

RGA for Windows Manual

SP104001 Rev 2.50
October 2000

As part of our continuous product improvement policy, we are always pleased to receive your comments and suggestions about how we should develop our product range. We believe that the manual is an important part of the product and would welcome your feedback particularly relating to any omissions or inaccuracies you may discover.

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Errata and addenda

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Section 1.

RGA for Windows Help Manual

This paper manual has been generated from the RGA for Windows Help Manual reference LP105010 Rev 2.20 which is a paperless manual run on the Windows Help Viewer. Some of the formatting has been changed but the text has not been altered, for this reason the section below makes little sense.

1.1. Welcome

Document Title:	RGA for Windows Help Manual
Document Reference:	LP105010
Current Issue:	Rev 2.20
Issue Date:	14 June 2000

As part of our continuous product improvement policy, we are always pleased to receive your comments and suggestions about how we should develop our product range. We would welcome your feedback particularly relating to any omissions or inaccuracies you may discover in this help document.

This RGA for Windows Help document will be updated from time to time. Please contact your local Spectra facility to see if there is a newer version available. Please have the information above ready.

This is a paperless form of the manual which was shipped with your software package and is based on the original manual:

LP1010005 Rev 2.47
August 1998

1.2. Using the Help Manual

1.2.1. Installation Instructions

The Help Manual is in the form of a Windows Help file that can be viewed using the Windows help file viewer WINHELP.EXE. By using this format as opposed to the original manual's word processor format it is available to

the widest possible number of users.

The manual may be viewed in Windows 3.11, Windows 95 or Windows NT operating systems. The file RGA4Win.HLP may be run from the CD or it may be copied to your hard drive and run from there.

Windows 3.11 and Windows NT 3.51

To run from disk:

1. Insert the disk in Drive D (we assume your CD ROM drive is D: if not substitute the correct drive letter)
2. From Program Manager select File | Run in the Command Line: box type D:\RGA4Win.HLP and click on the OK button or press ENTER.
3. The RGA for Windows Help Manual window will be opened.

To copy to your hard drive

(We will assume you have a directory named SPECTRA on your C: drive)

1. Insert the CD in Drive D
2. From Program Manager Main group run up File Manager by double clicking on its icon
3. You need to have two Windows displayed use Window | New Window and Window | Tile Horizontally to achieve this.
4. Click on the D drive icon so that the two files on the CD are displayed.
4. Click on the file RGA4Win.HLP so that it is highlighted and drag it to the directory C:\SPECTRA.
5. Now Open the RGA4Win.HLP file by selecting File | Run in the Program Manager in the file box type C:\SPECTRA\RGA4Win.HLP and press ENTER.

You should substitute drive letters and directories as appropriate for your system.

You can added a Program Item to the Spectra (or any other) Program Group to open RGA4Win.HLP, consult your Windows documentation or on-line help if you do not know how to do this.

Windows 95 and Windows NT 4

To run from disk:

1. Insert the CD in Drive D
2. Click on the Start button on the Taskbar... then select Run...
3. In the Open box type D:\RGA4Win.HLP then click OK or press ENTER.

To copy to your hard drive

(We will assume you have a folder named SPECTRA on your c: drive)

1. Insert the CD in Drive D
2. Open Windows Explorer by clicking on the Start button on the Taskbar..., then select Programs | Windows Explorer
3. Click on the D drive icon then select the file RGA4Win.HLP and drag it to the C:\SPECTRA folder
4. Now Open the Microvision Plus.HLP file by clicking on the Start button on the Taskbar... then selecting Run, in the Open box type C:\SPECTRA\RGA4Win.HLP and press ENTER.

You can run RGA4Win.HLP from Windows Explorer by double clicking on the file name irrespective of whether the file is on the hard drive or the floppy drive.

You should substitute drive letters and folder names as appropriate for your system.

You can add a Shortcut to the desktop, start menu or folder to open RGA4Win.HLP, consult your Windows documentation or on-line help if you do not know how to do this.

1.2.2. Using the Help Manual

The first page of the Help Manual consists of a Contents page containing links to other sections of the manual, it is equivalent to the contents page in the printed manual. At anytime you can click on the Contents button to return to this page.

By using the << and >> buttons you may scroll through the manual just as you would by turning the pages of the printed manual. In addition you can use the Hypertext links to jump to related sections of the manual. The hypertext links are the words or phrases that appear in green type.

We recommend that you start by using the Disk version of the Manual on the PC in your office together with the printed manual. Spend 10 minutes using the two together before installing the Disk Manual on the PC in the cleanroom where the printed manual is not allowed.

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Section 2.

Introduction

2.1. Introduction

RGA for Windows is a powerful yet easy to use Residual Gas Analysis software package developed to run on an IBM or compatible personal computer (PC) running Microsoft Windows in conjunction with the Spectra range of quadrupole mass spectrometers. This manual aims to provide full details and operating instructions for the software package. Some parts of the manual should be followed carefully and not be missed other parts are provided as a reference and are designed to be referred to when needed. Information relating to the instrument hardware (RGA control unit, RF head, analyser) can be found in the appropriate instrument manual. If the RGA for Windows software was purchased as part of a complete system all the instrument manuals should be contained in the one 23cm (9inch) x 21.5cm (8.5inch) white, three ring binder which also contains the software disks.

RGA for Windows will operate with Windows 3.1 or greater or Windows 95.

Getting Help
About This Manual
Software Versions

2.2. Getting Help

We are always pleased to provide assistance where we can. If you are experiencing any difficulties or need help please feel free to call your local Spectra facility and ask for the service department. Please have the following information ready so that our technical staff may help you quickly and effectively:

1. The serial numbers of the analyser, RF head and control unit; each of these numbers begins with the letters "LM"
2. The information displayed in the diagnostics window, refer to section Diagnostics

3. The information displayed in the Help about form. To access this select **Help | About** from the *menu bar*.

2.3. About This Manual

2.3.1. Text Conventions

As far as possible RGA for Windows uses a format and conventions common to other Windows software packages. The following text formatting conventions are used throughout this manual:

Italic type Windows terms. You can refer to your Windows manual for more information

Bold names on buttons
names of menus
Words or characters you should type. Example if the manual instructs you to type **cd spectra** you type the lowercase letters cd followed by a space and the lowercase letters spectra.
names within *dialog boxes*

Keyboard Conventions

Function key names are written in uppercase letters. Example, the Control key is written CTRL, the Escape key ESC.

Where keys need to be pressed simultaneously the + sign is used. Example ALT+F1 means hold down the ALT key while pressing the F1 key.

Where keys are pressed in sequence commas are used. Example: ALT, C, D would mean press the ALT key then press C then press D.

Where one of the four arrow keys is referred to the appropriate symbol is used enclosed in parentheses. Example, up arrow is written (↑).

Mouse Conventions

RGA for Windows only uses one mouse button. If you have a mouse with more than one button the left mouse button is the one you will use unless you have configured your mouse differently.

Point Position the mouse pointer so that it rests on the object to which you have been instructed to point.

Click Press then immediately release the mouse button without moving the mouse.

Double Click Press then immediately release, press again then immediately release the mouse button without moving the mouse.

Drag *Point* to the object to be moved, press and hold down the mouse button whilst moving the mouse to reposition the object. Then release the mouse button.

2.3.1. Microvision Plus features

Some of the features in RGA for Windows version 2.40 are only available if the RGA control unit is a Microvision Plus. In this manual these features will be marked with the Microvision Plus symbol,.

2.4. Software Versions

2.4.1. RGA for Windows Version Summary

This Help Topic was previously released as RGA for Windows Vversion Summary LP210004 Rev 1.10 4 Nov. 1999

This document contains a summary of the features associated with each release of RGA for Windows since Version 2.00.

Version	Release Date	Features
2.45	1 Nov. 1999	Windows operating system detection by Configure, Ports and Download programs. Can be used with smart comms. cards and Windows NT4. Bugs fixes for Year 2000 problems
2.44	31 Mar. 1999	Only bug fixes no new features.
2.43	1 Sept 1998	Recognises LM78 Vac Check as a product. The Degas bug is fixed.
2.42	26 June 1998	This version overcomes Year 2000 problems. Improved Macro Language DSIKSTORE command.

- Recall has an outgassing/throughput calculation facility.
Two versions of the sample file DDE-RGA.XLS are available for Excel V5/95 and Excel V7/97.
- 2.41 18 May 1998 Only shipped to Japan features as V2.42.
- 2.40 3 Oct 1997 Fully auto-detects the control unit type.
see Three types of pressure units available Torr, mBarr, note 1 Pascal.
PVD and Open ion source settings available.
The gain range sent back from the control unit to improve reliability.
Additional features to utilise improved Microvision Plus hardware;
four analogue inputs
zeroing accuracy feature
Vacuum Scan and Log Bar Chart Scans now completed in two sweeps
Variable ion source settings
Total pressure input from an external gauge
HPQ-2 control units can be accommodated.
Can now be used with a valve controller.
- 2.36 16 Aug 1996 Bug fixes only.
- 2.35 12 June 1996 No new features.
- 2.33 2 Nov 1995 Improved RF fail message.
Recall has improved use of the clipboard.
Library search improved.
Recall analytical tools available.
Recall has a DDE facility.
- 2.32 21 Sept 1995 Bug fixes.
- 2.30 8 Sept 1995 A new version to run with the new Microvision control unit.
RF fail feature, Microvision only.
Variable electron energy, Microvision only.
Total pressure calibration factor.
Ratio peaks in channel modes.
Filament current trip, Microvision only.

			New diagnostics page, Microvision only. Download now able to use .ram, .img and .bin files and report information about firmware.
2.22	25	July	No new features
	1995		
2.21	27	June	3kV SEM supply supported to allow x10000 gain setting.
Note 2	1995		Different SEM gains in different channels. SEM gain displayed in Mult button. Macro capability added, Ex RGA head multiplexing. User defined head names. Copy to clipboard User definable logo on printouts. Fast scan mode. Bright icons for the USA. New DDE command to set all parameters for one channel. Improvements to disk store and the RVC window.
2.20			Never released - went straight to V2.21
2.13	3	May	Bug fix only.
	1995		
2.12	7	April	Bug fixes only.
	1995		
2.10	19	Dec	New RVC options for various valve combinations Alarm outputs via a plug in PC card. Alarms in Multi-trend mode. Manual mult. calibrate. Now supports 3kV SEM board. A beta version of Fast Scan mode added.
Note 3	1994		
2.00a	6	May	This release follows a complete re-write of earlier versions of RGA for Windows and may be considered to be a new product.
	1994		

Note 1

The following control unit software (firmware) is required to run RGA for Windows V2.40.

Satellite satecode.ram or EPROM	V2.32
Microvision application (microv.img)	V1.22

Microvision core	V1.00 or D1.12b
Microvision Plus application (mvplus.img)	V1.50
Microvision Plus core	D1.12b

Note that HPQ-2 firmware is the same as Microvision Plus and Vac-Check firmware is the same as Microvision.

Note 2

Version 2.21 requires version 2.20 Satellite code.

Note 3

Version 2.10 requires version 2.10 code in the control unit (Satellite, Multiquad or Vacscan/Vacscan Plus).

2.4.1. New in Version 2.40

Two main changes have necessitated the release of version 2.40 RGA for Windows. The first concerns the way data is transmitted from the RGA control unit to the PC running RGA for Windows. In Peak Jump and Trend modes the gain range is now sent with each reading. This makes no difference to the normal operation of RGA for Windows but it does mean upgrading the software in your control unit if you are upgrading from an earlier version of RGA for Windows.

The second reason for the new release is the inclusion of some additional features that utilise the improved hardware in the Microvision Plus. The total pressure measurement can now be obtained from an external total pressure gauge via one of the Microvision Plus analogue inputs. The software allows for suitable scaling factor to be applied. The Microvision Plus allows various potentials used in the ion source to be altered, V2.40 now supports this. The zeroing accuracy can be altered to give faster overall scan speeds.

Section 3.

Installation

3.1. Installation

This section deals with installing and configuring the RGA for Windows software and how to connect RGA control units to your PC. You should refer to the control unit manual for details of how to install the analyser into your vacuum chamber and how to connect up the analyser, RF head and control unit. Please follow each part of this section carefully and only skip those parts that do not specifically apply to your particular system. If you have any questions or experience any difficulties, contact your local representative who will be able to help you.

There are slight differences in installing RGA for Windows on Windows 3.1 and later systems and Windows 95 systems. The differences for Windows 95 are noted with the Win95 label.

Unpacking

Single or Multi-Headed

Installing Single Headed RGA for Windows

Installing Multi-Headed RGA for Windows

Upgrading From Earlier Versions

Download

Baking The Analyser

3.2. Unpacking

When you receive your equipment carefully check each item before removing the wrapping to ensure that no physical damage has occurred during shipment. Also make sure all items have been received by checking against the enclosed packing slip.

If there has been obvious damage during shipment or if there are items listed on the packing slip as shipped which are not in the box, immediately contact your local sales/service representative.

Most insurance claims for shipment damage must be placed within 7 days from the date of delivery - in WRITING. So don't delay Check it out !!.

The RGA for Windows software is supplied on three High Density 3.5 inch floppy disks. These disks are shipped in clear plastic wallets held in the white, three ring manual binder.

3.2.1. Making Backup Disks

Before you do anything else you should generate backup disks from the program disks supplied. To do this use the MS-DOS DISKCOPY utility (or any other method you are familiar with) to make a copy of the original disks. Keep the original disks in a safe place and only use the copy.

3.3. Single or Multi-Headed

There are two types of RGA for Windows software and before proceeding it is important to establish which type you have. The first type is Single Headed RGA for Windows which is designed to operate with just one RGA head (control unit, RF power supply and analyser). Multi RGA for Windows is the second type and this is designed to operate with one to eight RGA heads.

On the RGA for Windows software disk labels will be written either “Single Headed” or “Multi Headed” depending on which type you have.

Alternatively you can check by letting the Install program tell you which type of software you have. To do this follow the steps 1 to 4 in Running Install. When the Spectra install Window is displayed the line of text immediately below the Spectra logo will read either:

Spectra Install : RGA for Windows LMSP -1-1-V2.4x
in which case the software is single headed

or it will read

Spectra Install : Multi RGA for Windows LMSP-1-2-V2.4x
in which case the software is Multi-Headed.

To proceed with the installation of the RGA for Windows software follow the instructions for the type of software you have.

The product code for single headed RGA for Windows is LMSP-1-1- followed by the version number. The product code for multi-headed RGA

for Windows is LMSP-1-2- followed by the version number. The version number will be V2.4x where x is a single digit number in the range 1 to 9.

