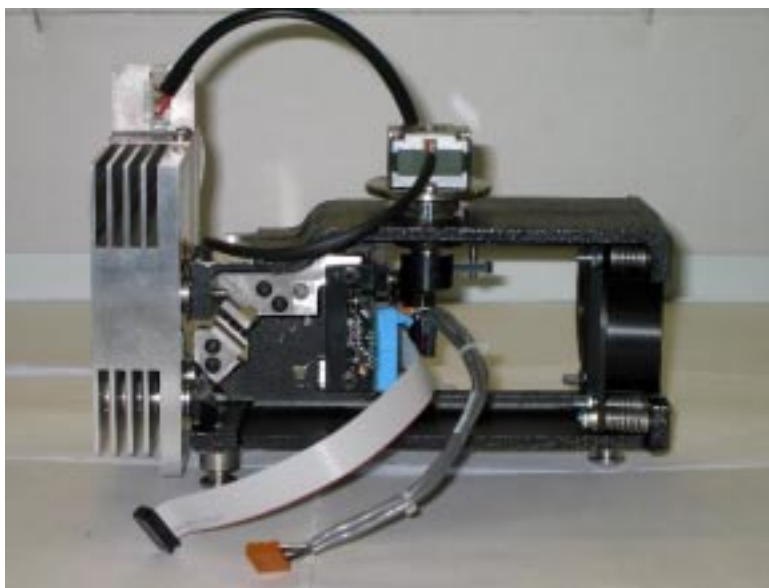
required for removing the Processor PWB).



- On the Processor PWB, disconnect P13, P17, P22 & P15.



- Carefully lift the optics module out of the detector and place safely on a flat bench.
- Remove the two screws on the large silver clamp that secures the black foam padding around the optics module.
- Take off all the padding pieces to expose the monochromator. This also enables access for replacing the Dual Photodiodes Detector PWB.



## 5.4 Installing Vis lamp option

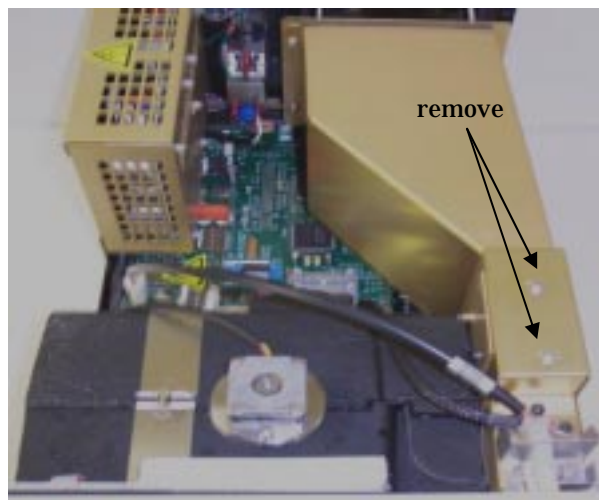
The Vis lamp upgrade kit (01-107439-00) will consist of the following parts;

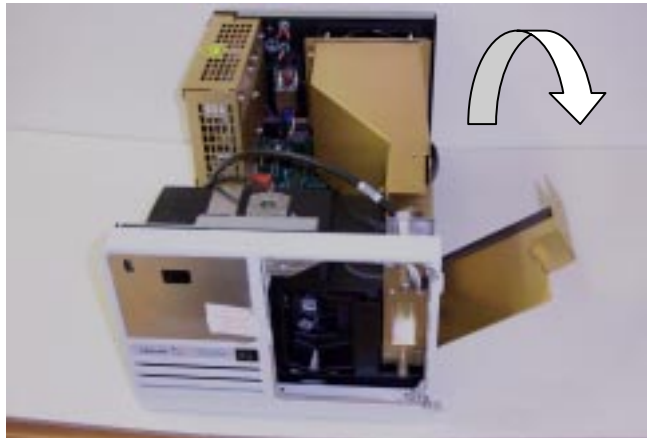
- Vis lamp and housing
- Panel cover
- 2 x spacers
- 2 x M4 hex cap screws
- 2 x spring washes
- 2 x washes



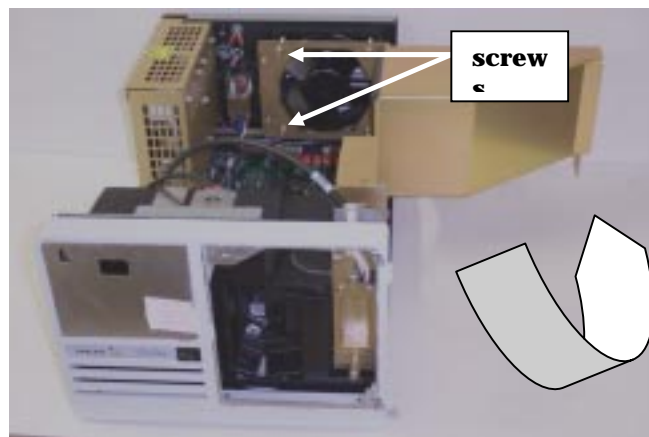
*Vis lamp upgrade kit*

- Remove the detector's top main cover, which is held by two screws on each side.
- Remove the two screws securing the small side panel and lower it down.





- Locate and remove the two screws at the rear of the detector used to secure the fan baffle. Then, swing the baffle to the right.



- Remove the two screws securing the small plate adjacent to the UV lamp source. These three items can be discarded.



- Remove the two padding pieces as shown below and fit the two spacers provided in the upgrade kit over the exposed screw holes.



- Fit the Vis lamp housing on top of the spacers and fit the two hex cap screws that come with the upgrade kit. Leave the screws

loose at this point to allow for optimization.



- Remove the Power Supply assembly to enable access to the connector sitting underneath (P16). This is on the Control PWB and it is where the Vis lamp plugs into. Connect the Vis lamp and return the Power Supply assembly to its original position.

Connect Vis  
lamp to P16



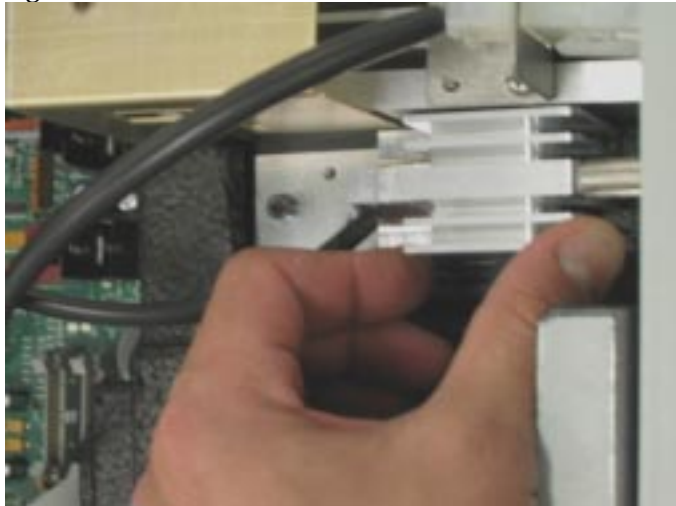
**Note:** Whenever the Vis lamp option is installed, you are required to perform a 0%T calibration as described in the Diagnostics section. Do this after you have optimized the Vis lamp as described below.

#### **5.4.1 Optimizing Vis lamp**

To optimize the light throughput of the Vis lamp, you will need to connect the ProStar325 detector to a local PC, establish communication, and open the Diagnostics software. Then, switch the detector on and allow it to initialize.



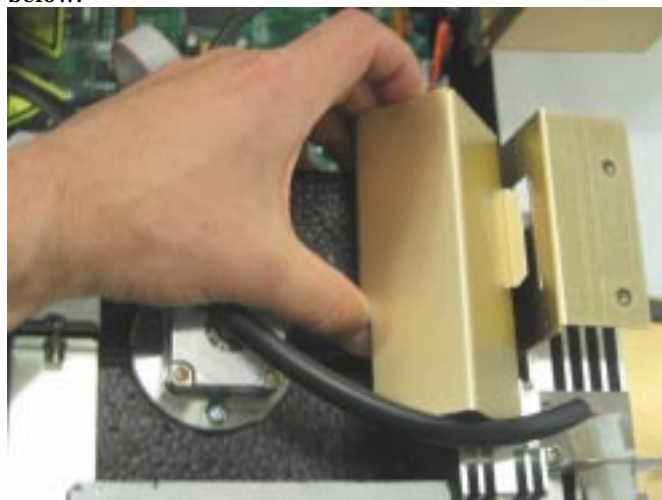
- Once communications has been established, check that the Vis lamp option is recognized. Check that the Instrument status on the Detector page of the diagnostics software displays “Vis On”.
  - Enter the Method tab and set the following parameters;  
Signal Mode: ADC counts  
Add Line: Time 20min  
OK  
Tick End of Method Line and set Method End Action to “Reset”
  - Select Download Method and wait for the Start button to become active.
  - Press Start
  - Enter the Main page to view the signal trace on the screen.
- 
- Move the Vis lamp housing with your fingers to increase the signal level on the screen.



- When the maximum level has been achieved, tighten the two screws evenly. The signal level may go down slightly when you do this. Try to minimize the loss.
- When optimization is complete, replace only one of the two padding pieces that was previously removed. Discard the other piece.



- Fit the new panel cover that comes with the upgrade kit as shown below.



- Replace and secure all other panels.



**Note:** Once this is complete, check that the new Vis lamp is not causing any over range errors. Please refer to Diagnostics section, page 120.

## 5.5 Performance test

Execute the instrument performance (install) tests to check that the instrument meets specification

1. Switch on the PC and load the **Verify software**
2. Click on the **Tests** tab.
3. Click **Start** to begin the tests.  
The software will start the instrument performance tests required to verify the instrument meets specifications.

The following tests are automatically enabled:

- Noise test
- Wavelength Accuracy (D<sub>2</sub> emission only),
- Wavelength Reproducibility,
- SBW Accuracy
- Auto Precision
- Detector Linearity
- Refractive Index
- Cell Length Ratio

## 6 Spare parts

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### Location of major assemblies

This section contains ordering information for spare parts. Part numbers are detailed in a list of spares provided for individual modules.

#### 6.1 Covers

Part Number	Description
01 107220 00	ASSY PANEL DOOR
09 101922 00	COVER LC DETECTOR BASE
01 107218 00	ASSY CASTING LC DETECTOR FRONT
01 107288 00	ASSY DOOR
09 102066 00	CAP DOOR ASSY
01 107146 00	ASSY FLOWCELL SURROUND

#### 6.2 Electronic spare parts

##### PWB's

Part Number	Description
02 101797 90	ASSY PWB FRONT PANEL LED/IrDA
02 101759 90	ASSY PWB INSTRUMENT PROCESSOR
02 101842 90	ASSY PWB DUAL PHOTODIODE PRE-AMP
02 101865 90	ASSY PWB 325 REAR PANEL INTERFACE
02 101875 90	ASSY PWB 325 RELAY INTERFACE

##### LOOMS

Part Number	Description
01 107159 00	ASSY LOOM IrDA DISPLAY

01 107155 00	ASSY LOOM VIS LAMP
01 107156 00	ASSY LOOM LAMP INTERCONNECT
01 107152 00	ASSY LOOM PRE-AMP CONTROL
01 107153 00	ASSY RIBBON PRE-AMP CONTROL
01 107157 00	ASSY LOOM POWER SUPPLY
01 107158 00	ASSY LOOM MAINS

**ASSEMBLIES**

Part Number	Description
01 107198 90	ASSY GRATING MOTOR & SHAFT
79 100447 00	ASSY POWER SUPPLY +5V, +/-12V
79 100448 00	ASSY POWER SUPPLY +24V
01 107192 90	ASSY FAN
48 100359 00	SWITCH MAINS
12 101313 90	ASSY CORCOM MAINS FILTER

## 6.3 Optical spares parts

**ASSEMBLIES**

Part Number	Description
01 107203 90	ASSY OPTICS COMPLETE LC DETECTOR

**LAMPS**

Part Number	Description
01 107154 00	ASSY D2 LAMP MODULE PRE-ALIGNED
56 101365 00	LAMP MINIATURE QUARTZ HALOGEN

**FLOWCELLS**

Part Number	Description
02 101818 00	FLOWCELL 9x0 ANALYTICAL
02 101819 00	FLOWCELL 9x1 PREP
02 101820 00	FLOWCELL 4x0.15 SUPER PREP

02 101821 00	FLOWCELL 4x0 SEMI MICRO
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## 6.4 Upgrade kits

Part Number	Description
01 107439 00	ASSY VIS LAMP FIELD UPGRADE KIT
01 107231 00	PROSTAR 325 DUAL WAVELENGTH

## 6.5 System cables

Part Number	Description
01 107234 00	ETHERNET CROSSOVER (LC to PC)
01 107233 00	ETHERNET CABLE (network configuration)

## 6.6 Miscellaneous

Part Number	Description
01 107433 00	ASSY BACK PRESSURE REGULATOR
16 101265 00	FITTING 1/8 TUBE NUT/FERRULE FLAT BOTTOM (Pack of 10)
16 101269 00	FITTING 1/8 TUBE NUT FLAT BOTTOM (each)
16 101264 00	FITTING 1/8 TUBE FERRULE (Pack of 10)
85 102015 00	PROSTAR 325 SOFTWARE CD
85 102016 00	PROSTAR 325 OPERATORS MANUAL



# 7

## Diagnostics

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### 7.1 Introduction

Fault finding on the ProStar 325 detector is made simple by several levels of diagnostic aids that are available to help diagnose problems. This allows a CSR (Customer Service Representative) to fault find the system to board level then verify system operation from the host computer. Printed Wiring Board (PWB) exchange is the recommended method of repair because of the extensive use of surface mount devices on multi-layer boards. The types of diagnostic tools available include;

- Power on self-test (POST) routines which are executed automatically when the instrument is switched on or reset
- LED status indicators on the main PWB
- Tests executed by firmware in conjunction with a 15-position thumbwheel selector switch on the main PWB
- A service diagnostics program (Diagnostics.exe)

### 7.2 Power On Self Test (POST)

Diagnostics switch position 0

These are performed when the detector is switched on during normal operation. Position 0 is reserved for normal operation. This allows for the normal start-up sequence (executed from the boot block) to take place. Some tests include those used in the thumbwheel switch selector diagnostic tests described (below).

Tests include:

\*FLASH MEMORY CRC/ CHECKSUM BOOT BLOCK

Display a '11' on the LEDs or flash '11' if error.

\*RAM test

Display a '22' on the LEDs or flash '22' if error.

\*FLASH MEMORY test.

Display a '33' on the LEDs if the flash doesn't respond or wrong flash type

\*ETHERNET CONTROLLER

If the Ethernet controller doesn't respond or flash '55'.

### 7.3 Power up sequence

Initializes all ports, interrupts, PCI bus

Test on-board SDRAM

Self check CRC of boot block  
 Check CRC of FLASH main code  
 Obtain IP address for detector

## 7.4 LED status indicators

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

Led	Status	Color
Power	Initializing	Yellow flashing
	Power On	Green
Lamp	Lamp On	Green
	Fault	Red
Ready/Run	Not Ready	Off
	Ready/Stopped	Green
	Method Running	Yellow flashing

## 7.5 PWB selector switch tests

Diagnostics switch position 1:

### **\*FLASH MEMORY CRC/ CHECKSUM BOOT BLOCK test**

The instrument continuously tests the boot block program. A '10' will be displayed on the seven-segment LED's if every test has succeeded, and a '11' will be displayed continuously if any test has failed, although testing will continue.

Note that this Flash Memory test would be done immediately after a reset.

Diagnostics switch position 2:

### **\* RAM test**

The instrument continuously tests all SDRAM on the main board. A '20' will be displayed on the seven-segment LED if every test has succeeded, and a '22' will be displayed continuously if any test has failed, although testing should continue.

Note that this RAM test would be done immediately after a reset.

Diagnostics switch position 3:

### **\*ADC/ DAC test**

This allows continuous testing of the main ADC, as well as the analog output drive.

Diagnostics switch position 4:

### **\* ACCESSORY output test**



All of the accessory (synchronisation and relay) outputs shall be toggled with a two second test period. These include relays 1-4, the peak-sense relay, as well as the Fault Out, Ready Out and Start Out signals. A '40' will be displayed on the seven-segment LED's

Diagnostics switch position 5:

**\* Not used at present**

Diagnostics switch position 6:

**\* Monochromator motor test**

Initialise stepper motor and set monochromators to somewhere near their theoretical zero-order position. Then continuously cycle at full speed in 20 degree (5600 microstep) movements back and forth of this position, with a 1 second interval between directional changes. Display '66' on the seven-segment LED's while the motor is resetting, then '60' while it is being cycled.

Diagnostics switch position 7:

**\* Deuterium lamp test**

Enable the lamp filament and display '76' on the seven-segment LED's up to and including the warm-up period. Then switch on the lamp and display '70' while it is operating.

Diagnostics switch position 8:

**\* QI (VIS) lamp test**

If fitted (i.e. #VIS\_FITTED detected), the visible lamp will be enabled. If not fitted, the test shall do nothing. Display a '86' on the seven-segment LED's prior to lamp being enabled, then '80' while it is running.

Diagnostics switch position 9:

**\* Not used at present**

Diagnostics switch position 10:

**\*EEPROM parameter erase**

The instrument will completely erase the EEPROM used to store calibration constants, serial numbers, and other such parameters. Note that this switch position will NOT erase any programs stored in the flash memory. A '06' is displayed on the seven-segment LED's while erasure is taking place. A '00' will be displayed if the erasure was successful, or a '02' if some error occurred.

Note that this EEPROM test would be done immediately after a reset.

Diagnostics switch position 11:

**\*FLASH MEMORY test**

The instrument continuously tests (CRC/ checksum read/write) the main program area in flash memory. A '00' shall be displayed on the seven-segment LED's if every test has succeeded, and a '01' will be displayed continuously if any test has failed, although testing will continue.

Note that this Flash Memory test would be done immediately after a reset.

## 7.6 Diagnostics CD

### 7.6.1 Introduction

To run the service diagnostics program for the ProStar 325 detector, you will need to insert the Verify CD into a computer CD ROM drive and connect the pc to the detector via the Ethernet connection.

From the Windows task bar select Start>Run>Browse. On the CD find the file Service/Diagnostics/Diagnostics.exe. This will execute the LCDiagnostics Application which you can use to verify all working aspects of the detector. To run the program from the local pc, you must save all the files associated with the diagnostics program to the same directory.



### 7.6.2 Functions of Diagnostic.exe

Diagnostics.exe is a standalone application that is run directly off the CD.

The program can be used to;

- verify lamp operation
- verify Ethernet/IrDA communications
- configure TCP/IP addresses
- check grating drive operation
- verify all relay operations
- check operation of signal processing
- monitor voltage supplies
- check all external connections
- build methods and download into the detector
- upload the internal method from the detector

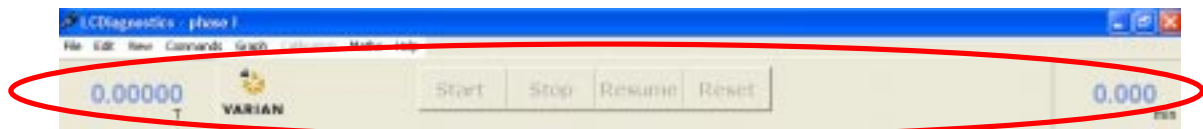
You can also enter important information into the EEPROM such as;

- detector installation date
- lamp installation date
- lamp serial number
- detector serial number
- customer details

### 7.6.3 Menu task bars

The top menu bar allows for;

- file management tasks
- editing options
- graph & trace options
- mathematics calculations
- execution of system commands
- Help files



The second menu bar is common to all pages. The extreme corners display the X&Y co-ordinates and the four command buttons control the detector.

There are four pages used for various functions;

- Main
- Detector
- Method
- Diagnostics

Each one can be selected by clicking on its respective tab.





Just below this is the graph menu bar. It allows for;

- auto scaling axis
- trace zooming
- cursor options
- report generation
- graph options
- mathematics functions

#### 7.6.4 Status bar

The status bar will always appear at the bottom of the screen. It indicates the status of;

- detector
- lamps
- Ethernet connection

Various colors indicate different status levels. These are detailed in the “Detector Status” description section of this manual.