3.4. Installing Single Headed RGA for Windows

Instrument Architecture
Computer System Requirements
PC to Control Unit Connection
Installing Share.exe
Running Install
Configuring RGA for Windows
The Spectra Program Group

3.5. Instrument Architecture

The complete RGA instrument has four basic elements:

the analyser	this is the part which fits into the vacuum chamber
RF power supply	this is a small electronic unit which fits directly onto the analyser
control unit	an electronic unit containing the power supplies and data acquisition system which connects to the PC via a serial cable
computer	this is the PC which runs the RGA for Windows software

The type of control unit used in RGA for Windows systems may vary. Microvision combines the traditional control unit and RF power supply electronics into one extremely compact unit which plugs directly onto the analyser.

Microvision Plus is similar to the Microvision but enhanced electronics gives improvements in performance and allows additional RGA for Windows features to be used.

The Satellite is designed specifically to operate with a PC and has no built-in data display just six LEDs on the front panel to give status indication.

The Vacscan Plus instrument has a built-in CRT and can operate as a stand alone RGA without being connected to a PC. When the Vacscan Plus is run

from the PC under RGA for Windows it operates in a Satellite emulation mode and its screen display will mimic the six LEDs on the front panel of the Satellite. When the Vacscan Plus is first powered up it assumes its stand alone mode, only when it is connected to the PC via its RS232 port and RGA for Windows is booted up will it switch to the Satellite emulation mode.

Vacscan control units may also be used in RGA for Windows systems.

There are certain limitations when using a Vacscan Plus or Vacscan as a Satellite. These are:

- a Remote Vacuum Controller cannot be fitted
- an Analogue Output Module is limited to six channels
- the scan speeds are slower (approximately 50%)
- the Download feature cannot be used
- the maximum mass range capability is 200amu
- only RS232 serial communication is possible
- the RF Tuning and RF Select facility is not available

3.6. Computer System Requirements

The minimum requirements for running RGA for Windows are listed in the table below. This is however only the minimum requirement and the overall performance of Windows and hence RGA for Windows can be improved considerably by increasing the specification of the PC. For this reason we would always recommend that RGA for Windows is run on a PC fitted with at least a 33MHz 80486dx.

Component	Description
Microprocessor	25MHz 80386sx
RAM	4MB
Hard Disk	Required with at least 6MB of free space
Video	Standard VGA 640 x 480 16 colour
Microsoft Windows	Version 3.1 or later or Windows 95. True Type fonts installed.
Mouse	A mouse is required.
Serial Port	Required to connect the control unit to the PC.

3.7. PC to Control Unit Connection

Most PCs are supplied with 2 serial ports called Com1 and Com2. The connectors for Com1 and Com2 are usually positioned on the rear of the PC and may be either 9-way or 25-way male D-type connectors. If you have a problem identifying these connectors you should refer to the documentation supplied with your PC or contact the PC manufacturer or distributor directly.

The RGA for Windows software will run a single control unit and this control unit MUST BE connected in order to run RGA for Windows. Normally one of the standard serial ports (Com1 or Com2) on the PC is used to connect the RGA control unit. The connection between your PC and the control unit is made using the RS232 cable supplied. If both of the serial ports are being used you will need to fit a Satellite comms card. This is described in Satellite Comms Card

The standard cable to connect a Satellite, Microvision or Microvision Plus to the PC is a 9-way D plug to 9-way D socket RS232 cable and a 25-way D socket to 9-way D plug RS232 cable is available as an option. To connect a Vacscan or Vacscan Plus to the PC a null modem cable is required, as standard this is a 9-way D socket to 9-way D socket. A 25-way D socket to 9-way D socket is available as an option. In all cases the standard cable length is 3 metres (9 feet) longer cables are available on request, please contact your local Spectra facility.

CAUTION

You must only use RS232 cables supplied with the equipment. We cannot guarantee that other manufacturers cables will work correctly in Spectra RGA systems.

If you must use an RS232 cable not supplied with the equipment then use the cable supplied as an extension to your cable ENSURING THE CABLE SUPPLIED WITH THE EQUIPMENT IS PLUGGED INTO THE PC.

Identify the serial port to which you will connect the control unit. As part of the installation process the configuration program will be run. This will determine which serial ports are available on your PC and ask you to specify to which one the RGA control unit has been connected.

Note that it is only necessary to have the control unit connected to the PC to run RGA for Windows, you do not have to have the RF power supply or

analyser connected at this stage. In the case of a Microvision or Microvision Plus, the unit does not need to be connected to the analyser. However, if you enter a scanning mode the message “The Microvision is not connected to the analyser or the RF has failed” will be displayed.

If you are connecting control units to your computer using an RS422 or RS485 serial interface please refer to RS422 and RS485

3.8. Installing Share.exe

If you are installing RGA for Windows to run under Windows 3.1 you will need to install SHARE. If you are installing RGA for Windows on later versions of Windows, such as Windows for Workgroups 3.11 and Windows 95, you will not need to install SHARE, so you may skip this section.

The SHARE program is supplied with DOS and allows different programs to use common files in an orderly fashion. RGA for Windows will not run without this command as the Microsoft Access Database Engine is used by RGA for Windows for the spectra library. The library data files are stored in an Access format. You should find SHARE.EXE in your DOS sub-directory.

To install the share command add the following line to your autoexec.bat file in a part of the file that is used when booting Windows;

```
c:\dos\share.exe /l:500 /f:5100
```

This assumes that the share.exe command is in the DOS sub-directory c:\dos. If it is in another sub-directory use that name instead of dos in the above line.

note that there is a single space before each of the two forward slashes (/).

- f: allocates the number of bytes for the share file information
- l: sets the number of files that can be locked at any one time.

When the line has been added to the autoexec.bat file you need to re-boot your PC.

3.9. Running Install

The INSTALL.EXE program included on program Disk 1 should be used to

install RGA for Windows onto your hard disk. To install RGA for Windows follow the procedure listed below:-

- 1 Run up Windows
- 2 Insert the program Disk 1 in drive A (or B if you prefer).
3. Chose the Run... option from the Windows Program Manager Eile select menu.

Win95 *Click* on the Start button on the Taskbar and select Run . . .

- 4 Type a:install (or b:install if you are using the drive B)

The Spectra Install window will be displayed.

The install options:

RGA for Windows
Download
Recall
DDE Examples
Macro Examples

will be displayed. You can select the product options by *checking* the appropriate products. The default is for all of the product options to be selected (*checked*). We strongly recommend you install all the product options.

You may also change the default directory where RGA for Windows will be installed. For the purposes of this manual we will assume you use the default C:\SPECTRA\ directory.

- 5 *Click* on the Install button to begin the installation process. You will be prompted to insert program Disk 2 and Disk 3 at the appropriate time.
- 6 RGA for Windows will be installed on your hard disk and a program group called SPECTRA will be created and the RGA for Windows program items added.

Win95 RGA for Windows will be installed on your hard disk and the Spectra folder will be created which will contain all the RGA

for Windows program items.

- 7 When the installation process has been completed the Share.exe warning box will be displayed; *click* on the Ok button. You will then be prompted to run the configuration program which is described in the following section.

3.10. Configuring RGA for Windows

The configuration program is run automatically as part of the installation process and can be re-run at any time to change the configuration of RGA for Windows.

To re-run Configure, *double click* the Configure icon in the SPECTRA program group.

Win95 To re-run Configure *click* on the **Start** button on the Taskbar then select **Programs | Spectra** and *click* on the Configure item.

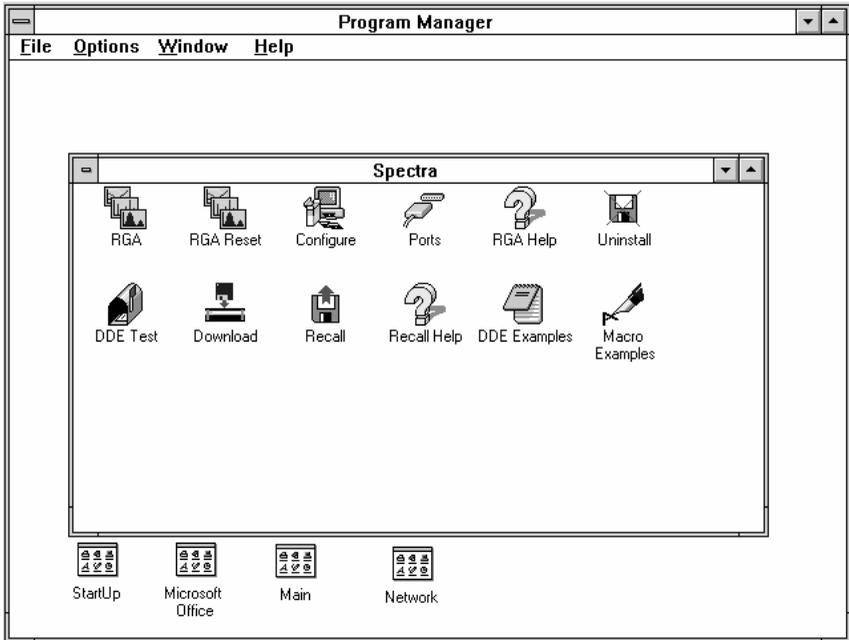
The configure program will produce a list of the Com ports available on your PC which are not currently being used. When configure is run on a PC with the two standard Com ports and a mouse connected to Com 1 it will report Com 2 as the only available option. If you are not using a mouse or have a bus mouse then Com 1 and Com 2 would be reported as options.

To select the required Com port you should *click* on the Use Communication Port *dropdown list box*. The list of available ports will be displayed. To select *click* on the required option in the list. To make the change and exit the program you should *click* on the Ok button, using the Cancel button will exit the program but the Com port setting will not be altered.

The Spectra program group will now be displayed. If you are upgrading from an earlier version of RGA for Windows please familiarise yourself with the topics covered in Upgrading From Earlier Versions.

3.11. The Spectra Program Group

The Spectra program group as shown below contains thirteen program items, each is briefly described below.



Win95 The items in the Spectra folder are described below, they are the same as the program items in the Spectra program group in Windows 3.1 and later systems. To display the Spectra folder *click* on the Start button on the Taskbar and select Programs | Spectra from the start menu.

RGA *Double click* on this item to start RGA for Windows using the previous session parameters. This is the way you will normally start RGA for Windows.

RGA Reset *Double click* on this item to start RGA for Windows using the default parameters. Use this item when you first start RGA for Windows or after a software upgrade.

Configure This runs the configure program allowing the selection of the comms ports.

RGA Help The help files are contained in a separate program and may be

opened by *double clicking* this icon, *clicking* on the Help button or selecting Help whilst running RGA for Windows.

Ports This is a utility program allowing custom configuration of multiple comms ports. It is designed primarily for multi headed systems and systems where Spectra Satellite Comms cards are being used. Please refer to Ports and Addresses for further details.

Uninstall This utility is used to remove RGA for Windows from your hard drive. The Install disks will be required to complete this operation.

DDE Test This test program is used with the DDE Links feature and is described in DDE Links

Download This is used to upgrade the code in a Satellite control unit, refer to Download

Recall Recall is a separate program which allows the review of RGA for Windows data files obtained using the Disk Store feature described in Disk Store Please refer to the Recall manual.

Recall Help Recall has its own help files stored as a separate program, again refer to the Recall manual.

DDE Examples These are example files to help the user with the DDE (dynamic data exchange) Links feature. Please refer to DDE Examples

Macro Examples These are example files to help users with the Macro feature described in Macro Examples

You have now completed the installation of RGA for Windows. We strongly recommend you work through Getting Started Introduction that will not only give you an introduction to RGA for Windows but will also check that your system is functioning correctly.

3.12. Installing Multi-Headed RGA for Windows

The remainder of this section of the manual deals with installing Multi Headed RGA for Windows systems and we have split it into two parts. Firstly, we quickly describe a basic installation of Multi RGA for Windows with step by step instructions and no detailed information. For nine out of ten users this will be quite sufficient. We have provided two versions of this part one for Windows 3.1 or later systems the other for Windows 95 systems. You only need to follow the one applicable to you. In the second part we provide full details of the plug in serial card and how to install and configure the Multi RGA for Windows software.

We suggest you start by following the step by step guide, if you require more detailed information to complete the installation refer to later parts of this section. When you have completed the installation you may wish to study the rest of the section for background information.

Quick Guide Windows 3.1
Quick Guide Windows 95
Multi-Headed Detailed Installation
Computer Requirements, Multi
Ports and Addresses
Satellite Comms Card
Connecting Control Units
Installing Share, Multi
Installing Override.com
Comms Cards and Windows 95
Running Install, Multi
Spectra Program Group, Multi
Configuring Multi RGA for Windows
RS422 and RS485
Windows System Ini File
Default Comms Settings

3.13. Quick Guide Windows 3.1

Here we will get your Multi RGA for Windows system up and running by following five simple steps. We will be making a “standard installation”, if this is not appropriate for your needs please refer to the second part of this section of the manual where you will find detailed information.

Step 1.

Setting the physical addresses on the comms card.

The comms card is full described later in this section, in step 1 we will just check and set if necessary the factory default settings of comms card.

1. Check that the four large 40 pin ICs IC1, IC7, IC13 and IC16 are fitted, this will ensure you have a four port card.
2. Check that IC5, IC9 and IC11 are fitted, this will ensure your card is configured for RS232, if you want to use RS422 refer to section RS422 and RS485.
3. Check that jumper J9 is fitted between pins 3 and 4 this will set the addresses as follows:

Port 1 to address 0280 to 0287
Port 2 to address 0288 to 028F
Port 3 to address 0290 to 0297
Port 4 to address 0298 to 029F

if you need to use other addresses refer to Satellite Comms Card .

4. Check that jumper J13 is fitted between pins 1 and 2 this puts all the ports on the same IRQ.
5. Check that jumper J8 is fitted between pins 5 and 6, this puts all the ports onto IRQ5. RGA for Windows requires one IRQ to itself to operate correctly. IRQ5 must not be used by any other devices. If you cannot use IRQ5 because you have other devices connected to it refer to Satellite Comms Card

Step 2.

Installing the comms card in the PC and connect the control units.

Note the position of the connectors for the four ports on the comms card:

Port 1 PLG 5 mounted on the PCB closest to the edge connector
Port 2 PLG 4 mounted on the PCB furthest from the edge connector
Port 3 fitted to a flying lead connected to PLG 6 on the PCB
Port 4 fitted to a flying lead connected to PLG 2 on the PCB

The comms card should be installed in accordance with the PC

manufacturer's instructions for the installation of plug-in cards. Note that you will need an ISA (XT) slot for the card and a free adjacent slot.

Now, connect the control units to the comms card using the cables supplied. You can switch on the RGA control units and then power up your PC.

Step 3

Installing the software on the PC.

To install Multi RGA for Windows:

- 1 Run up Windows
- 2 Insert the program Disk 1 in drive A (or B if you prefer).
- 3 Chose the Run... option from the Windows Program Manager File select menu.
- 4 Type a:install (or b:install if you are using the drive B)

The Spectra Install window will be displayed.