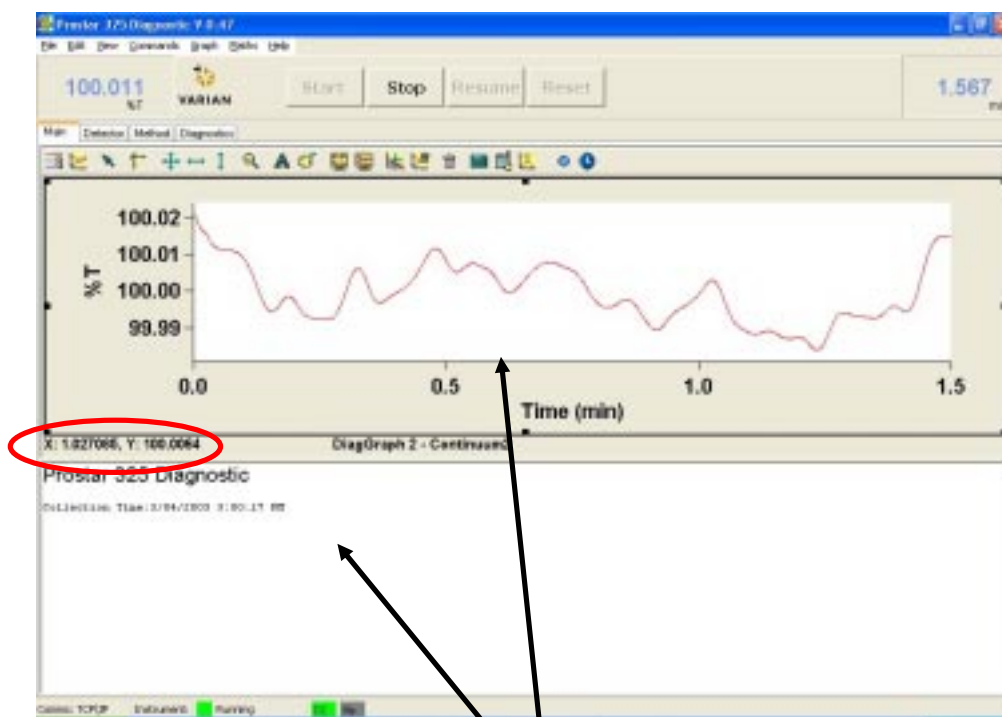
### 7.7 Main Display

The “Main” page is used to view spectrum traces collected during troubleshooting and detector performance verification.

X&Y axis co-ordinates are chosen in the “Method” page.

The trace window can be expanded to any size by dragging out its edges. Double clicking in the trace window will also toggle the size of the window, making it possible to view report information such as method parameters as well as the spectrum trace on the one page.

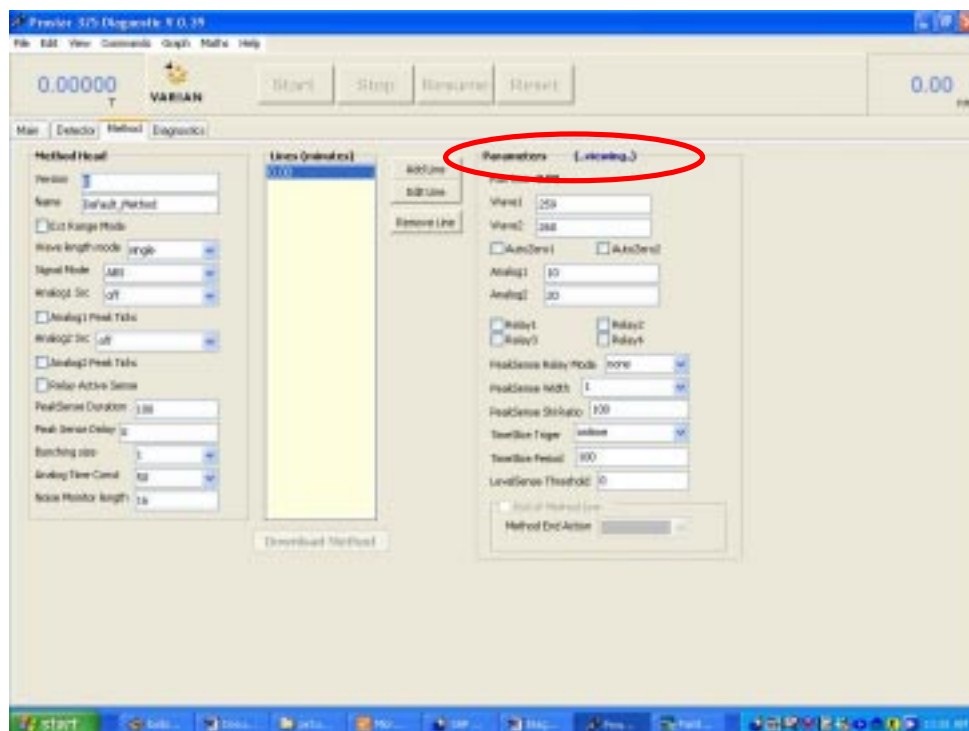
When moving the cursor across the spectrum, the X&Y co-ordinates will be shown in the bottom left corner of the trace window.



Double clicking in either of these two windows will expand it to full screen viewing.

## 7.8 Method Development

This Method Editor page is used for building methods. There are two modes of operation possible on this page. Editing & Viewing. The active mode is shown at the top of the parameters box.



### 7.8.1 Building a method

A method consists of a sequence of timed event command lines each one having been assigned a unique set of detector parameters. They can be run for a defined period of time and are totally independent of each other.

Each command line appears in the Lines column and is specified in minutes.

Lines (minutes)
0.00
2.00
5.00
-15.00-
-25.00-

There is a basic default method stored in each detector with a single command line beginning at time 0.00.

This line cannot be modified nor deleted.

To add a line to a method, select the Add Line button. You will now activate the Editing mode function and the top of the parameter's window will indicate this accordingly.

This will enable all entry fields in the Parameters & Method Head columns to be programmed.

A maximum of 50 lines per method may be added.

Dual wavelength selection will only be permitted if the detector is configured with the dual wavelength option.

Parameters (..editing..)

RunTime 2.00

Wave1 259

Wave2 289

OK

Cancel

### End of Method

Any command line can be assigned an End of Method instruction. This is done while in editing mode and is evoked by selecting the “End of Method Line” tick box. Then, choose a desired action from the two options given in the “Method End Action” dropdown menu. Hold or Reset.

It is possible to assign multiple command lines an End of Method instruction. However, each method must consist of at least one. They will appear in the format “-25.00-“. If no command line in the method has an End of Method instruction assigned to it, a dialog pop up box will appear on the computer screen prompting for one to be assigned when the “Download Method “ button is pressed..

When finished selecting parameters click OK.

Lines (minutes)

0.00

2.00

5.00

-15.00-

-25.00-

End of Method Line

Method End Action: hold, reset, hold

## 7.8.2 Modifying a method

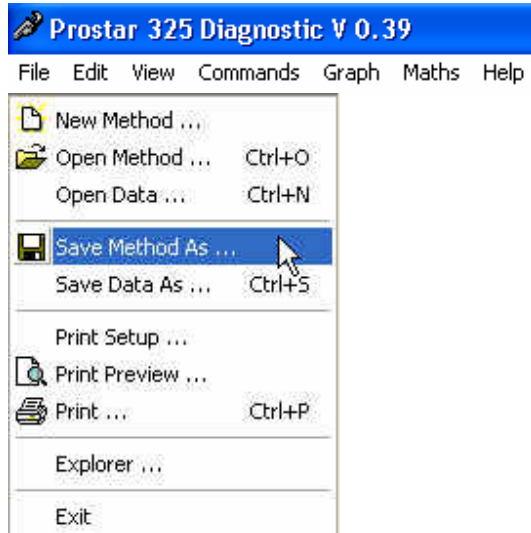
To edit an existing method, highlight the desired command line and click on the Edit Line button. This will bring you into Editing mode and allow all the entry fields to be programmed as above. To delete a command line, highlight the desired line by clicking on it and then choose Remove Line.

## 7.8.3 Downloading a method

A method may be loaded into the detector by clicking the Download Method button. This will then allow that method to be executed using the Start/Stop/Resume/Reset buttons. This can only be done when in Viewing mode.

### 7.8.4 Saving a method

A method can be saved using the top menu bar by clicking on File>Save Methods As...". From here you can allocate a method file name and store it in the desired location.

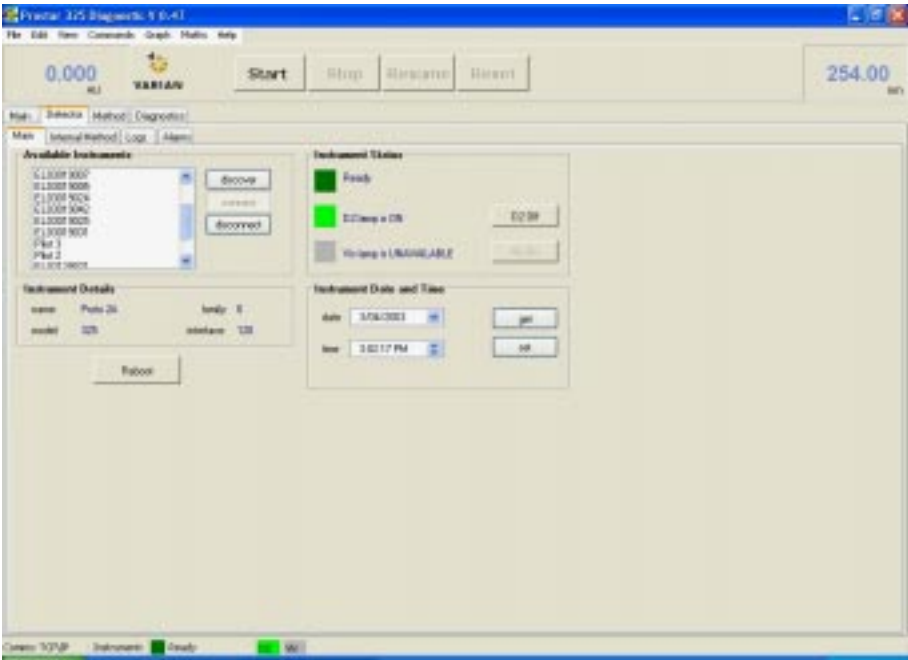


### 7.9 Detector Status

Entering this page will display a further four sub-pages located within.



7.9.1 Main



**Available Instruments** – “discover” button searches the Ethernet network (if the detector is configured into one) and displays all the detectors located on that network. You can then connect or disconnect to any detector configured on the network. Use the “connect” and “disconnect” buttons to perform these functions.

**Instrument Details** – details such as name and model of the connected detector will be displayed here.

**Instrument Status** – this will display the current status of the connected detector and indicate the state of the source lamps. These are individually color coded and each color is defined below.

Instrument Status	Color
Not ready	Red
Ready	Green
Running	Lime green
Offline	Black

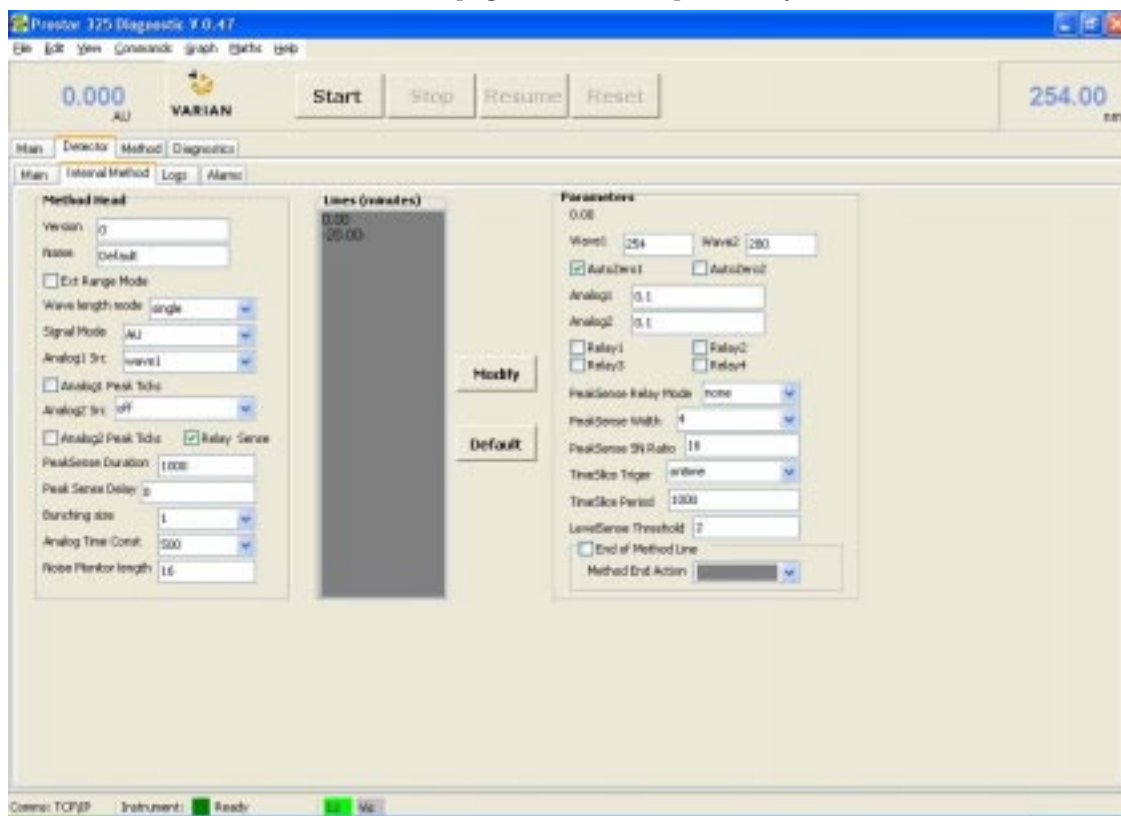
Lamp Status	Color
Lamp off	Grey
D2 lamp is warming	Yellow
D2 lamp is on	Green
No Vis option	Light grey

**Instrument Date and Time** – displays the time and date as held by the detector's internal clock.

## 7.9.2 Internal Method

The detector comes pre-loaded with a default method which performs a single beam absorbance scan at 254nm for single wavelength configurations. For detectors with the dual wavelength configuration, a second wavelength at 280nm will also be used.

This page will display the default parameters used in this method. It is not possible to modify it from this page. If you wish to modify, click on the Modify button which will then put you in editing mode and allow you to change the parameters in the “Method” page as described previously.



## 7.9.3 Logs

These logs give an account of detector performed functions & reported errors. This can be a useful tool when troubleshooting. To view a log, click on the desired “get log” button.

The information will be displayed in the following format;

Date/Time/Function/Code number

**Run Log**

This will display an account of all functions performed by the detector.

**Error Log**

This will display an ongoing account of all errors encountered by the detector.

These error logs can be saved in a text format by clicking on “save error log”.

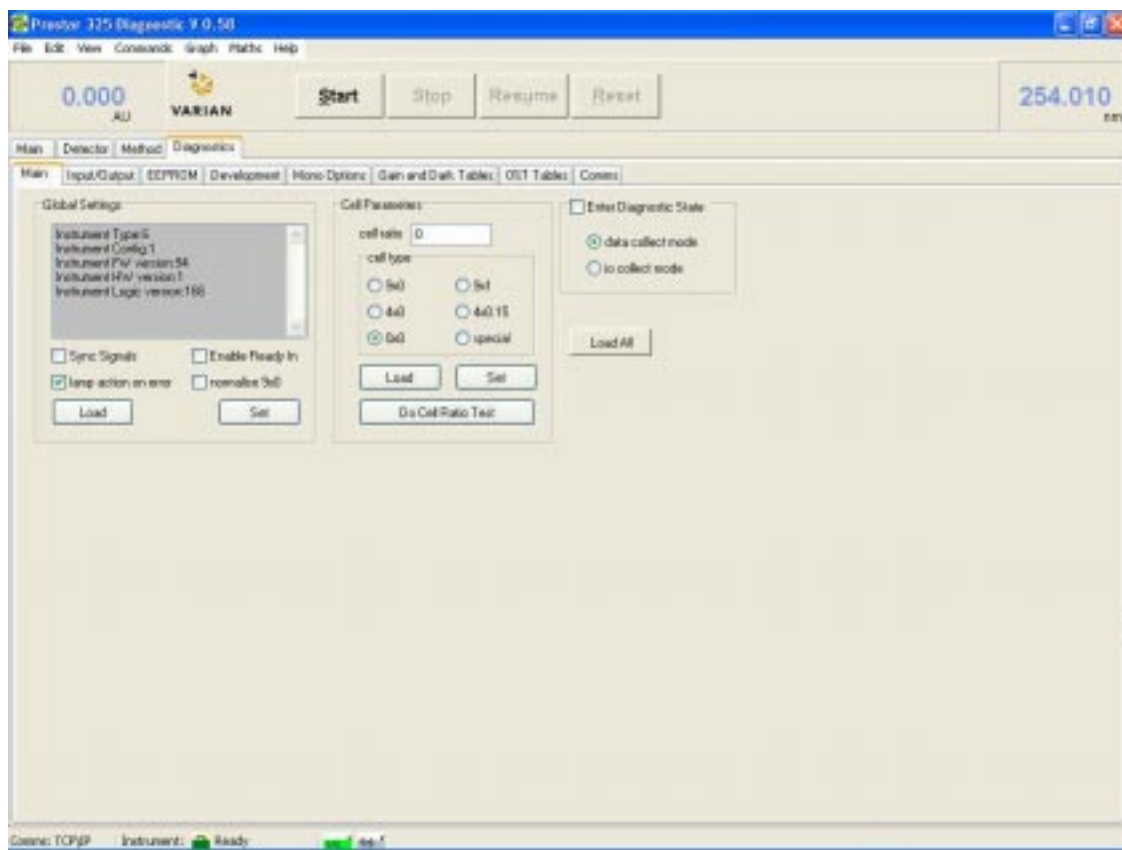
### 7.9.4 Alarms

The alarms page allows you to program either source lamp to switch on and off at specified times. This is useful in turning the lamps on prior to using the detector and allowing them adequate time to warm up and stabilize. It uses the internal clock of the detector as its reference.

## 7.10 Diagnostic Functions

Entering this Diagnostics page will display a further eight sub-pages located within.

- Main
- Input/Output
- EEPROM
- Development
- Mono Options
- Gain and Dark Tables
- 0%T Tables
- Comms



### 7.10.1 Input/Output

To activate this page you must be in Diagnostic State.

Go to 'Diagnostic' > 'Main' and select 'i/o collect mode'. Then tick 'Enter Diagnostic State'.

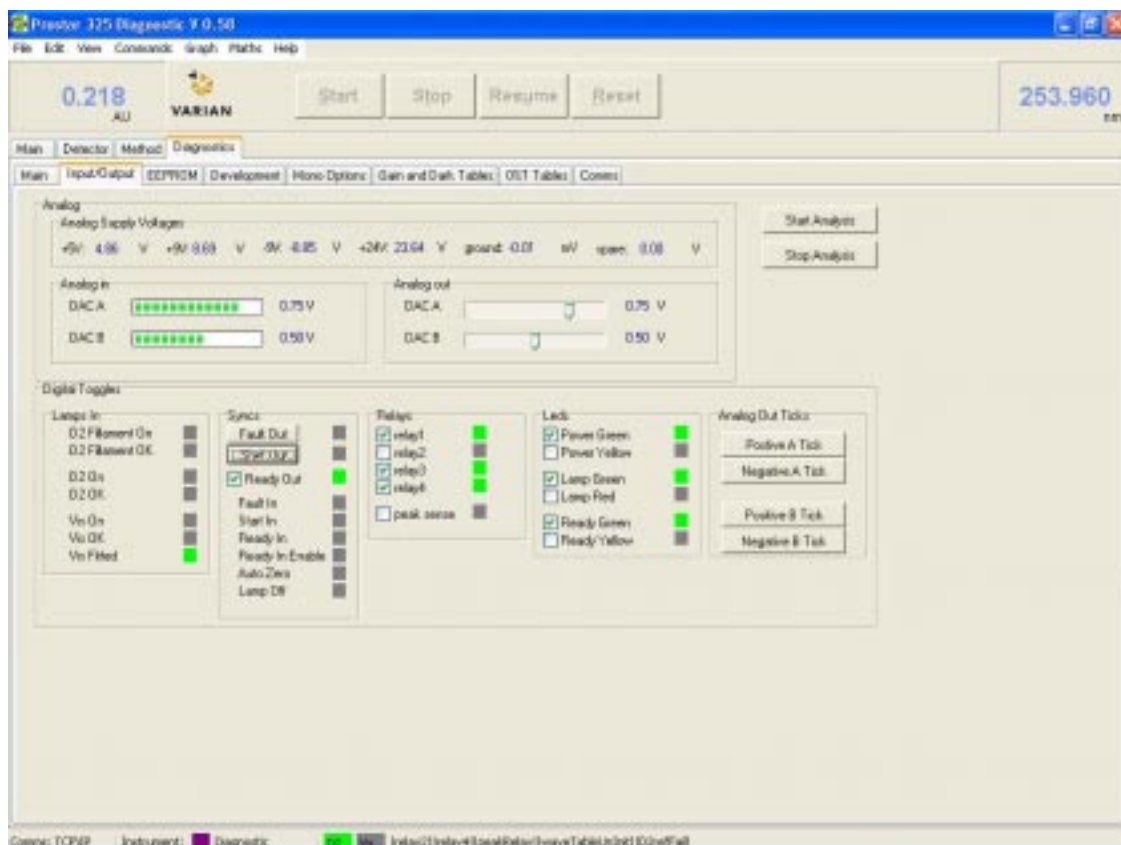
Note: you must first select i/o collect mode before entering into the diagnostic state or else this page does not become active.