The install options:

RGA for Windows
Download
Recall
DDE Examples
Macro Examples

will be displayed. You can select the product options by *checking* the appropriate products. We strongly recommend you to install all the product options.

You may also change the default directory where RGA for Windows will be installed. For the purposes of this manual we will assume you use the default C:\SPECTRA directory.

- 5 *Click* on the Install button to begin the installation process. You will be prompted to insert program Disk 2 and Disk 3 at the appropriate time.

- 6 RGA for Windows will be installed on your hard disk and a program group called SPECTRA will be created and the Multi RGA for Windows program items added.
- 7 When the installation process has been completed a warning box will be displayed telling you to install Share.exe and Override.com; *click* on the Ok button. The configuration warning box will then be displayed and you will be prompted to run the Configure program. *Click* on the Ok button.

Before running RGA for Windows you need to install SHARE.EXE if you are using Windows 3.1. If you are using later versions such as Windows for Workgroups 3.11 you will not need to install SHARE.EXE.

To install SHARE.EXE follow the instruction in Installing Share.exe

You will need to install override.com by adding the line C:\spectra\override.com to your autoexec.bat file, to do this:

1. Open a text editor such as Notepad which can be found in the Accessories program group in Windows.
2. Open the autoexec.bat file which can be found in the root directory, usually c:\.
3. Add the line c:\spectra\override.com to a part of the autoexec.bat file which is used when Windows is booted up.
4. Save the autoexec.bat file under the same name.
5. Now re-boot your PC so that the change is implemented.

Note: since the content of autoexec.bat files vary greatly from computer to computer it is not possible define exactly where the line should be put. Usually it will be towards the end of the file. If you experience any difficulties try putting the extra line in a different place in the autoexec.bat file.

Step 4

Assigning logical names to the ports on the comms card.

To assign the logical names to each port:

double click on the Ports program item in the Spectra program group
A warning box will be displayed asking you if you want to install our own
comms. driver, *click* on the Yes button. See Windows System Ini File for
more information about the comms driver.

click on the 1 Comms Card Default button (this was the way we configure
the comms card in step 1)

then *click* on the Ok button.

You will then be prompted to re-start Windows, *click* on the Yes button to
do this.

Step 5

Configuring RGA for Windows so that each head number is allocated to a
port by its logical name.

Double click on the Configure program item in the Spectra program group,
the Configure window will be displayed. Select the number of heads by
clicking on the Number of Heads connected: *dropdown list box* then *click* on
the appropriate number in the *dropdown list*. Then select the number of
comms cards fitted in your PC by *clicking* on the Number of Comms Cards
fitted: *dropdown list box* then *click* on the number in the list. Then, *click* on
the Ok button.

You should have now successfully installed Multi RGA for Windows.
Further information about the installation process can be found in the rest of
this section.

3.14. Quick Guide Windows 95

Here we will get your Multi RGA for Windows system up and running by
following five simple steps. We will be making a “standard installation”, if
this is not appropriate for your needs please refer to the second part of this
section of the manual where you will find detailed information.

Step 1.

Setting the physical addresses on the comms card.

The comms card is full described later in this section, in step 1 we will just
check and set if necessary the factory default settings of comms card.

1. Check that the four large 40 pin ICs IC1, IC7, IC13 and IC16 are fitted, this will ensure you have a four port card.
2. Check that IC5, IC9 and IC11 are fitted, this will ensure your card is configured for RS232, if you want to use RS422 refer to RS422 and RS485
3. Check that jumper J9 is fitted between pins 3 and 4 this will set the addresses as follows:

Port 1 to address 0280 to 0287
Port 2 to address 0288 to 028F
Port 3 to address 0290 to 0297
Port 4 to address 0298 to 029F

if you need to use other addresses refer to section Setting the physical address.

4. Check that jumper J13 is fitted between pins 1 and 2 this puts all the ports on the same IRQ.
5. Check that jumper J8 is fitted between pins 5 and 6, this puts all the ports onto IRQ5. RGA for Windows requires one IRQ to itself to operate correctly. IRQ5 must not be used by any other devices. If you cannot use IRQ5 because you have other devices connected to it refer to Satellite Comms Card

Step 2.

Installing the comms card in the PC and connect the control units.

Note the position of the connectors for the four ports on the comms card:

Port 1	PLG 5 mounted on the PCB closest to the edge connector
Port 2	PLG 4 mounted on the PCB furthest from the edge connector
Port 3	fitted to a flying lead connected to PLG 6 on the PCB
Port 4	fitted to a flying lead connected to PLG 2 on the PCB

The comms card should be installed in accordance with the PC manufacturer's instructions for the installation of plug-in cards. Note that

you will need an ISA (XT) slot for the card and a free adjacent slot.

Now, connect the control units to the comms card using the cables supplied. You can switch on the RGA control units and then power up your PC.

Step 3

This is where the installation under Windows 95 differs from the installation on other Windows systems. There is no software available for configuring comms cards under Windows 95. All the configuration can be done via the Windows95 control panel. Step 3 describes configuring one comm. port. For each card step 3 must be repeated 4 times (once for each port).



- 1) Select the  icon from Control Panel.
- 2) At the first page in the Add New Hardware Wizard.....



click on the Next> button.

- 3) At the second page, select 'No' to the question 'Do you want Windows to search for your new hardware?'



and then select Next>.

- 4) At the third page, select Ports (COM & LPT)



as the type of hardware to install, and then *click* on the Next> button.

- 5) At the fourth page, select (Standard port types) for the Manufacturer and Communications Port for the Model



and then select Next>.

- 5) At the fifth page Windows will come up with some likely hardware settings for the new port, these will most likely be wrong but at this stage they cannot be changed.



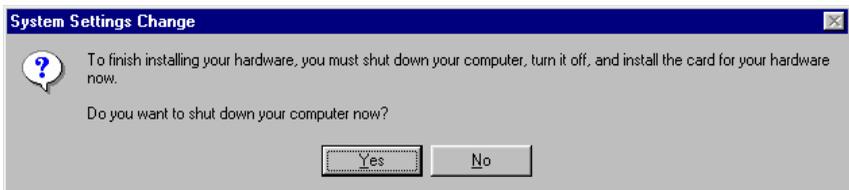
Just select Next> to accept the settings.

- 6) At the sixth and final page...



click on the Finish button.

7) You will see the following message;



Select No so that the machine does not re-boot.

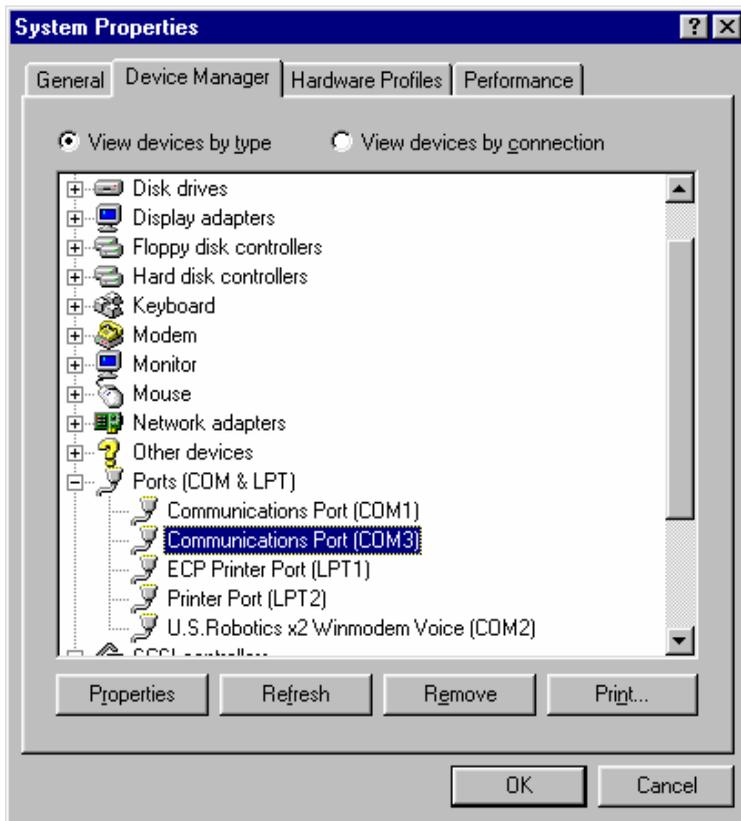
Repeat the above steps for each comm. port that you want to add.

Once all the ports are added, all that remains is to configure the correct settings.



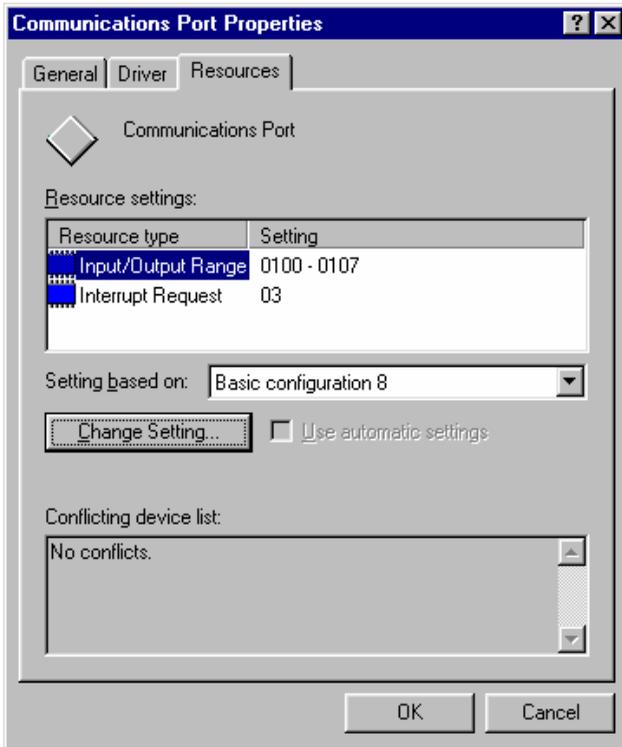
1) Select the **System** icon from Control Panel

- 2) Select the Device Manager tab at the top of the window and then expand the Ports (COM & LPT) branch by *clicking* on the + sign....

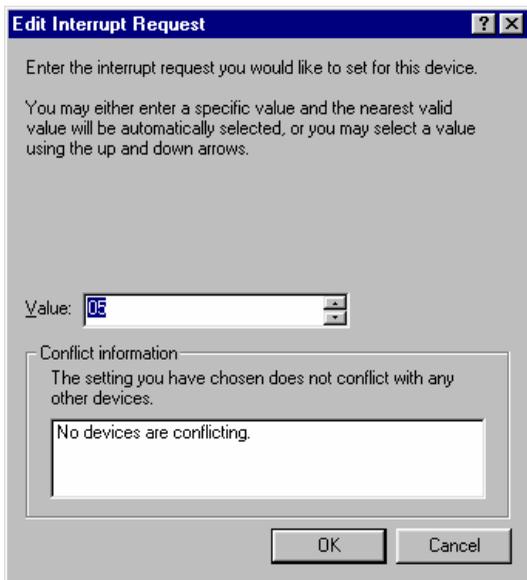
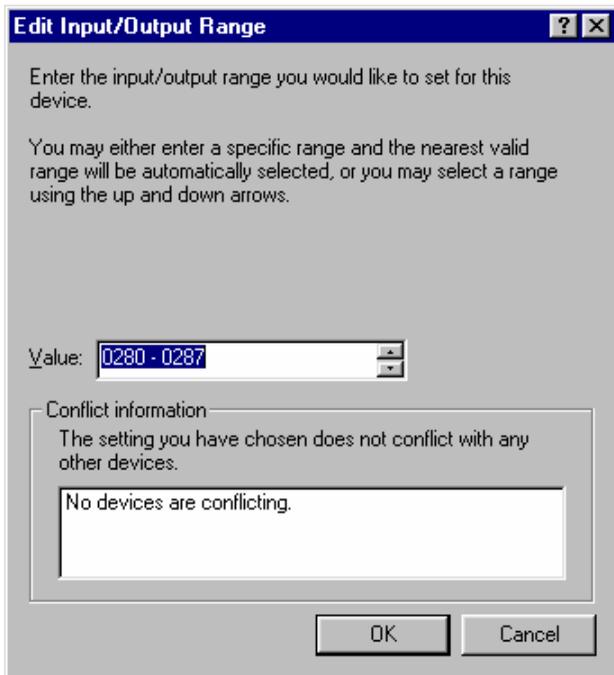


For each comm. port that you added in the previous steps, select it and carry out the following steps.

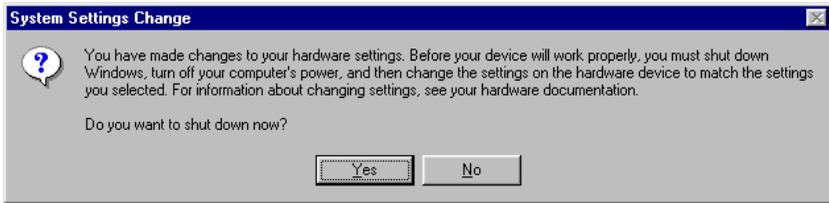
- 4) *Click* on the Properties button and select the Resources tab at the top of the window...



- 5) Change the Setting based on: setting to 'Basic configuration 8'. Once this is done you will be able to change the Input/Output Range (Base address) and Interrupt Request (IRQ) settings by *double clicking* them and selecting the appropriate values for the configuration of your comms card.



- 6) When the settings are correct, *click* the OK button. The following message will appear :



- 7) If you still have more ports to configure then choose No and repeat the steps above. If it is the last port left to configure then you can select Yes and the machine will shut down.

As long as the settings on the card match the settings that you have entered, when you reboot the ports will work OK.

Step 4

Installing the software on the PC.

To install Multi RGA for Windows:

- 1 Run up Windows 95
- 2 Insert the program Disk 1 in drive A (or B if you prefer).
- 3 *Click* on the Start button on the Taskbar and select Run... from the start menu.
- 4 Type a:install (or b:install if you are using the drive B)

The Spectra Install window will be displayed.

The install options:

RGA for Windows
Download
Recall
DDE Examples
Macro Examples

will be displayed. You can select the product options by *checking* the appropriate products. We strongly recommend you to install all the product options.

You may also change the default directory where RGA for Windows will be installed. For the purposes of this manual we will assume you use the default C:\SPECTRA directory.

- 5 *Click* on the Install button to begin the installation process. You will be prompted to insert program Disk 2 and Disk 3 at the appropriate time.
- 6 RGA for Windows will be installed on your hard disk and the Spectra folder will be created which will contain all the RGA for Windows program items.
- 7 When the installation process has been completed the configuration warning box will then be displayed and you will be prompted to run the Configure program. Press the Qk button.

Step 5

Assigning logical names to the ports on the comms card.