**Analog Supply Voltages** - Used to view power supply voltage levels coming from the two rear power supplies PS1 & PS2. These measurements are performed by the ADC circuits on the main Processor PWB.

**Analog In** - Verify the Analog input and output circuits (DACA & DACB) by setting the sliders on the two Analog Out controls to any value and then have this voltage measured and displayed in the corresponding Analog In (DACA & DACB) fields. This can be used to verify chart recorder and external integrator connections.

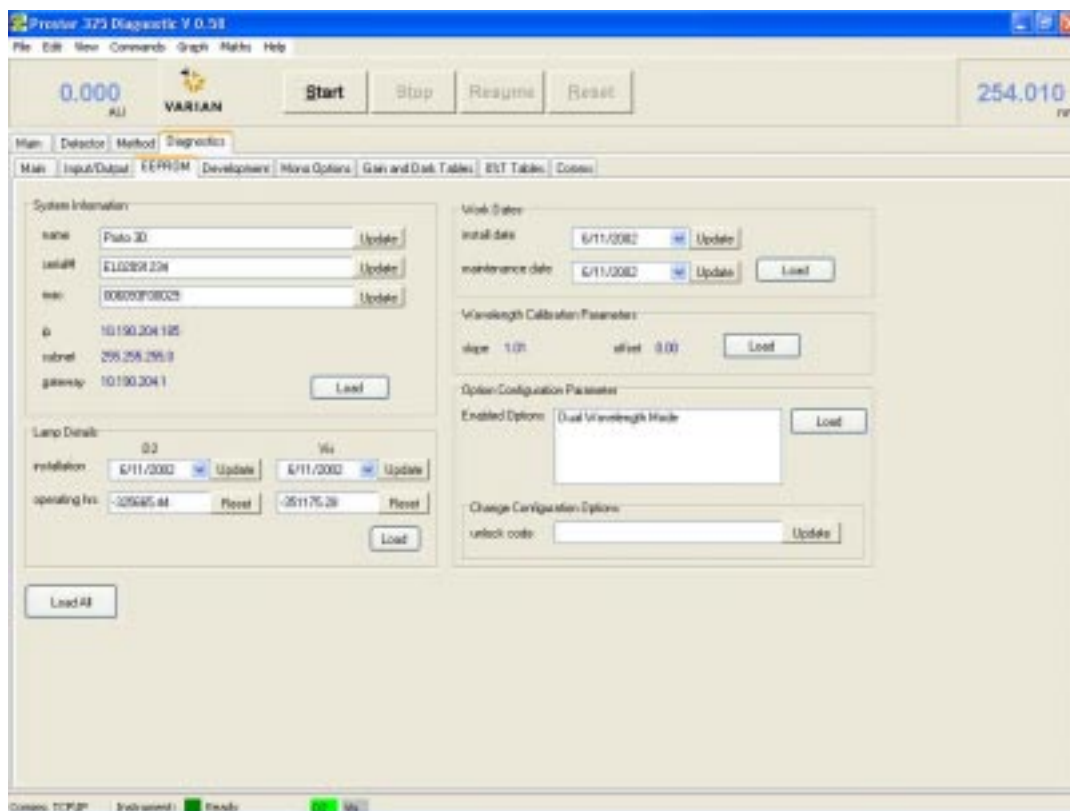
To activate these Analog tests you must click on Start Analysis.

**Digital Toggles** - Verify the operation of the Sync signals located at the rear of the detector. Toggle any signal by clicking in its tick box and then monitor it at the output either on the D-range connector pin, or on the Rear Panel Interface PWB if fitted. The five detector relays can be individually toggled to verify their operation as well as checking the bi-color status of each of the three front panel LED's.



### 7.10.2 EEPROM

Use this page to view and reset the information contents of the EEPROM. From here you can reset the dates and operating hours whenever installing a new lamp source, as well as the installation and maintenance dates for the detector.

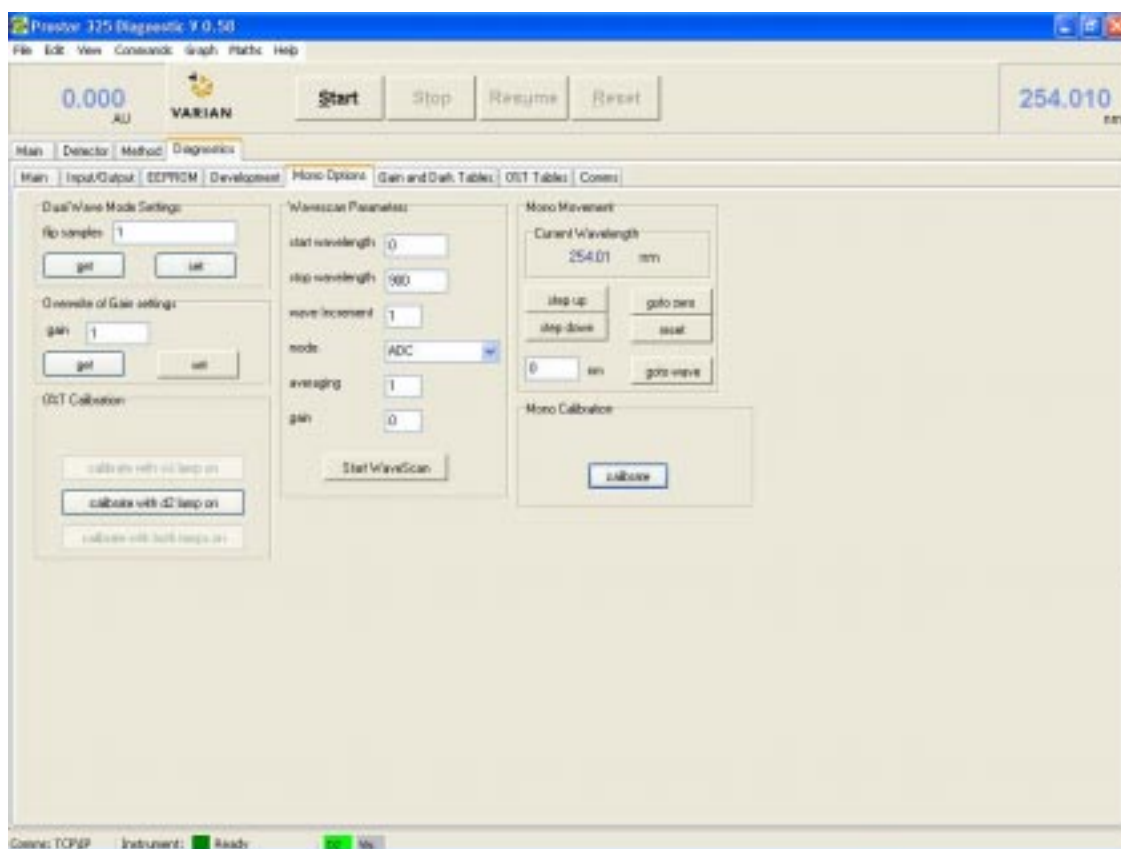


Clicking on “Load” will display the current EEPROM information for the detector you are connected to. This can be done individually in a specific group of information, such as Lamp Details, or you can click “Load All” to display the entire contents. To make an entry into the EEPROM, enter in the desired information into the appropriate field and click on “Update”.

**Wavelength Calibration Parameters – (slope)** this is a correction factor that is mathematically applied to help maintain wavelength accuracy of the optics. It eliminates any inaccuracies in wavelengths caused by mechanical errors such as grating squareness. The D2 emission line at 656.1nm is a strong signal and is well characterized. It is widely used in UV-Vis spectroscopy as an accurate wavelength marker. The detector performs a search for this emission line, and then does a search for 0nm. A correction factor is then applied between these two points. This will ensure that these two points are accurately identified and ‘placed’ in their correct spectral position. All wavelengths can therefore be deemed as accurate. A typical slope value would be around 1.01.

**Configuration Options** - Updating detector models to dual a wavelength option is performed on this page. You will require the code supplied when purchasing the appropriate upgrade kit to complete this task.

### 7.10.3 Mono Options



**0%T Calibration** – this calibration is required whenever a lamp source or optics module is replaced. Refer to the Calibration section below.

**Mono Calibration** - recalibrate the monochromator's wavelengths which will load new co-efficients into the EEPROM. Refer to the Calibration section below.

**Wavescan Parameters** – enter parameters here to perform wavelength scans. A typical scan of the D2 lines can be set up to verify performance of the detector.

**Mono Movement** - drives the monochromator grating motor to verify its operation. You can slew the motor to a specific wavelength and also check the bi-polar micro-stepping function. Clicking “goto zero” will drive the grating to 0nm and will present the source light image into the flowcell compartment.