To assign the logical names to each port:

click on the Ports item in the Spectra folder

A warning box will be displayed asking you if you want to install our own comms. driver, *click* on the Yes button. See INI File Settings for more information about the comms driver.

click on the 1 Comms Card Default button (this was the way we configured the comms card in step 1)

then *click* on the Qk button.

You will then be prompted to re-start Windows, *click* on the Yes button to do this.

Step 5

Configuring RGA for Windows so that each head number is allocated to a port by its logical name.

Click on the Configure item in the Spectra folder, the Configure window will be displayed. Select the number of heads by *clicking* on the Number of Heads connected: *dropdown list box* then *click* on the appropriate number in the *dropdown list*. Then select the number of comms cards fitted in your PC by *clicking* on the Number of Comms Cards fitted: *dropdown list box* then *click* on the number in the list. Then, *click* on the Ok button.

You should have now successfully installed Multi RGA for Windows. Further information about the installation process can be found in the rest of this section.

3.15. Multi-Headed Detailed Installation

This section of the manual gives more detailed information on the installation of multi-headed RGA for Windows systems. This section will only be necessary if the step by step guide in the previous section was not suitable for your system.

3.15.1. Instrument architecture

The complete Multi Headed RGA for Windows system comprises of one PC running Multi RGA for Windows software and a number of RGA heads. Each RGA head has three basic elements:

the analyser	this is the part which fits into the vacuum chamber
RF power supply	this is a small electronic unit which fits directly onto the analyser
control unit	an electronic unit containing the power supplies and data acquisition system which connects to the PC via a serial cable

A three headed system would consist of; one PC fitted with a comms card which is running Multi RGA for Windows, three analysers, three RF power supplies, three control units and three RS232 serial cables.

Multi headed RGA for Windows systems may be configured to run one head, this is often done when additional heads are to be added at a later date.

The type of control unit used in RGA for Windows systems may vary. Microvision combines the traditional control unit and RF power supply

electronics into one extremely compact unit which plugs directly onto the analyser.

Microvision Plus is similar to the Microvision but enhanced electronics gives improvements in performance and allows additional RGA for Windows features to be used.

The Satellite is designed specifically to operate with a PC and has no built-in data display just six LEDs on the front panel to give status indication.

The Vacscan Plus instrument has a built-in CRT and can operate as a stand alone RGA without being connected to a PC. When the Vacscan Plus is run from the PC under RGA for Windows it operates in a Satellite emulation mode and its screen display will mimic the six LEDs on the front panel of the Satellite. When the Vacscan Plus is first powered up it assumes its stand alone mode, only when it is connected to the PC via its RS232 port and RGA for Windows is booted up will it switch to the Satellite emulation mode.

Vacscan control units may also be used in RGA for Windows systems.

There are certain limitations when using a Vacscan Plus or Vacscan as a Satellite. These are:

- a Remote Vacuum Controller cannot be fitted
- an Analogue Output Module is limited to six channels
- the scan speeds are slower (approximately 50%)
- the Download feature cannot be used
- the maximum mass range capability is 200amu
- only RS232 serial communication is possible
- the RF Tuning and RF Select facilities are not available

A mixture of different types of Spectra control units may be used in multi headed systems. For instance a three headed system could be made up from a Satellite, a Vacscan Plus and a Microvision. Any limitations associated with a control unit would still apply (e.g. you still cannot connect an RVC to a Vacscan Plus).

3.16. Computer Requirements, Multi

The minimum requirements for running Multi RGA for Windows are listed in the table below.

This is only the minimum requirement and the overall performance of Windows and hence RGA for Windows can be improved considerably by

increasing the specification of the PC. For this reason we would always recommend that Multi RGA for Windows is run on a PC fitted with at least a 90 MHz Pentium and 8MB of RAM. A 17inch monitor running at a resolution of 1024 x 768 is also recommended if data from multiple heads is to be viewed simultaneously.

Component	Description
Microprocessor	66MHz 80486sx
RAM	8MB
Hard Disk	Required with at least 6MB of free space
Video	Standard VGA 640 x 480 16 colour
Microsoft Windows	Version 3.1 or later or Windows 95. True Type fonts installed.
Mouse	A mouse is required.
Serial Port	One serial port required to connect each control unit to the PC. e.g. four heads four serial ports

3.17. Ports and Addresses

Before describing the Satellite comms card it is worth explaining a little about the physical address of a port and its logical name.

Each port is identified by a unique base address and an IRQ number which can be “shared” between ports. This information constitutes the physical address of a port and is configured on our Satellite Comms Card by setting jumpers. The possible settings for base address and IRQ selection are listed in tables 4, 5 and 6.

Logical names take the form of COM1, COM2 etc. and are used by the PC as a short hand to refer to a physical address (base address and IRQ). In the IBM PC and compatible computers a traditional relationship exists for COM1 to COM4 which is listed in table 3. The relationship is not physically fixed and it is quite possible to change the physical address allocated to any of these logical names using software. In fact the ports program supplied with RGA for Windows allows you to do this and assign logical names to the 4 extra ports on our comms card.

Port	Address	IRQ
Com 1	03F8h to 03FFh	4
Com 2	02F8h to 02FFh	3
Com 3	03E8h to 03EFh	4
Com 4	02E8h to 02EFh	3

3.18. Satellite Comms Card

The Satellite communications card (comms card) has been designed to enable Spectra RGA control units to be connected to a PC for multi headed RGA applications. If you are installing a multi headed RGA for Windows system you will almost certainly need to fit a comms card in your PC.

The majority of PCs have two built in serial ports, Com1 and Com2. Com1 is usually used to connect a mouse leaving Com2 free to connect an RGA control unit in single headed RGA for Windows systems. If both Com1 and Com2 were being used a comms card would have to be fitted to run a single head.

In two headed systems the control units will usually be connected to a comms card leaving Com1 for the mouse and Com2 free. If a bus mouse is used then it is possible to connect the two control units to Com1 and Com2 and not fit a comms card.

3.18.1. Comms card description

The Satellite comms card is a flexible serial interface board which may be set up in various configurations depending on the application. It should be supplied correctly configured for your application but before fitting the card it is worth checking the configuration. All the necessary information for configuring the card is given in the following section.

The Satellite comms card is populated according to the number of ports requested, one port is required for each control unit with four ports being available on a fully populated card. To determine how many ports are fitted look to see how many of the large 40 pin ICs (IC1, IC7, IC13, IC16) are fitted one is required for each port. Also check that these ICs carry the identification PC16550DN or similar (only the numbers 16550 are important).

The Satellite comms card will have been set to the requested serial interface specification, RS232 or RS422. To check this, for RS422 IC5, IC9 and IC11

will not be fitted and links Lk1 to LK8 will be fitted otherwise the board will be configured for RS232.

Also note the position of the connectors for the four ports on the comms card:

- Port 1 PLG 5 mounted on the PCB closest to the edge connector
- Port 2 PLG 4 mounted on the PCB furthest from the edge connector
- Port 3 fitted to a flying lead connected to PLG 6 on the PCB
- Port 4 fitted to a flying lead connected to PLG 2 on the PCB

3.18.2. Setting the physical address

The Physical Address is set by the three jumpers J8, J9 and J13. You should check against the following tables to ensure the required configuration is obtained.

Four setting options are available for the address decoding of the four ports. Jumper J9 is used to select the required option:

J9	PORT 1	PORT2	PORT 3	PORT 4
no link	03F8	02F8	03E8	02E8
3 - 4	0280	0288	0290	0298
1 - 2	02A0	02A8	02B0	02B8
1 - 2 & 3 - 4	03E8	02E8	02A0	02A8

Note that there are 8 bytes per port.

Each of the four ports generates its own IRQ (interrupt request). Under normal circumstances the four IRQs are “ORed” together and connected to a single IRQ line. Jumper J8 sets which IRQ line is selected. The table below shows the various options:

J8	IRQ
1 - 2	IRQ 3
3 - 4	IRQ 4
5 - 6	IRQ 5
7 - 8	IRQ 7
9 - 10	IRQ 2

The IRQ setting for Port 1 has the additional capability of connection to IRQ

4 or to the same IRQ as the other ports. This is governed by the setting of jumper J13:

J13	IRQ
1 - 2	same as ports 2,3 and 4
2 - 3	IRQ 4

Jumpers: J1, J2, J3, J4, J5, J6, J7, J10, J11, J12, J14 & J15 control the handshaking lines for the various ports. The setting of these links should not be altered.

3.18.3. Choosing the configuration

The configuration you choose will depend on your PC as well as the number and type of peripheral devices you have connected. The two important things to note are:

you will have to allocate a Comms Port for each RGA control unit you want to connect

you need one IRQ for all the RGA control units connected (regardless of the number) but no other devices must use this IRQ.

The majority of PCs have two built in serial ports usually referred to as Com 1 and Com 2 and use addresses 03F8-03FF and 02F8-02FF respectively. The interrupt request lines used for Com 1 and Com 2 are IRQ4 and IRQ3 respectively.

Great care should be taken when selecting port numbers (Com1 to Com12) and IRQ lines since their use may vary from one type of “compatible” PC to another. Before fitting a comms card or attempting to install RGA for Windows you should be familiar with the configuration of your PC.

Our standard configuration for the Satellite comms card is:

J9	link 3 to 4	which sets
Port 1		address 0280 to 0287
Port 2		address 0288 to 028F
Port 3		address 0290 to 0297
Port 4		address 0298 to 029F

J13 link 1 to 2 which sets
Port 1 to the same IRQ as Ports 2 to 4

J8 link 5 to 6 which selects
IRQ 5 for the four Ports.

Unless you specified otherwise your comms card will have been supplied with the above configuration.

The comms card should be installed in accordance with the PC manufacturers instructions for the installation of plug-in cards. Note that you will need TWO free slots for each comms card.

3.19. Connecting Control Units

Multi RGA for Windows software will run from one to eight control units, split into two groups of four units. The control units will normally be connected to Ports 1 through 4 on one of up to two Satellite comms cards, depending on the number of heads being used. The connections between your PC and the control units are made using the serial cables supplied, usually these will be RS232. The standard cable to connect a Satellite or Microvision to the PC is a 9-way D plug to 9-way D socket RS232 cable, a 25-way D socket to 9-way D plug RS232 cable is available as an option. To connect a Vacscan or Vacscan Plus to the PC a null modem cable is required as standard this is a 9-way D socket to 9-way D socket. A 25-way D socket to 9-way D socket is available as an option. In all cases the standard cable length is 3 metres (9 feet) longer cables are available on request, please contact your local Spectra facility.

Other types of serial communication such as RS422 or RS485 may be possible depending on the types of control units being used. Please refer RS422 and RS485 if you are using RS422 or RS485.

CAUTION

You must only use RS232 cables supplied with the equipment. We cannot guarantee that other manufacturers cables will work correctly in Spectra RGA systems.

If you must use an RS232 cable not supplied with the equipment then use the cable supplied as an extension to your cable ENSURING THE CABLE SUPPLIED WITH THE EQUIPMENT IS PLUGGED INTO THE PC.

Identify the serial port to which you will connect the first control unit. It is worth making a note of which control unit is connected to which port, for example Head 1 to Port 1. Then, connect the remaining control units.

Note, that it is only necessary to have the control units connected to the PC to run RGA for Windows, you do not have to have the RF power supply or analyser connected at this stage. In the case of Microvision and Microvision Plus, the unit does not have to be connected to the analyser. However, if you enter one of the scanning modes an RF Failed message will be generated.

As part of the installation process the configuration program will be run. This will determine which serial ports are available on your PC and ask you to specify which one is connected to each control unit.

3.20. Installing Share, Multi

If you are installing RGA for Windows to run under Windows 3.1 you will need to install SHARE. If you are installing RGA for Windows on later versions of Windows, such as Windows for Workgroups 3.11 or Windows 95, you will not need to install SHARE, so you may skip this section.

The SHARE program is supplied with DOS and allows different programs to use common files in an orderly fashion. RGA for Windows will not run without this command as the Microsoft Access Database Engine is used by RGA for Windows for the spectra library. The library data files are written in an Access format. You should find SHARE.EXE in your DOS sub-directory.

To install the share command add the following line to your autoexec.bat file in a part of the file that is used when booting Windows:

```
c:\dos\share.exe /l:500 /f:5100
```

This assumes that the share.exe command is in the DOS sub-directory c:\dos. If it is in another sub-directory use that name instead of dos in the above line.

note that there is a single space before each of the two forward slashes (/).

f: allocates the number of bytes for the share file information
l: sets the number of files that can be locked at any one time.

When the line has been added to the autoexec.bat file you need to re-boot

your PC. Do not re-boot your PC until you have read the next section.

3.21. Installing Override.com

If you are running under Windows 95 you do not need override.com.

In multi headed RGA for Windows systems where a Satellite comms. card is being fitted it is necessary to add the line **c:\spectra\override.com** to the autoexec.bat file. This is because the system BIOS on most PCs contains the addresses of the first four Com ports. When you boot up your PC the system BIOS looks for these Com port addresses and if they are present uses them to over write those in the Windows system.ini file. To prevent this the override.com program writes zeros into the BIOS for the four Com port addresses so that they are ignored when the PC is booted up and the values from the system.ini file are used.

To add the line:

1. Open a text editor such as Write which can be found in the Accessories program group in Windows.
2. Open the autoexec.bat file which can be found in the root directory, usually c:\.
3. Add the line **c:\spectra\override.com** to a part of the autoexec.bat file which is used when Windows is booted up.
4. Save the autoexec.bat file under the same name.
5. Now re-boot your PC so that the change is implemented.

Note: since the content of autoexec.bat files vary greatly from computer to computer it is not possible define exactly where the line should be put. Usually it will be towards the end of the file. If you experience any difficulties try putting the extra line in a different place in the autoexec.bat file.

3.22. Comms Cards and Windows 95

If you are running under Windows 95 and are installing a comms card you will need to configure Windows 95 to recognise the card. There is no

software to automatically do this. Please follow the step by step instructions in Quick Guide Windows 95 . You should do this before you install the RGA for Windows software.

3.23. Running Install, Multi

The INSTALL.EXE program included on program Disk 1 should be used to install Multi RGA for Windows onto your hard disk. To install RGA for Windows follow the procedure listed below:-

- 1 Run up Windows
- 2 Insert the program Disk 1 in drive A (or B if you prefer).
- 3 Chose the **R**un... option from the Windows Program Manager **F**ile select menu.

Win95 *Click* on the **S**tart button on the Taskbar and select **R**un . . .

- 4 Type **a:install** (or **b:install** if you are using the drive B)

The Spectra Install window will be displayed.

The install options:

RGA for Windows
Download
Recall
DDE Examples
Macro Examples

will be displayed. You can select the product options by *checking* the appropriate products. We strongly recommend you to install all the product options.

You may also change the default directory where RGA for Windows will be installed. For the purposes of this manual we will assume you use the default C:\SPECTRA directory.