### ***Performing a Deuterium lamp emission line scan***

Set up the following parameters to perform a scan of D2 emission line at 656.1nm to verify that the detector's D2 lamp, signal processing and optics are in working order.

Start wavelength = 640

Stop wavelength = 670

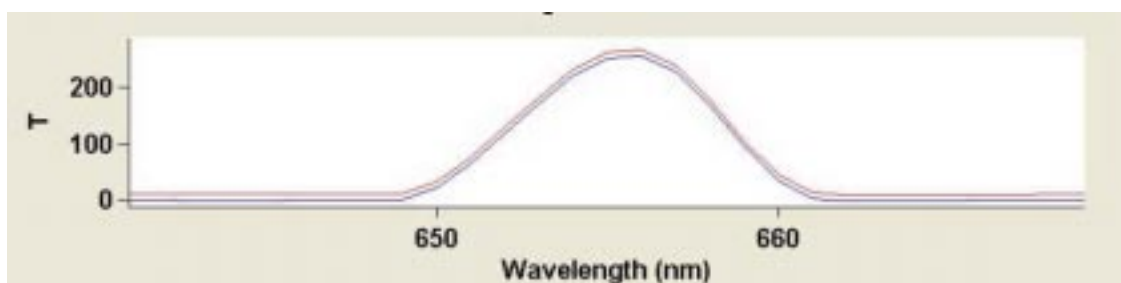
Wave increment = 1

Mode = T

Averaging = 1

Gain = 10

Click "Start Wavescan" and the detector will produce the following trace.



### ***Vis lamp emission over range***

There are circumstances where a newly installed Vis lamp can cause the detector to over range at around 730nm. This can occur with high throughput detectors using a brighter than normal Vis lamp.

If you experience this over range after a new Vis lamp has been fitted, then it is suggested to move the lamp from its current position by moving it either sideways, or in & out of its mount. This problem will only be highlighted when scanning in single beam mode and can easily be identified by performing the following;

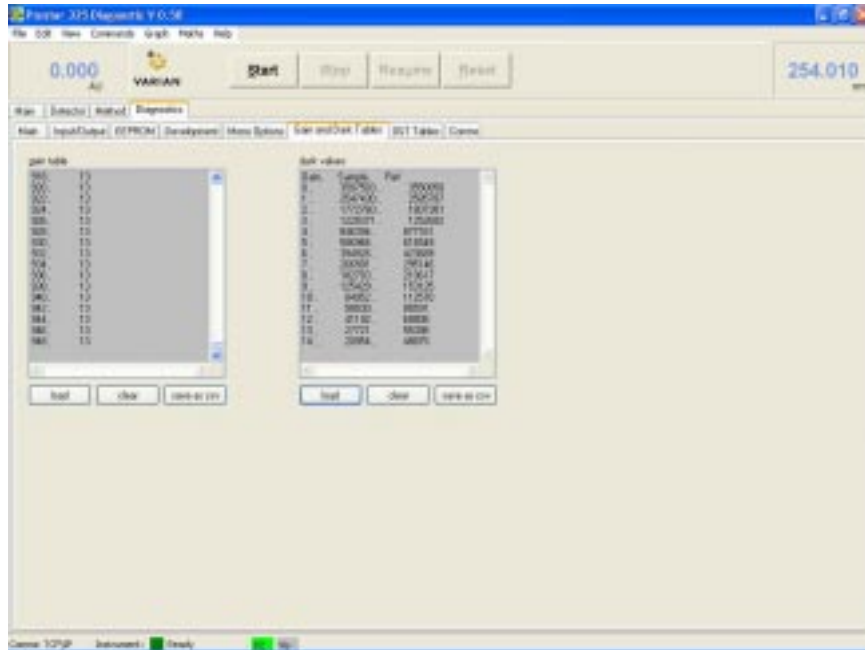
Open the Verify program and select the Wavelength Accuracy test.

Enter in the scan range 200 – 900nm and press Start.

A spectrum will then be displayed over this range and any over range at 730nm will be obvious.



### 7.10.4 Gain and Dark Tables



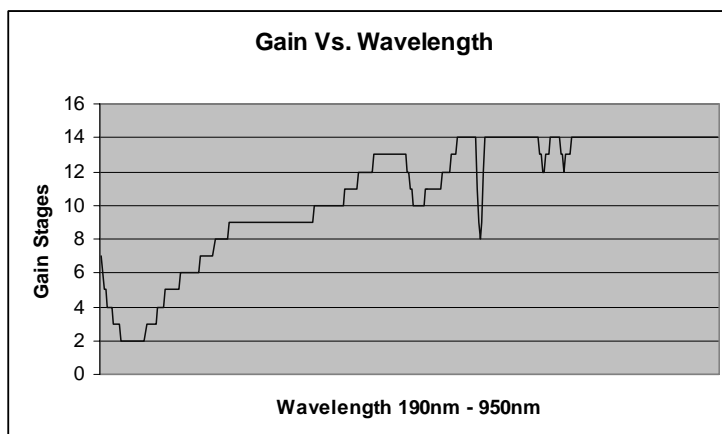
**Gain Table** - this displays each wavelength interval where a gain calibration was performed, and shows the corresponding gain stage used at that wavelength (as described in the Electronics section).

This calibration is performed using the UV lamp source which has a typical working range of 190 – 400nm. The gain stages within this range should be quite low because the signal strength is high. Above this range, the gain stages should increase as the signal level decreases. Around 656nm the gain should decrease again in the presence of the deuterium peak at 656.1nm. All this should be reflected in the gain table data.

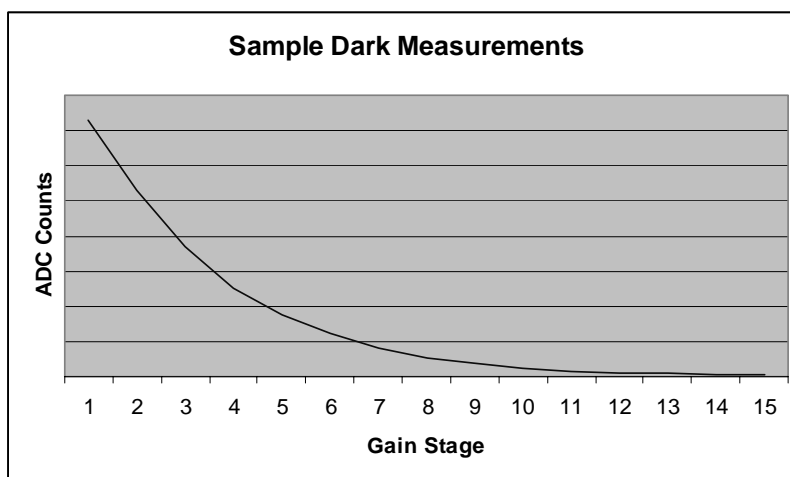
If the gain stages are all high across the entire range, then this will indicate that a low, or possibly no signal, is reaching the photodiodes.

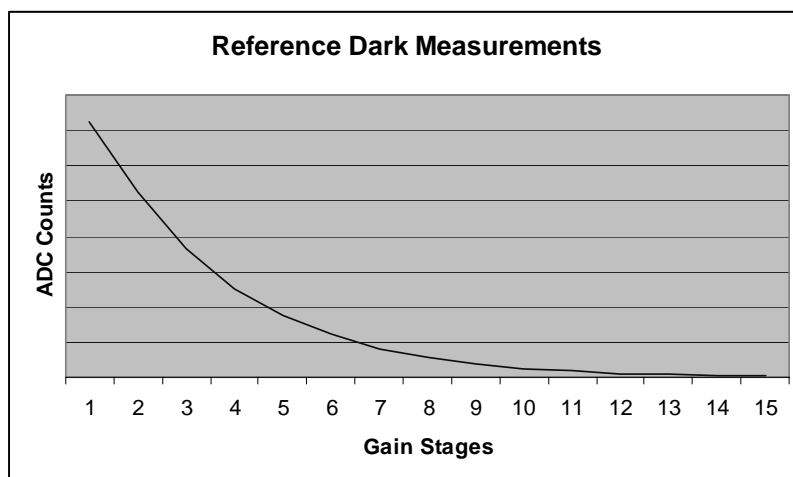
You can download the CSV file of the gain table and plot it in a graph and use it as part of troubleshooting.

Below is a typical plot from a working detector.