- 5 *Click* on the **I**nstall button to begin the installation process. You will be prompted to insert program Disk 2 and Disk 3 at the appropriate time.

RGA for Windows will be installed on your hard disk and a program group called SPECTRA will be created and the Multi RGA for Windows program items added.

Win95 RGA for Windows will be installed on your hard disk and the Spectra folder will be created which will contain all the RGA for Windows program items.

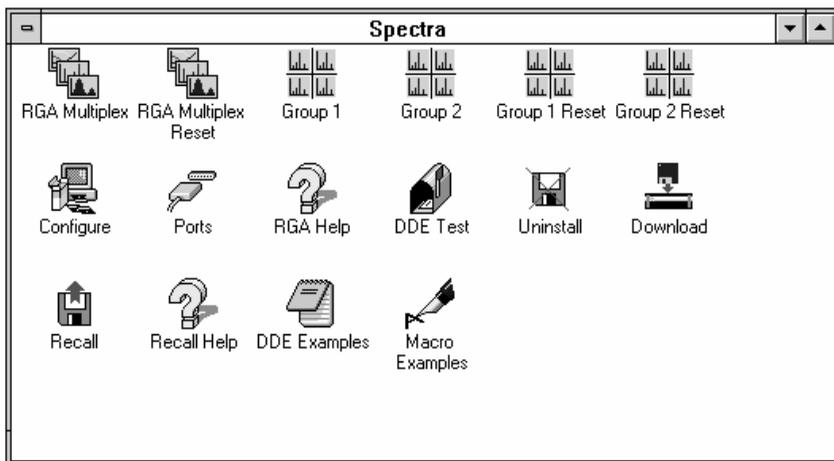
When the installation process has been completed the Share.exe warning box may be displayed; *click* on the **Ok** button. The configuration warning box will then be displayed and you will be prompted to run the Configure program. *Click* on the **Ok** button.

3.24. Spectra Program Group, Multi

The Spectra program group as shown below contains seventeen program items, each is briefly described below.

Win95 The items in the Spectra folder are described below, they are the same as the program items in the Spectra program group in

Windows 3.1 and later systems. To display the Spectra folder *click* on the **Start** button on the Taskbar and select **Programs | Spectra** from the start menu.



RGAs

- RGAs Multiplex** This item is used to start RGA for Windows using the Multiplex facility and the previous session parameters.
- RGAs Multiplex Reset** This item is used to start RGA for Windows using the Multiplex facility and the default parameters.
- Group 1** This item is used to start the first group of up to four heads using the settings from the previous session.
- Group 1 Reset** This item is used to start the first group of up to four heads using the default settings.
- Group 2** This item is used to start the second group of heads (heads 5 to 8) using the settings from the previous session.
- Group 2 Reset** Used to start the second group of four heads using the default settings.
- Configure** This runs the configure program allowing the selection of the comms ports.
- Ports** This is a utility program allowing custom configuration of multiple comms ports. It is designed primarily for multi headed systems where Spectra Satellite comms cards are being used.
- RGAs Help** The help files are contained in a separate program and may be opened by *double clicking* this icon, pressing the help button or selecting Help whilst running RGA for Windows.
- Uninstall** This utility is used to remove RGA for Windows from your hard drive.
- DDE Test** This test program is used with the DDE Links feature and is described in section 5.

- Download This is used to upgrade the code in a Satellite control unit, refer to Download for more information.
- Recall Recall is a separate program which allows the review of RGA for Windows data files obtained using the Disk Store feature described in Disk Store . Please refer to the Recall manual.
- Recall Help Recall has its own help files stored as a separate program, again refer to the Recall manual.

DDE Examples

These are example files to help the user with the DDE (dynamic data exchange) Links feature. Please refer to section 5 of this manual.

Macro Examples

These are example files to help users with the Macro feature described in section 5 of this manual.

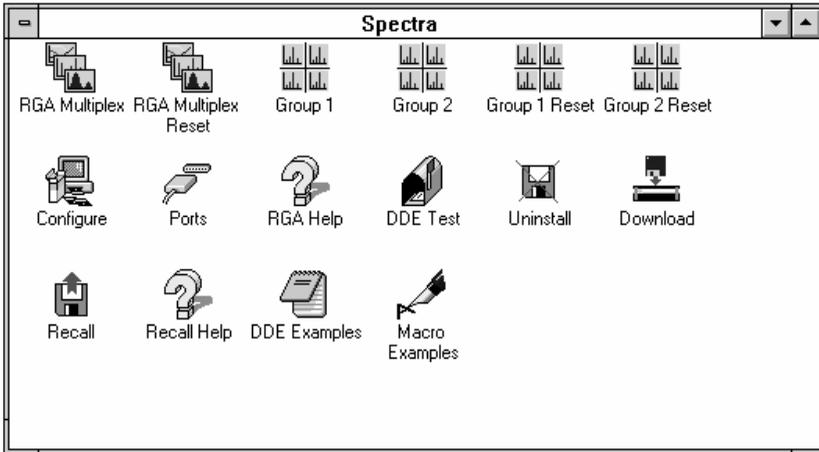
To complete the installation of Multi RGA for Windows you must run the configuration program. To do this *double click* on the Configure icon in the SPECTRA program group.

3.25. Configuring Multi RGA for Windows

The configuration program should be run as part of the installation process and can be re-run at any time to change the configuration of Multi RGA for Windows. To run Configure, *double click* the Configure icon in the SPECTRA program group.

- Win95 To run Configure *click* on the **Start** button on the Taskbar and select **Programs | Spectra** and *click* on the Configure item in the Spectra folder, the Configure window will be displayed.

The Configure Window will be displayed, as shown below.



The first thing to set is the number of heads which are connected to the PC. To do this *click* on the down arrow to the right of the **Number of Heads connected:** text. A *dropdown list* containing the numbers 1 to 8 will be displayed, *click* on the appropriate number.

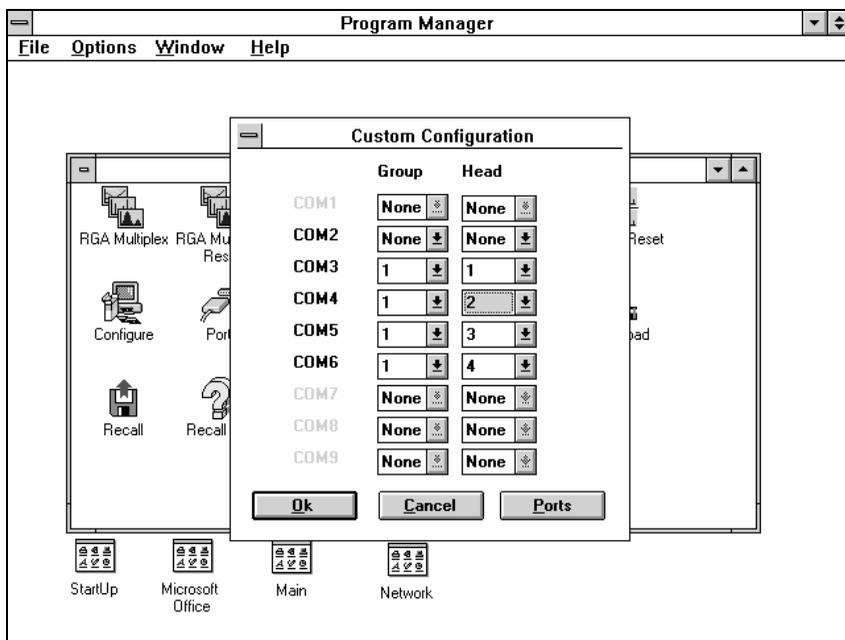
Next select the number of Satellite comms cards which are fitted in the PC. *Click* on the down arrow to the right of the **Number of Comms cards fitted:** text. *Click* on the appropriate number in the *dropdown list*. Note that **0** is selected when a comms card is not fitted and the two built-in comms ports Com1 and Com2 are to be used.

Now you should choose whether you wish to carryout a standard or custom configuration. The standard configuration will use our default settings for the assignment of; heads to ports, addresses to ports and IRQ settings. These default values will work successfully on the majority of computers and the various settings are given at the end of this section. The custom configuration allows the user full control of the set up of RGA for Windows. We recommend using the standard configuration if at all possible.

To select the standard configuration *click* on the **Standard configuration** *radio button* and then *click* on the **Ok** button.

To select the custom configuration *click* the **Custom configuration** *radio button* and then *click* on the **Ok** button. The custom configuration window will be displayed, as shown below, which lists the nine possible comms ports with those not available being *grayed out*. For example Com1 will

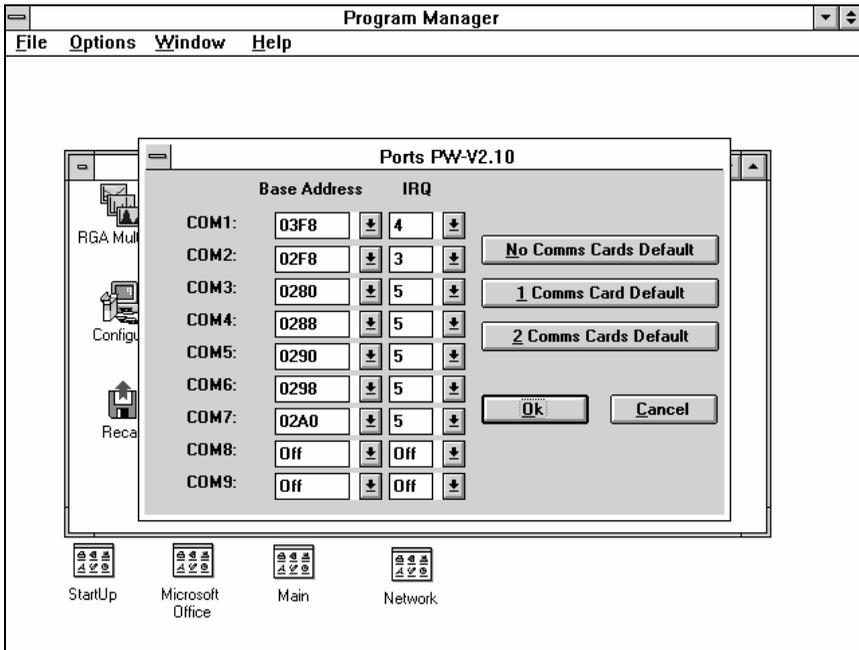
often be *grayed out* because the mouse is connected to Com1. Each of the available Comm ports can be assigned to a group, either group 1 for the first four heads or group 2 for heads 5 to 8. Also, each of the four heads within a group may be assigned to a particular Comm port. To do this *click* on the appropriate down arrow and select the required number from the *dropdown list* by *clicking* on it.



From the custom configure window you can select the ports window by *clicking* on the **Ports** button. This has the same effect as selecting the Ports icon from the Spectra program group. The ports window will be displayed as shown below. This shows base address and IRQ for each of the nine possible comms ports which may be set-up to match the hardware fitted to your PC. Three default options are available through the three buttons **No Comms Card Default**, **1 Comms Card Default** and **2 Comms Cards Default**. These give the most common configurations. As you *click* on each of the buttons the values for the base address and IRQ will change. Selecting one of these three buttons gives the same result as selecting 0, 1 or 2 comms cards in the configuration window. The default settings are given at the end of this section.

Once you have made the changes *click* the **Ok** button and the restart Windows warning box will be displayed. *Click* the **Yes** button and Windows will be re-started to implement the new settings.

When Windows has re-started you must enter the configuration program again, whether you are performing a standard or custom configuration and repeat the configuration process outline above re-setting any parameters that are not as you set them. This time when you exit the configuration program Windows will not be re-started.



You have now completed the installation of the RGA for Windows software. We strongly recommend that you now work through the Getting started section of this manual. This will not only introduce you to RGA for Windows but will also check out the operation for your RGA system.

3.26. RS422 and RS485

RS422 is a differential serial communications system usually used when the distance between the transmitter and receiver exceeds that permitted under RS232. If you are using a Satellite control unit it must be fitted with the RS422 option The Satellite comms card must be configured for RS422

operation. The cables used are not the same as the RS232 cables and the two types are not interchangeable. Using RS422 makes no difference to the software as the serial protocol is the same. Connection of the system is the same as RS232 systems.

At the time of writing none of the Spectra range of control units support RS485, although it is planned to be offered in the future. The Satellite comms card does not support RS485.

3.27. Windows System Ini File

The windows system.ini file contains the line

```
comm.drv = comm.drv
```

during the installation process our own comms port driver is loaded on to your computer to allow serial communications with more than four peripherals (the limit in Windows). The above line will be replaced with the line:

```
comm.drv = c:\spectra\ledacomm.drv
```

assuming you use the default directory.

3.28. Default Comms Settings

No Comms Cards Fitted

Port	Com	Group	Head	Base Address	IRQ
Built In 1	1	1	1	03F8	4
Built In 2	2	1	2	02F8	3
None	3	None	None	Off	Off
None	4	None	None	Off	Off
None	5	None	None	Off	Off
None	6	None	None	Off	Off
None	7	None	None	Off	Off
None	8	None	None	Off	Off
None	9	None	None	Off	Off

This is used when one or both of the built-in comms ports are to be used.

Note if no comms card is selected and the mouse is connected to COM1 only COM2 will be shown as available to RGA for Windows.

3.28.1. One Comms Card Fitted

Port	Com	Group	Head	Base Address	IRQ
Built In 1	1	None	None	03F8	4
Built In 2	2	None	None	02F8	3
Comms Card 1	3	1	1	0280	5
Comms Card 2	4	1	2	0288	5
Comms Card 3	5	1	3	0290	5
Comms Card 4	6	1	4	0298	5
None	7	None	None	Off	Off
None	8	None	None	Off	Off
None	9	None	None	Off	Off

3.28.2. Two Comms Cards Fitted

Port	Com	Group	Head	Base Address	IRQ
Built In 1	1	None	None	03F8	4
Built In 2	None	None	None	02F8	3
1st Comms Card 1	2	1	1	0280	5
1st Comms Card 2	3	1	2	0288	5
1st Comms Card 3	4	1	3	0290	5
1st Comms Card 4	5	1	4	0298	5
2nd Comms Card 1	6	2	1	02A0	5
2nd Comms Card 2	7	2	2	02A8	5
2nd Comms Card 3	8	2	3	02B0	5
2nd Comms Card 4	9	2	4	02B8	5

3.29. Upgrading From Earlier Versions

3.29.1. RS232 cable

Users who are upgrading from earlier versions of RGA for Windows software may need to modify the RS232 cable. If you encounter either of the following error messages:

"Noise has been detected on the Carrier Detect line of the RS232 interface

which may degrade the performance of your system. Refer to the trouble shooting section of the RGA for Windows manual."