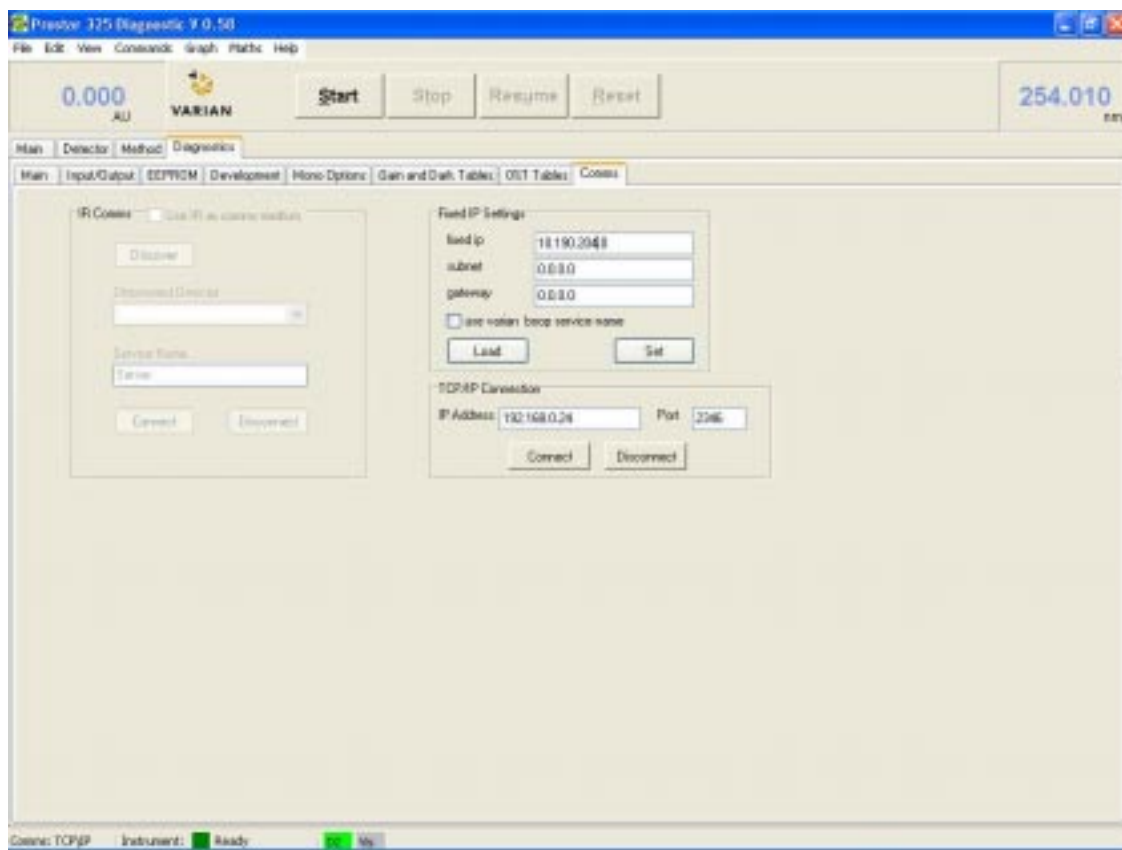


**Dark Values** – this table displays the electronic offset voltages present in the ADC circuits on the main Processor PWB. Both the Reference and Sample channels are measured independently. These measurements are performed with the UV lamp source off. Each of the 15 gain stages is selected and any offset voltage present in the signal processing circuits is measured and tabled against its corresponding gain. Then, when the detector is in its normal operating mode, these offset values are subtracted from the signal level to give a true indication of actual signal strength. These measurements are displayed in ADC counts and both channels should be overlapping. Typical plots of a working detector for both channels are shown below.





### 7.10.5 Comms



**IR Comms** – when communicating via infra red link, use these fields to establish communication to the desired detector. The “Discover” button is greyed out.

**Fixed IP Settings** – Used to manually assign an IP address, subnet & gateway settings. Enter the details in the desired fields then click “Set”.

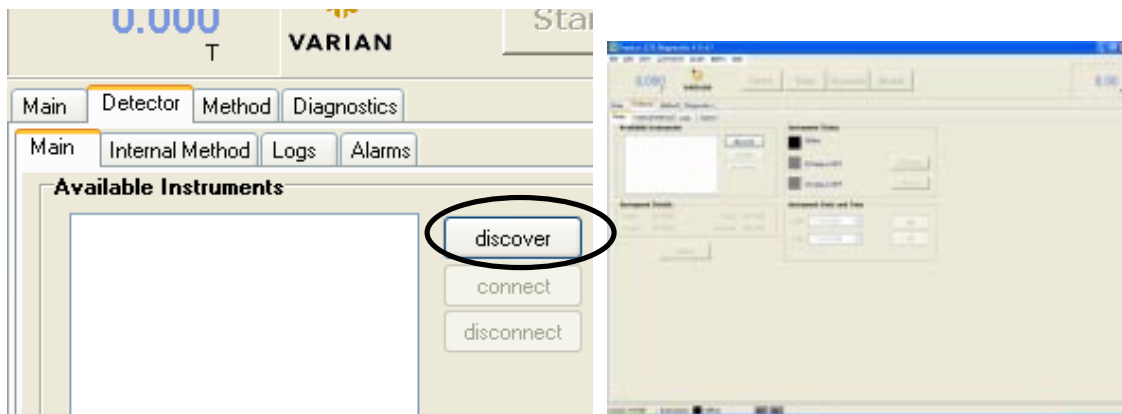
These details can also be uploaded from the detector by clicking on “Load”.

**TCP/IP Connection** – If you know the unique IP address of the detector you wish to connect to, enter in the address and click “connect”.

This is a direct method of connection and is an alternative to using the ‘Discover’ method as previously described.

## 7.11 Establishing communications

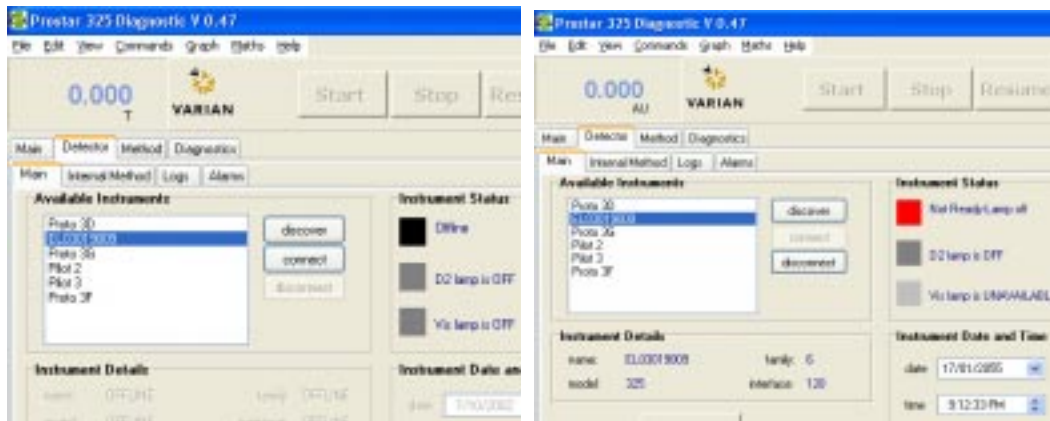
Go to the tab “Detector”>”Main” and then click “discover”



This will display a list of all the available detectors connected to that workstation (either directly, or via a network setup).



Highlight the desired detector and click on “connect”. Once communications has been established, the 'Not Ready-Lamp off' indicator will turn a red color. This means the detector has connected to the P.C and is ready for the D2 lamp to be turned on. In some instances the D2 lamp may be already on, therefore the indicator will be a green color.



## 7.12 Calibration

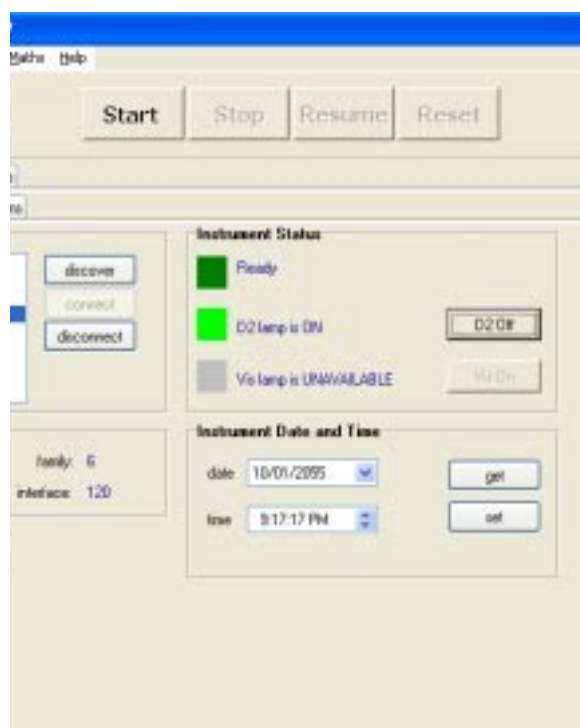
### 7.12.1 Mono

A mono calibration will be required under the following circumstances;

- After replacing the optics module
- Wavelength accuracy test fails
- After replacing the main Processor PWB
- After replacing the Detector PWB

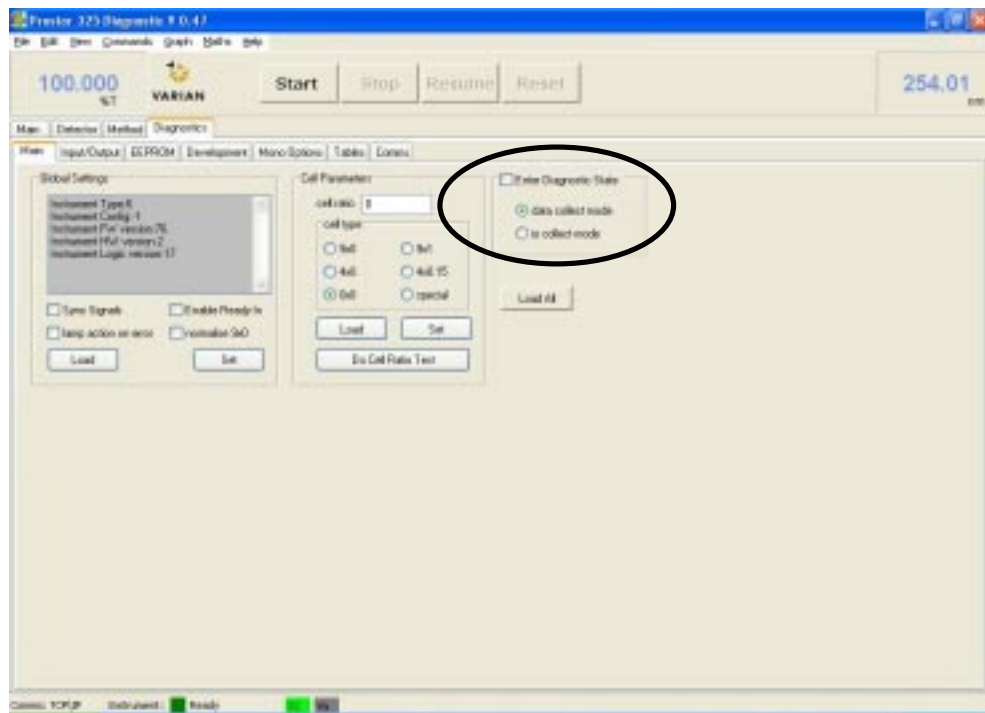
Establish communications with the detector as described above. Turn the D2 Lamp ON by clicking the D2 Lamp button, and wait until it is ready.

Both the 'Ready' and 'D2 Lamp is ON' indicators should be a green color.