OR

"Noise has been detected on the Ring Indicator line of the RS232 interface which may degrade the performance of your system. Refer to the trouble shooting section of the RGA for Windows manual."

then you definitely need to modify the cable.

WARNING

This work must only be carried out by a competent person. If in any doubt, contact your local agent for a replacement cable.

To do this:-

1. Switch off both the PC and the Satellite control unit and disconnect the power supply leads.
2. Unplug the RS232 cable from the PC.
3. Carefully remove the D-type connector shell. This may involve prizing apart the two halves in the case of a plastic shell or removing the two screws in the case of a metallised shell.
4. Disconnect the wire connected to pin 1 of the 9 way D socket (pin 8 in the case of a 25 way D socket). Carefully cut back this wire to ensure it cannot short on any of the other pins, the cable braid or the metal shell.
5. Connect pins 1,9 and 4 together (9 way) or connect pins 2,8 and 20 together (25 way). Note that pin 4 (9 way); pin 20 (25 way) already has a wire connected - keep this connection.
6. Re-assemble the D-type connector.
7. Re-connect the serial cable and then the mains leads.
8. Switch on the control unit and run up the PC.
9. Run RGA for Windows using RGA Reset.

Remember the above should only be necessary if you are upgrading from earlier versions of RGA for Windows. New instruments supplied with version 2.00 or later versions of software should have a modified RS232 cable.

3.29.2. Preserving settings

The installation procedure has been improved from previous versions so that if a copy of RGA for Windows is already on the computer in the same directory that you choose to install the new version to it will not overwrite any settings from the original installation. All the settings are stored in a file called RGA4WIN.INI (RGA4WINn.INI for Multi RGA for Windows where n is the head number) you may wish to save a copy of this in a separate directory before you start the upgrade. Any changes that are required to upgrade the original settings files to V2.40 format will be made and a message indicating that the upgrade was carried out will be displayed.

If an upgrade was not carried out or it failed for some reason then the normal configuration procedure is entered.

3.30. Download

Download may only be used with Satellite, Microvision and Microvision Plus units. It CANNOT be used with Vacscan and Vacscan Plus units.

The RGA control unit has EPROM based software and an area of battery backed RAM which can also contain the control unit operating software. When RGA for Windows establishes communication with the Satellite, Microvision or Microvision Plus the code held in the battery backed RAM will be used if it is found, otherwise the EPROM software is used.

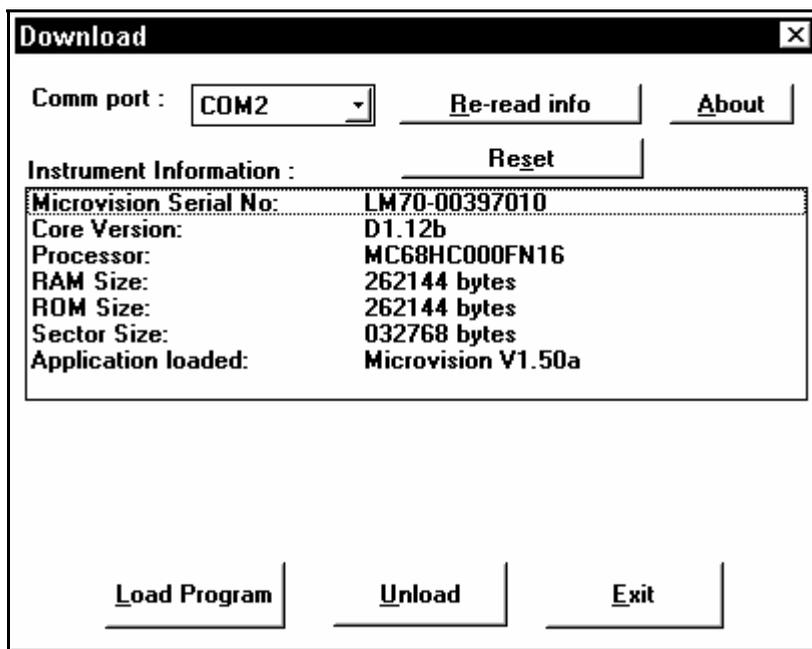
When a software upgrade is carried out it is often necessary to upgrade the software in the control unit as well as the RGA for Windows software on the PC. The control unit software can be downloaded from the PC via the serial link thus removing the need to change the EPROM.

To do this:

double click on the Download icon in the Spectra program group. The Download *dialog box* will be displayed as shown below.

Win95 To run Download *click* on the **Start** button on the Taskbar and

select **Programs | Spectra** and *click* on the Download item in the Spectra folder, the Download window will be displayed as shown below.



Select the comm. port by *clicking* on the **Comm port:** *dropdown list box* and then *click* on the required comm. port. As soon as you do this the RGA for Windows software will try to establish communications with the control unit. If this is successful one or more lines of information will appear in the **Instrument Information:** box. This process can be repeated by *clicking* on the **Re-read info** button and will be repeated each time a new comm. port is selected.

To load the control unit code into RAM *click* on the **Load Program** button and the **Select File To Download** *dialog box* will be displayed. You can select the drive and directory where the code is stored. Also you can select the file type as Satellite and Microvision/Microvision Plus control units have different file types. The full file name for Satellite code to run RGA for Windows using the default path is:

C:\spectra\satcode.ram

The full file name for Microvision code to run RGA for Windows using the default path is:

C:\spectra\microv.img

The full file name for Microvision Plus code to run RGA for Windows using the default path is:

C:\spectra\mvplus.img

Once the correct file name has been specified *click* on the **OK** button and the code will be transferred, this takes a little time (just long enough to get a cup of coffee, if you're quick).

Click on the **Exit** button to close the Download *dialog box*.

Clicking on the **About** button will display the Download version window which provides useful information for our technical staff should you require assistance.

Note that in a multi-headed system it will be necessary to Download control unit code to each control unit in the system. The above procedure must be repeated selecting each comm. port used in turn.

To remove the software from the battery backed RAM in the control unit use the **Unload** button. The RGA control unit will revert to using the software held in the EPROM. This must be done if the EPROM in a Satellite has been changed, otherwise RGA for Windows will carry on using (or trying to use) the code held in the battery back RAM.

It may not always be possible to upgrade the software in the Satellite by using the download facility. For instance if the EPROM software is many software versions older than the new software. Please contact your local Spectra facility if you are in doubt. Changing the EPROM is quite straight forward and if it is required full instructions will be supplied with the replacement EPROM.

If you are upgrading to version 2.40 RGA for Windows from version 2.1x (where x = 0 to 9) you will need to upgrade the software in the Satellite control unit but this can be done using the Satellite Download facility.

Remember that you cannot use the Satellite Download facility with Vacscan Plus or Vacscan control units. To upgrade to version 2.40 from earlier versions you will have to change the EPROM(s) in the control unit. This is a straight forward procedure, please contact your local Spectra service centre for further details.

3.31. Baking The Analyser

CAUTION

The Electron Multiplier (SEM) MUST NOT be operated at temperatures above 50°C.

With dual (faraday and electron multiplier) detector instruments serious damage will be caused to the electron multiplier if it is operated at temperatures above 50°C. Where instruments use a standard RF power supply the RF must be removed to bake out so there is no chance of the multiplier inadvertently being switched on.

It is possible to run instruments using RF power supplies fitted with a bakeable adapter during a bake out. In this case only the faraday detector should be used NOT the multiplier.

No damage is caused to the multiplier by high temperatures provided it is not switched on.

The only remedy when a multiplier has been damaged due to being operated at higher temperatures is to replace it.

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Section 4.

Getting Started

4.1. Getting Started Introduction

This manual assumes that you are familiar with the Windows environment. We have made every effort to use the standard windows terminology so that you can quickly refer to the Microsoft Windows manual for detailed information about specific windows topics. In addition to the standard Windows terminology, some terms are defined which describe controls and concepts used within RGA for Windows. The basic operation of RGA for Windows and its terminology are introduced in this section.

Also included in this section is a quick general introduction to the subject of Residual Gas Analysis. The modes of operation and techniques employed within the RGA for Windows package are also introduced.

At the end of this section we include a guided tour of RGA for Windows. We strongly recommend that you take the time to run through the tour since it will give you a basic understanding of how to use RGA for Windows and will check that the complete system is operating correctly.

- RGA for Windows Basics
- Parts of RGA for Windows
- Controls
- Quadrupole RGA
- Guided Tour
- Running RGA for Windows
- Running Diagnostics
- Setting a Total Pressure Trip
- Starting the Bar Chart Mode
- Switching a Filament On
- Changing the Mass Scan

4.2. RGA for Windows Basics

4.2.1. Running RGA for Windows

After installing RGA for Windows, thirteen (seventeen in the case of Multi

RGA for Windows) program items will have been added to the SPECTRA program group as shown in figures 1 and 2.

Win95 The RGA for Windows items appear in the Spectra folder. *Click* on the **Start** button on the Taskbar then select **Programs | Spectra**.

The configure program was run as part of the installation process. If you ever connect control units to different serial (Com) ports, the configure program must be run to specify the serial port used.

When RGA for Windows is run for the first time after installation, a POWER UP RESET should be performed. This will ensure that all the parameters stored in data files on the PC and in the control unit's memory are reset to the default values. To perform a POWER UP RESET *double click* the RGA Reset program item icon.

Win95 *Click* on the **Start** button on the Taskbar, select **Programs | Spectra** then *click* on the RGA Reset item.

If you are using Multi RGA for Windows *double click* on the RGA Multiplexer Reset program item icon, do not use the Group 1 Reset and Group 2 Reset icons until you are more familiar with the system.

Win95 If you are using Multi RGA for Windows *click* on the RGA Multiplexer Reset item, do not use Group 1 Reset and Group 2 Reset until you are more familiar with the system.

To run RGA for Windows when a POWER UP RESET is not required you should *double click* the RGA program item icon.

Win95 *Click* on the **Start** button on the Taskbar, select **Programs | Spectra** then *click* on the RGA item.

To run Multi RGA for Windows when a POWER UP RESET is not required you should *double click* on the RGA Multiplexer program item icon.

Win95 *Click* on the **Start** button on the Taskbar, select **Programs | Spectra** then *click* on the RGA Multiplexer item.

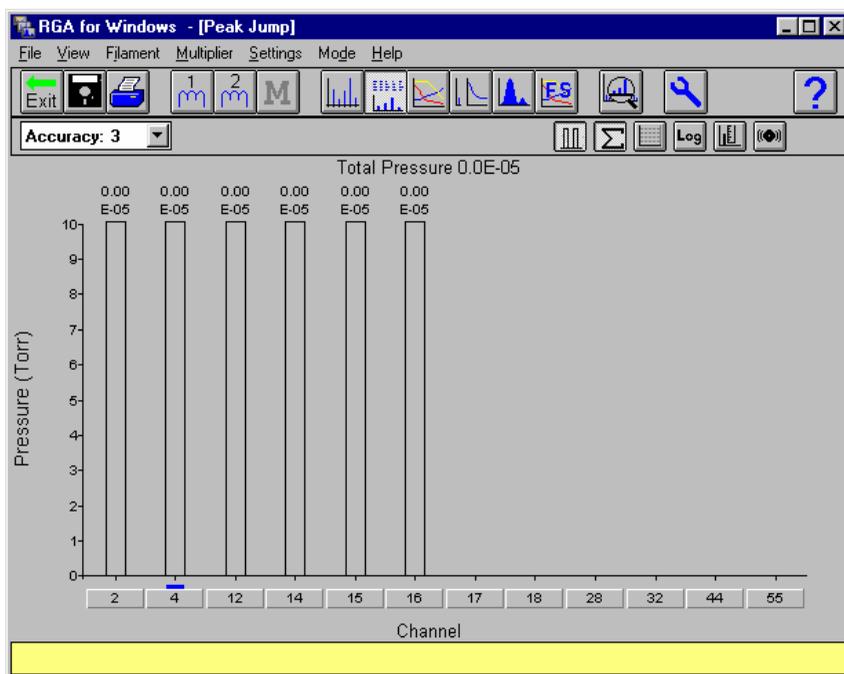
Mouse and keyboard operation

RGA for Windows operation is similar to any other windows application. Keyboard operation is supported using the standard *menu* and *shortcut keys*. There are a number of operations which can be performed more efficiently using the keyboard, however a keyboard is only required if you want to specify a filename for disk store. Text information can only be entered using the keyboard and you will probably find that changing the numeric value of a parameter by a large amount is best achieved by entering the new value from the keyboard.

The basic techniques for keyboard and mouse operation are described in the Microsoft Windows user guide.

4.3. Parts of RGA for Windows

A typical peak jump mode display is shown below click on the the graphic to identify the various parts of the screen.



Title Bar

The Title Bar unsurprisingly contains the application name RGA for

Windows, the head number and the currently selected mode.

Menu Bar

In common with other Windows applications all the software functions can be accessed from the menu bar.

Icon Bar

Buttons on the icon bar allow access to the main functions and modes within RGA for Windows.

Setting Bar

Functions and parameters which are related to a specific scanning mode are displayed and altered here.

Channel Buttons

Modes which are channel based (peak jump, multi trend and fast scan) have a number of parameters associated with each channel. These parameters are altered in the Channel Settings *dialog boxes* which are accessed using the channel buttons.

Help Bar

To discover the purpose of a particular button, you should *point* to the button of interest. The text displayed on the help bar will automatically change to indicate the function of that button. The text displayed will only be updated when you *point* to another button.

Mode Window

The scanning modes plot the results of the scan in this window.

4.4. Controls

Controls on the *icon* and *setting bars* together with those available through the channel buttons provide the ability to set most of the parameters and select the main functions. There are some more advanced features which can only be set from the *menu bar*. Most of the controls on the *icon* and *setting bars* and in the channel buttons are interactive allowing you to quickly change a parameter or select a function. In some cases the controls will cause a *dialog box* to be displayed allowing a series of parameters to be set using standard windows controls. A description of each *dialog box* is included in the reference section of this manual. The basic operation of the interactive controls are explained below.

On/Off Buttons

These are controls which have two states. When you *click* on the button the state of the parameter is toggled and the button will indicate the new state of the parameter. On/off buttons can appear on the *icon* or the *setting bar* where the current state is indicated by the simulated raised or depressed state of the button. When the button is raised the function is off and when depressed it is on. The leak check audio on/off and bar chart autorange buttons use this type of control.

Push button

These buttons depress while you *click* but will then spring out and activate the required function straight away. Parameter increment and decrement buttons operate in this way. Some push buttons have an auto repeat feature which enables the button to be "repeatedly pressed" while the mouse button is held depressed.

Button group

This refers to a group of three related push buttons which appear on the *setting bar* in several modes. Although the buttons operate just like any other push button they are used to set the same parameter. The centre button has an icon indicating to which parameter the button group relates. If you *click* this button a parameter setting *dialog box* is opened which allows the parameters value to be set. The button to the left (↑) and right (↓) will decrement and increment the parameter respectively.