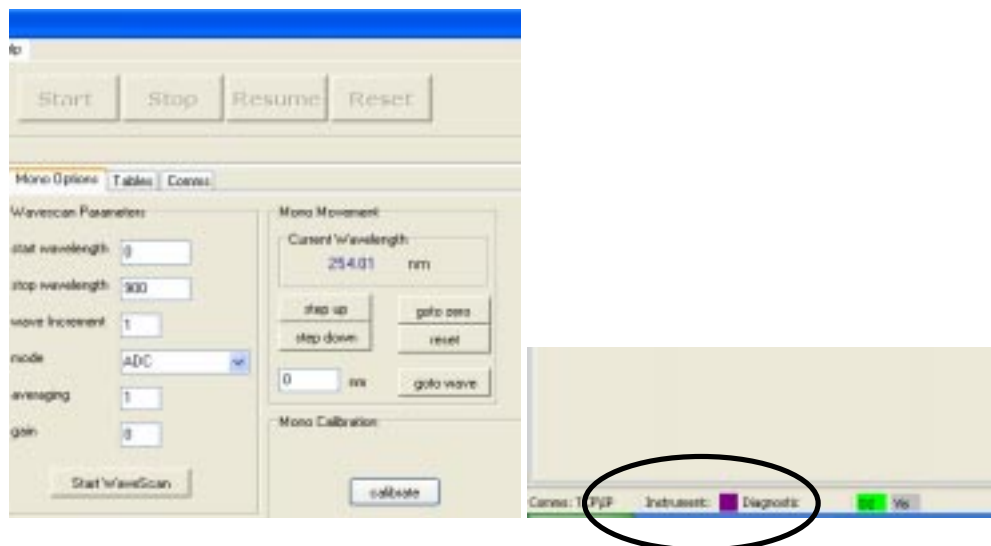


Go to 'Diagnostic' > 'Main' and tick 'Enter Diagnostic State' as shown below. You must be in 'data collect mode'.

**Note;** you must select this mode before enabling the Diagnostic State.

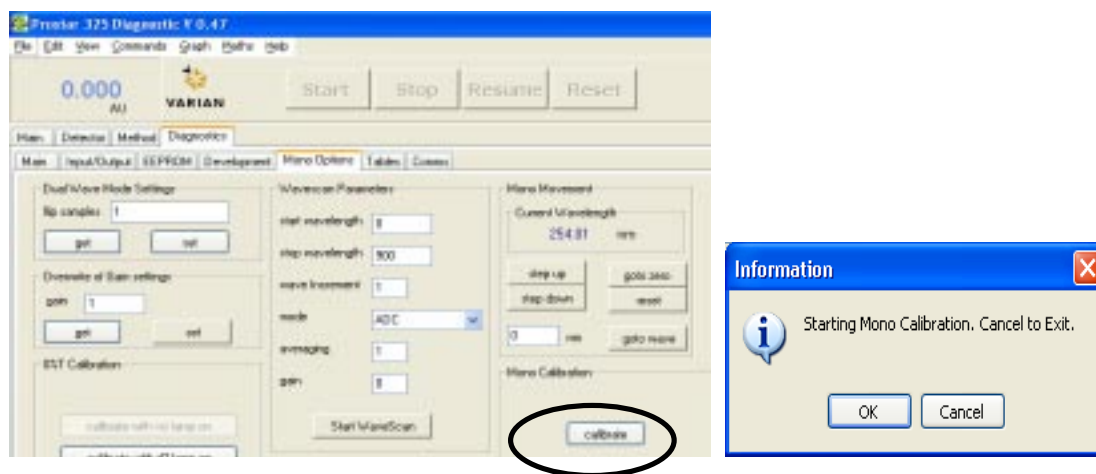


Go to 'Mono Options' and make sure that the detector is in the Diagnostic state (check the bottom of the screen and observe that there is a violet box next to the Diagnostic sign).



Click on 'calibrate' and a pop-up box "Starting Mono Calibration" will appear. Press 'OK'.

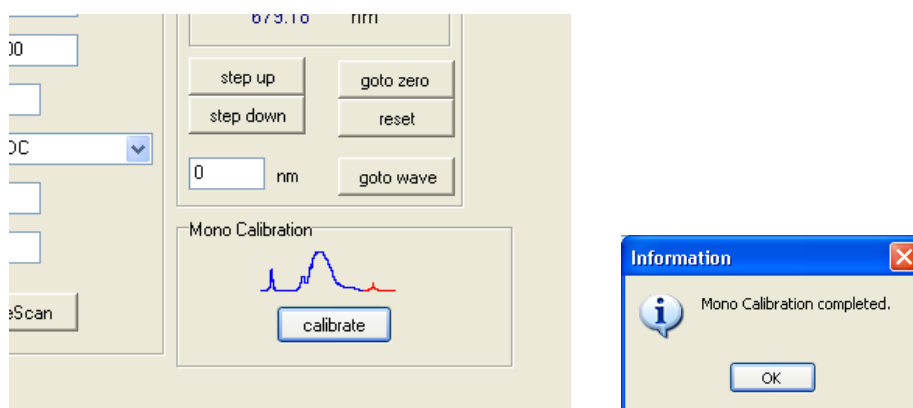




A small graph will appear indicating that mono calibration is in progress. Once completed the “Mono Calibration completed” pop-up box will appear. Press 'OK'.

The wavelength calibration is now complete.

Go back to 'Main' tab and un-tick “Enter Diagnostic State”.



### 7.12.2 0% Transmission

There are three 0%T calibration options available.

**Calibrate with Vis lamp on**

**Calibrate with D2 lamp on**

**Calibrate with both lamps on**

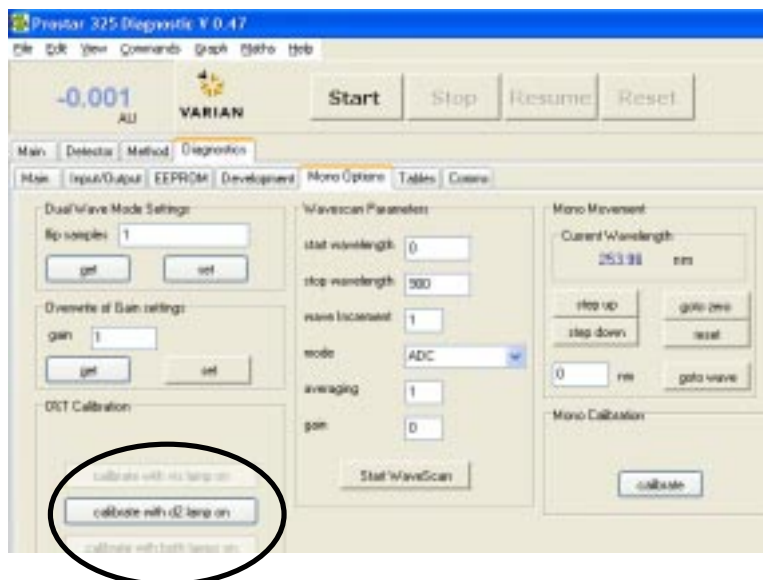
These will be required under the following circumstances;

	<b>Calibrate with Vis lamp on</b>	<b>Calibrate with D2 lamp on</b>	<b>Calibrate with both lamps on</b>
Fitting Vis lamp option	Y	Y	Y
Replacing Vis lamp	Y	Y	Y
Replacing UV lamp	if Vis fitted	Y	if Vis fitted
Replacing Processor PWB	if Vis fitted	Y	if Vis fitted
Replacing Detector PWB	if Vis fitted	Y	if Vis fitted
Replacing mono	if Vis fitted	Y	if Vis fitted
Refractive Index test fails	if Vis fitted	Y	if Vis fitted
Detector Linearity test fails	if Vis fitted	Y	if Vis fitted

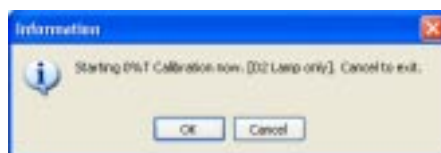
Establish communications as described in the procedure above.  
 Turn the D2 Lamp ON by clicking the D2 Lamp button, and wait  
 until it is ready.  
 Both the 'Ready' and 'D2 Lamp is ON' indicators should be green.



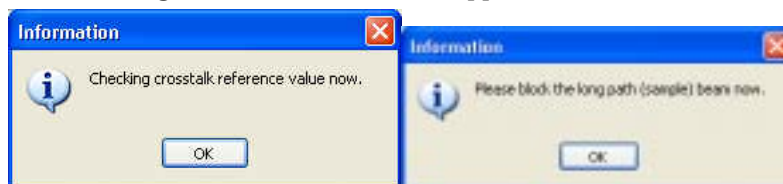
Go to 'Diagnostic' > 'Mono Options' and in the 0%T Calibration field, click on the calibration option required as per the table above.



The 'Starting 0%T Calibration now' pop up box will appear. Click 'OK'.



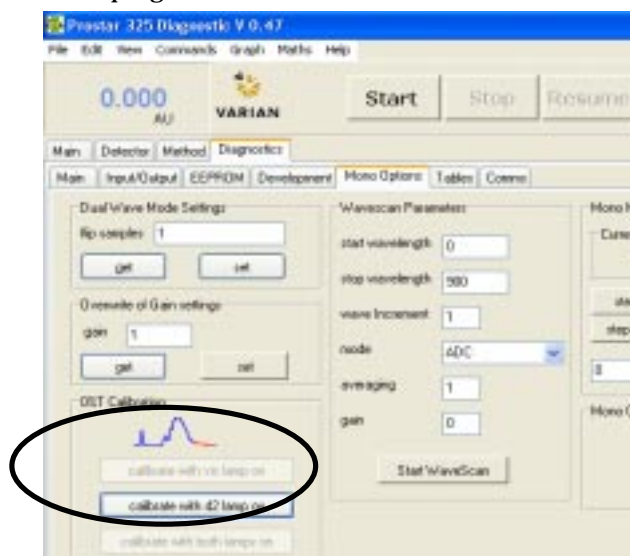
The following information boxes will appear.



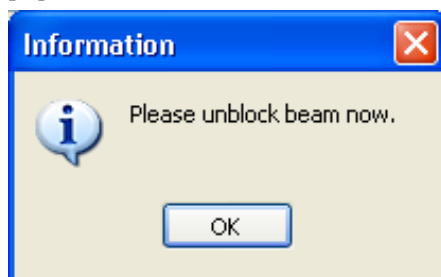
Place a black piece of paper between the Flow Cell and the Surround. This will block the bottom light path. Click 'OK'. Make sure you have only blocked the sample beam.



A small graph will appear indicating that calibration is in progress.



When the following pop-up box appears, remove the black piece of paper and click 'OK'.



Another pop-up box will appear indicating that calibration is complete.  
Click 'OK' to finish 0%T calibration.