Dropdown list box

Where a parameter may take one of a limited number of possible values a *dropdown list box* is used. When you *click* on the parameter a list of available settings is displayed. You should then *click* the required setting as displayed in the list. In some cases where the list of options is too long a vertical scroll bar will appear to the right of the list indicating that other possible settings are available. The range control on the *setting bar* is an example of a *dropdown list box*.

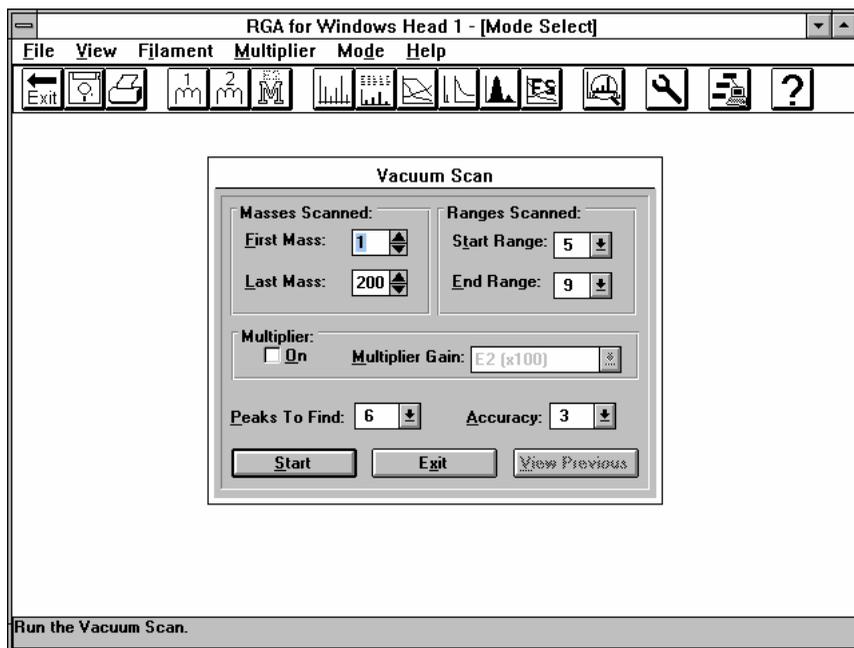
4.5. Quadrupole RGA

Quadrupole residual gas analysers are regularly used to characterise and monitor vacuum environments at pressures below 1×10^{-4} mBar. Operation at higher pressures is carried out using a quadrupole with a high pressure adapter. The spectra obtained by plotting ion current against mass can

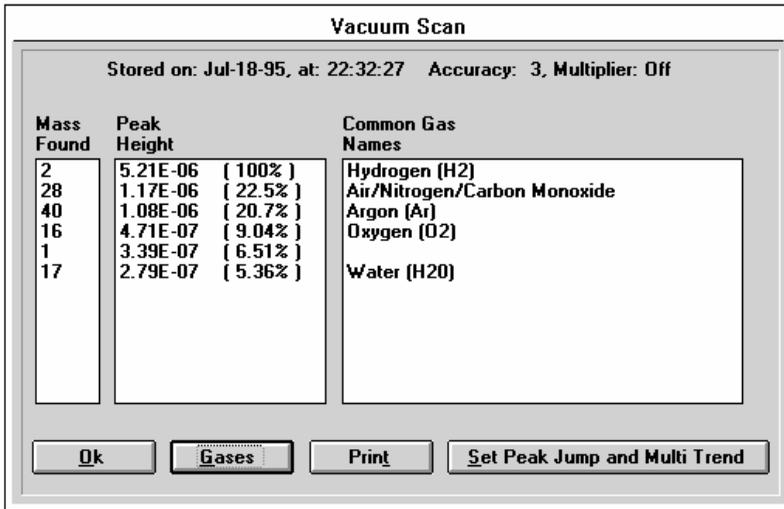
provide the user with valuable information on the relative abundance of gasses in the vacuum system. RGAs may be used to perform a number of different types of analysis. Since the demands of different applications vary widely, it is necessary to provide a range of optimised general purpose modes of operation. To get the best possible performance from the RGA the correct mode of operation should be selected for your particular application. The basic modes of operation supported by RGA for Windows are listed below along with a brief description of when they should be used.

4.5.1. Vacuum scan

Vacuum scan is a fully automated vacuum analysis program that requires the minimum effort to produce useful information about the state of your vacuum system. It will scan a user selected mass range for the largest partial pressures within a defined magnitude range, as shown below.



When complete, the mass numbers and their magnitudes are listed in descending order, as shown below. The number of masses reported is variable between 1 and 12.



This mode carries out a basic RGA check and as such should be used regularly for system monitoring. All too often people forget about the quality of their vacuum until something goes wrong. With vacuum scan you can regularly check the vacuum quality and print the results for hard copy without spending any time on the system yourself.

The mass range to be scanned may be adjusted from 1 to the maximum mass available on your system. The magnitude range is set in terms of the instrument gain ranges. If the ranges scanned are set so that the start range is E-6 and the end range is E-7, the required number of masses with magnitudes in the range 9.90×10^{-6} down to 0.7×10^{-7} will be listed.

When the scan has finished and the results have been displayed some additional functions are available. Firstly the mass numbers and range of the peaks listed may be transferred to the peak jump, multi-trend and fast scan modes. Secondly you have the option to ask for a list of suggested common gasses for the masses present.

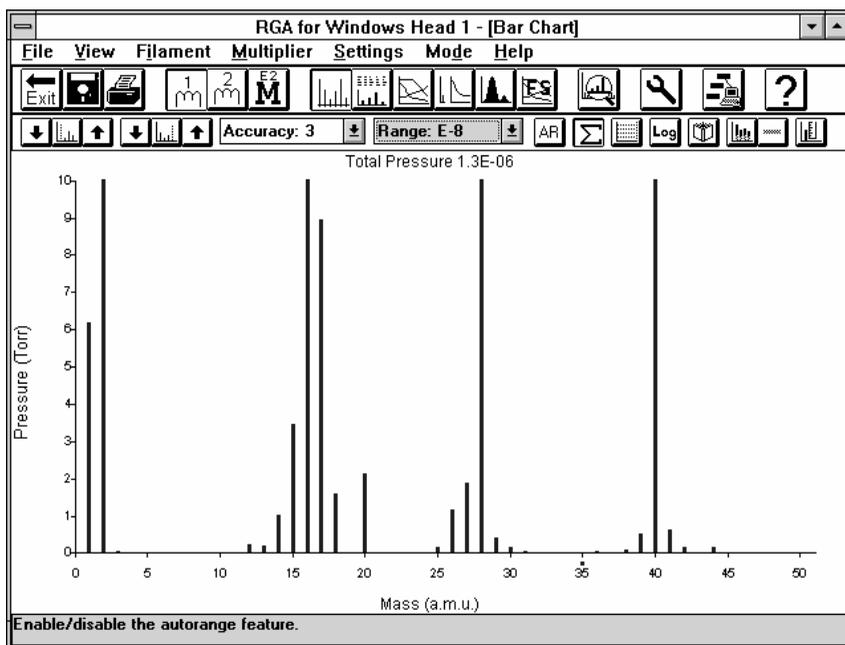
The results of the last scan are stored along with a date and time stamp. It is possible at any time to view the results of the previous vacuum scan until the mode is run again. At this time the previous results are overwritten with the new scan results.

4.5.2. Analogue

This is not intended to be used as an analytical mode although it may be useful for some applications. It is an important mode for tuning the R.F. head and as a means of monitoring the general condition of the analyser. Under normal operation you should not need to use this mode.

4.5.3. Bar chart

In this mode the peak intensity information is presented in a histogram format as shown below



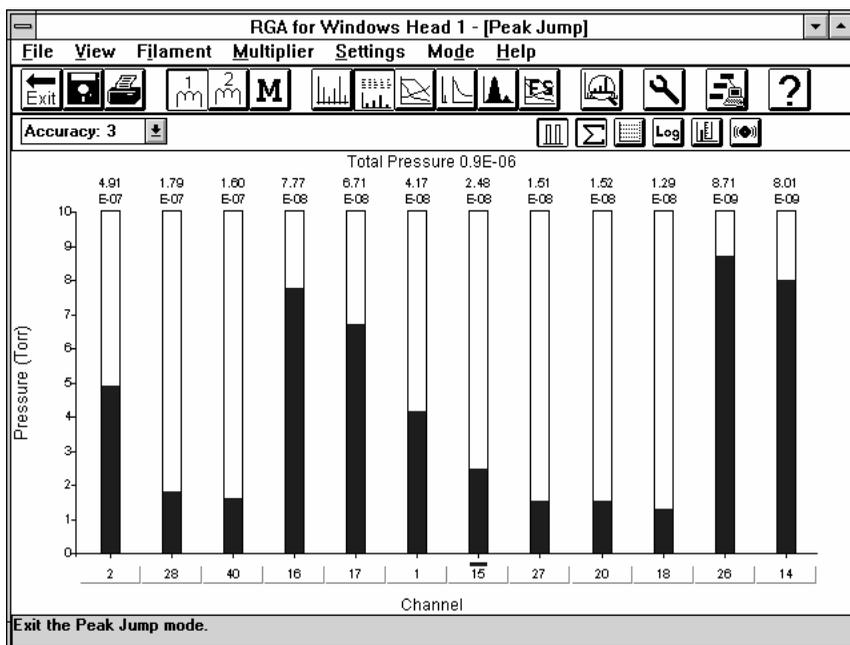
The start mass and mass span of the scan can be chosen as can the range on which the scan is taken. An autorange feature is also available which will adjust the range of the instrument until the mantissa of the largest peak falls within the range 0.70 and 9.60 when the linear axis is selected. A logarithmic intensity axis enables the display of data over the full dynamic range of the instrument. This mode is used for taking a general over-view of the vacuum system. It is the mode in which you are likely to find something unexpected within the vacuum system.

This mode is useful in many circumstances....

- When you wish to take a snapshot picture of the vacuum system at any point in time.
- If you do not know what is going on in the vacuum system you would use this mode to see which gas predominates.
- If you are collecting data on more than the 12 components which could be handled by the peak jump or multi-trend modes.

4.5.4. Peak jump

Having established that the general condition of your vacuum system is satisfactory, your attention will probably turn to a limited number of specific components on which your process depends. You now no longer need to spend time measuring every peak in the system but want to concentrate on just a few.



This mode enables you to individually set the mass in any of the twelve channels. You can assign each individual channel to either a specific gain range or, set the instrument to autorange throughout its whole dynamic range. This gives tremendous flexibility for process monitoring as you can monitor high and low level components simultaneously. As you are only

spending time looking at the chosen peaks this gives you a major time saving in one of two ways.

Firstly this enables you to take readings more frequently. However, the instrument offers a variable accuracy code which enables you to control the measurement routine, the more accurate the result, the longer the time it will take. This means that instead of using the time in peak jump to acquire more data, you could acquire the same amount of data but with considerably improved accuracy.

Secondly, in addition to measuring partial pressure peaks you may select either total pressure, or one of the two or more (depending on RGA control unit type) built in analogue inputs to be measured in any channel.

This mode also has a high and low alarm capability for each channel. The alarms operate in the range $0.1E-14$ to $9.9E-05$. The alarm condition is triggered if the magnitude of a peak exceeds the high alarm setting or falls below the low alarm setting. The peak is plotted in red if its magnitude falls outside the alarm range and an output is set true on the relevant pin of the AUX I/O connector on the control unit.

There are a number of key advantages for this mode:-

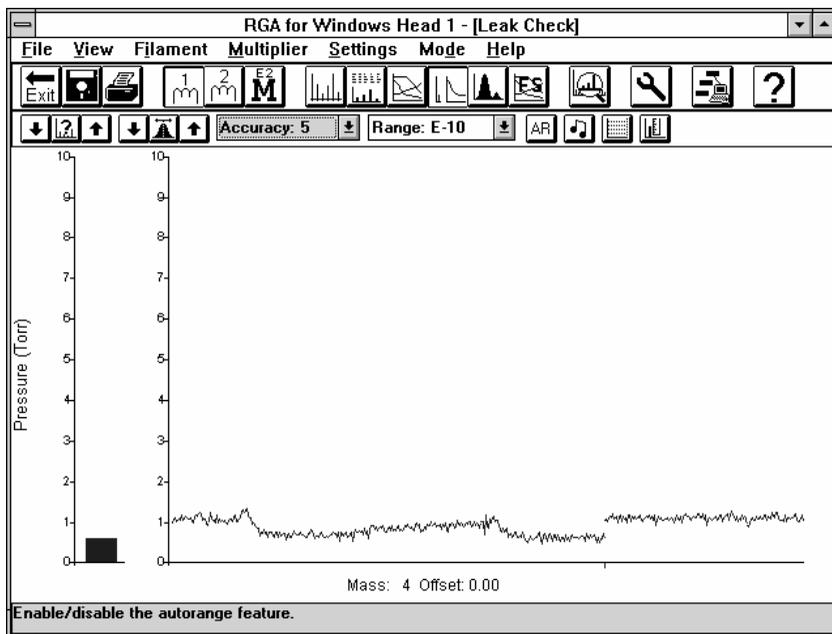
The logarithmic axis and auto ranging ability makes this mode useful for any kind of process monitoring. Alarms enable the system to be used to regulate key process values.

The increased speed with which data can be collected makes this mode useful for short term experimental monitoring applications.

The control you have over the accuracy makes this mode useful for detailed experimental work.

4.5.5. Multi trend

Very often when only a few components are being measured you may not be interested in the instantaneous magnitude of a particular mass, but rather in the variation in magnitude over time. The trend mode enables up to twelve components to be monitored over time. You can individually set the mass, range and detector for each channel. The results are displayed on an intensity versus time graph which scrolls across the screen. The scroll rate is set by the scan interval. The interval sets the resolution of the time axis and also sets the minimum scan rate. If the time taken to complete a single scan is



4.6. Guided Tour

This section takes you step by step through the initial powering up of the instrument and will check that the system is operating correctly. It ensures that the control unit has arrived in good working order, that the analyser is installed properly in the vacuum chamber and that the link to your PC has been made.

The step by step guide will introduce you to many of the features available in RGA for Windows and also provides you with useful background information about how it operates.

4.6.1. Before you start

Before you can run through the guided tour the various components in the system must be installed and connected together correctly. You should refer to the Unpacking and installation section of the RGA control unit manual for details about installing the analyser and how to connect it to the RGA control unit. The control unit to PC connection, software installation and configuration should be completed according to the instructions given in

section 2 of this manual.

Before proceeding with the tour you should also ensure that the pressure in the analyser chamber is below the maximum operating pressures listed below.

4.6.2. Maximum pressure limitations

The table below shows the pressure requirements for each analyser type. Before switching on a filament, the total pressure in the analyser chamber must be below those listed in the table.

DETECTOR	MODE	MAX PRESSURE
Faraday only	Faraday	1×10^{-4} Torr
Dual	Faraday	1×10^{-4} Torr
(faraday & electron multiplier)	Multiplier	2×10^{-6} Torr

CAUTION

The Electron Multiplier (SEM) MUST NOT be operated at temperatures above 50°C.

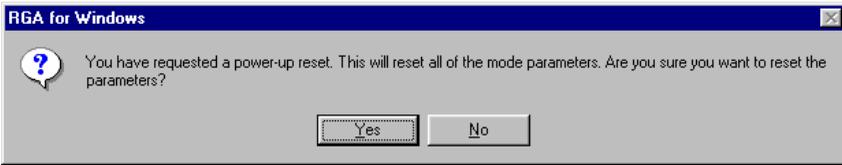
4.7. Running RGA for Windows

Switch on the RGA control unit and ensure that it is powered up by checking the status of the power indicator. Now run up Windows on your PC and from the program manager open the SPECTRA program group.

To start single headed RGA for Windows *double click* on the RGA Reset icon. To start multi headed RGA for Windows *double click* on the RGA Multiplexer Reset icon. When you run RGA for Windows for the first time or after a software upgrade you should always use a reset.

Win95 *Click* on the **Start** button on the Taskbar, select **Programs | Spectra** then *click* on the RGA Reset item for single headed systems or RGA Multiplexer Reset for multi-headed systems.

After a few seconds the following message box will be displayed

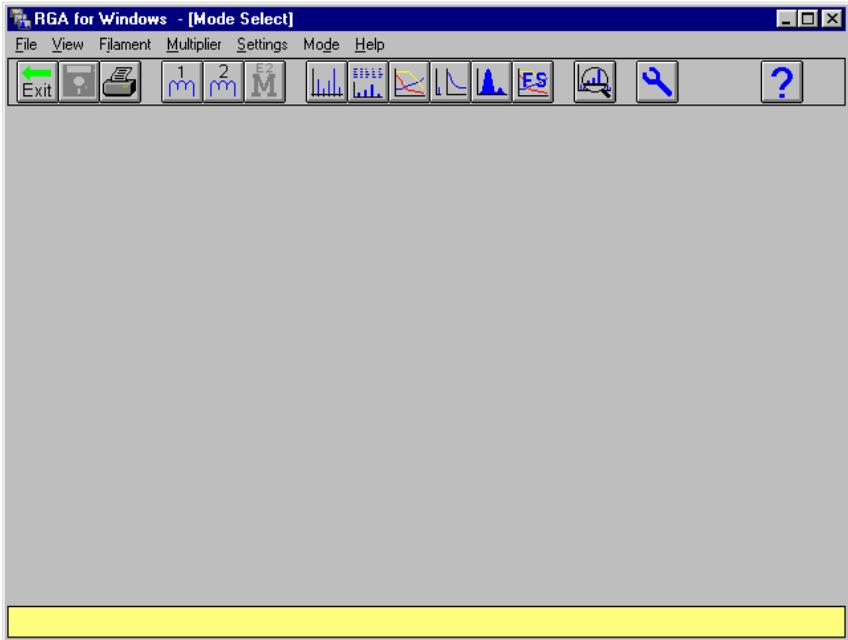


click on the Yes button to start RGA for Windows using a power up reset. If you click on the No button RGA for Windows will start normally without resetting.

The Spectra Loading window will be displayed



At this point, providing the RGA for Windows software has been able to establish the link to the control unit, the RGA for Windows - [Mode Select] window will be displayed as shown below. If the link to the control unit is not made or the software cannot run for any other reason an error message will be displayed. For information about how to proceed if you get an error message, refer to the Trouble shooting section of this manual.



If a second *dialog box* saying that the selected RF and Analyser does not match the actual RF and Analyser should be displayed,



just *click* on the **Ok** button.

The Confirmation *dialog box* will be removed and the RGA for Windows software will be loaded from your hard disk.

4.7.1. Using the help bar

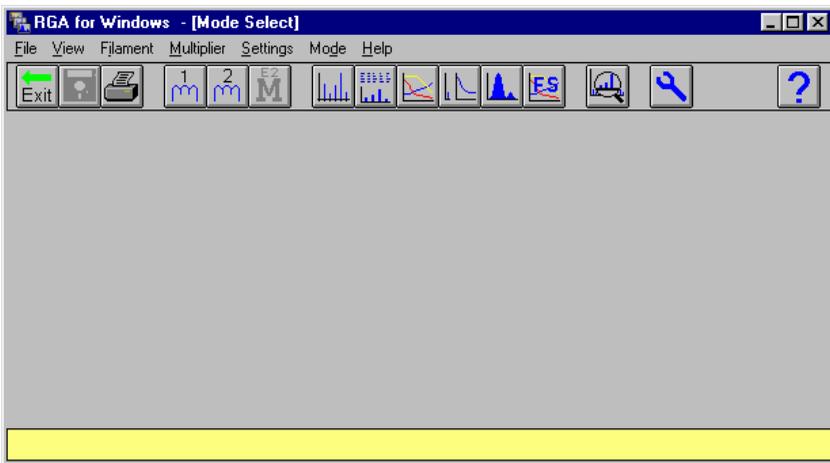
Point the mouse at the exit button. Note that the text in the yellow help bar at the bottom of the screen changes to "Exit the program". This indicates the function that will be performed if you *click* on the exit button. The function of any button may be determined in this way.

Now point at the buttons and use the help bar to locate the "Run the Diagnostics" button.

4.8. Mode Select Window

Once RGA for Windows has started and the serial communications link to the RGA control unit has been established the Mode Select Window will be displayed. This is your starting point to RGA for Windows from where you can enter the various operating modes.

In the graphic below click on the various buttons for more information.



Exit Button

Click on the Exit button in the Mode Select window to close RGA for Windows. In the operating modes clicking Exit will return you to the Mode Select window. Also see Exit .

Disk Store Button

Click on the Disk Store button to start storing data to disk. This will be grayed out in the Mode Select window. See Disk Store

Print Button

Click on the Print button to send data to the printer. See Printing for more information.

Filament Buttons

Click on one of the two filament buttons to switch one of the filaments on. A filament must be on before the RGA will acquire any data. Make sure the pressure is low enough before you switch a filament on, see Guided Tour . Filaments are explained in Filaments .

Multiplier Detector

Click on this button to switch on the Multiplier detector if your instrument is fitted with one. The filament must be on. See Multiplier Detector for more information.

Bar Chart Button

Click on the Bar Chart button to enter the Bar Chart mode, see Bar Chart .

Peak Jump

Click on the Peak Jump button to enter the Peak Jump mode, see Peak Jump.

Multi Trend Button

Click on the Multi-Trend button to enter the Multi-Trend mode, see Multi Trend.

Leak Check Button

Click on the Leak Check button to enter the Leak Check mode, see Leak Check.

Analogue Button

Click on the Analogue button to enter the Analogue mode, see Analogue.

Fast Scan Button

Click on the Fast Scan button to enter the Fast Scan mode, see Fast Scan

Vacuum Scan

Click on the Vacuum Scan button to run Vacuum Scan, see Vacuum Scan and Quadrupole RGA.

Diagnostics Button

Click on the Diagnostics button to run the instrument Diagnostics. We recommend you do this each time you run up the RGA, see Running Diagnostics and Diagnostics

Change Head Button

This button will only be shown if you are running the Multi-Headed version of RGA of Windows. Click on the this button to change to another head, see Multiplexer and Loader.

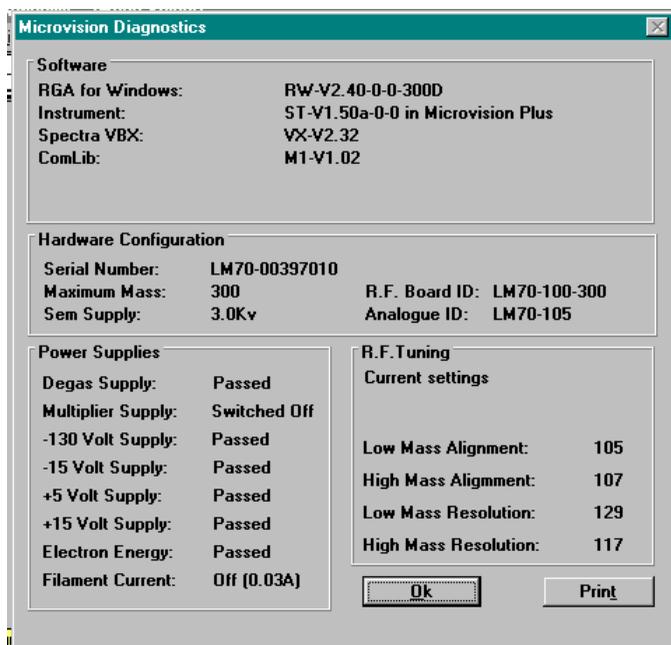
Help Button

Click on the Help button to enter the on-line Help system. This system is not the same as this Help Manual or the paper manual. See Help.

4.9. Running Diagnostics

Having found the "Run the Diagnostics" button see Mode Select Window you should now *click* on it to start the diagnostic procedure. The Diagnostics *dialog box* will be displayed and, as the diagnostic procedure progresses, the results are displayed.

When complete the *dialog box* should look similar to the one shown below.



There are some differences in the information displayed in the Diagnostics window depending on the control unit type but it is not important at this stage.

Note that if your system only has the Faraday detector fitted then the result of the multiplier supply test will show "Not fitted" rather than "Switched off". If any test fails you should refer to the Trouble shooting section of this manual for information about how to proceed. Also note that the Diagnostics *dialog box* contains a software section giving the version numbers of the various programs in the system. If you have to contact your local service centre at any time this information is vital for our service engineers

Now *click* the **Ok** button to close the Diagnostics *dialog box*.

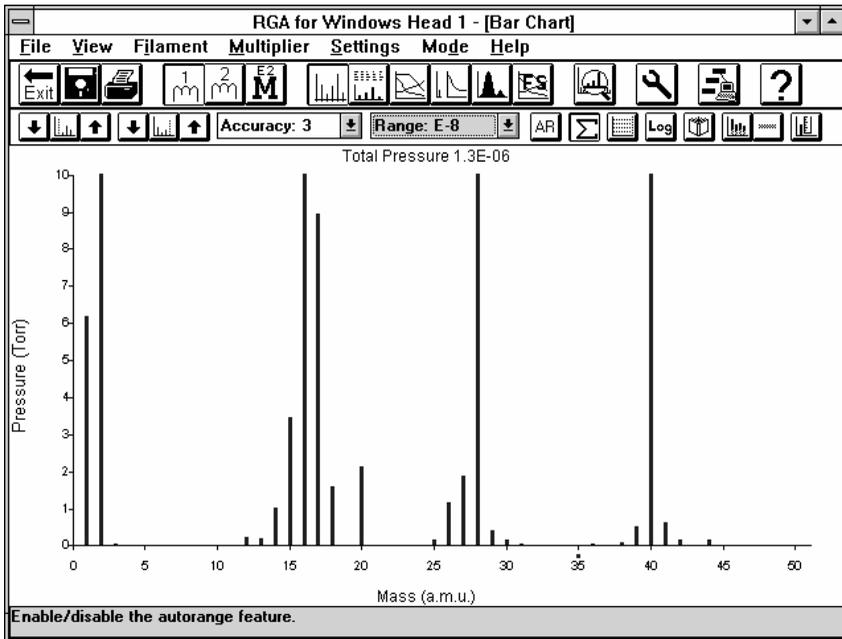
4.10. Setting a Total Pressure Trip

The total pressure trip can provide a limited amount of protection to the filaments if they are operated at pressures higher than the preset level. It is not guaranteed to prevent damage to the filaments but may limit the amount of damage caused if they are operated at too high a pressure. The sequence of operations specified in the guided tour will ensure that the maximum possible protection is given to the filaments so it is not necessary to understand the total protect mechanism at this time. We do however recommend that you read the detailed description given in Filament Trips .

To proceed, *click* on the **Filament** menu item on the *menu bar*. The Filaments menu will appear. Now *click* on the **Protect Filament...** menu item. The Filament Protect *dialog box* will now be displayed. To enable total protect, *click* on the **Total Trip Enabled** *check box*. An **X** should be displayed in the check box and note that the **Total Trip at:** 5.0E- *dropdown list box* is set to **5**. To close the *dialog box*, *click* on the **Ok** button.

4.11. Starting the Bar Chart Mode

To start the Bar Chart mode, *click* the Bar Chart button on the *icon bar*. An annotated picture of the Bar Chart mode window is shown below, which identifies its controls and the main areas of interest.



Filament 1 Button

Click on the Filament 1 button to switch filament 1 on and off, see Filaments.

First Mass Button Group

This group of three buttons control where the Bar Chart scan begins by selecting the first mass to be scanned.

Mass Span Button Group

This group of three buttons control the number of masses to be scanned.

Accuracy

Accuracy controls the stability of the readings and speed of acquisition, see Accuracy

Range

Range controls the amount of electronic amplification that is applied to the measured signal, see Range.

Total Pressure Display

The quadrupole can mimic an ion gauge and provide an indication of total pressure measurement. The total pressure is displayed here if total pressure is enabled. See Total Pressure Measurement

Autorange Button

Click on the Autorange button to enable the autorange facility. The gain range will be adjusted so that the largest partial pressure measurement is within the scale of the y-axis. Also see Autorange .

Total Pressure Button

This button controls whether the Total Pressure measurement is made and displayed. See Total Pressure Measurement

Grid Button

A grid may be displayed to make it easier to read partial pressure measurements. See Grid .

Log Axis Button

The y-axis may be either linear or logarithmic, see Logarithmic Axis Bar Chart .

Library Button

Click on this button to enable the library feature, see Library.

Background Button

Click on this button to enable the background feature, see Background.

Background Subtract Button

Use this button to subtract the currently enabled background from the spectrum to give a live spectrum. See Background.

Mass Cursor Button

Click on this button to enable the mass cursor feature that allows accurate partial pressure reading to be made. See Cursor.

Scan Dot

The scan dot indicates where on the mass scale the current reading is being taken. It should move along the mass scale pausing only briefly at the end before re-starting at the first mass. No scan dot or a stationary scan dot usually indicates some sort of problem.

At this time there should be no peaks plotted on the axis in the mode window and the Total Pressure reading should be 0.0E-05. This is, of course, due to the fact that the filaments are switched off. You should however notice that the scan dot is moving along the x-axis indicating the progress through the mass scan from mass 1 to mass 50.

4.11.1. Changing the scan accuracy

The accuracy code allows a trade off to be made between overall scan speed and stability of results. It operates by modifying the sampling time at each discrete point in the mass scan. The highest accuracy code is 5 which gives the slowest scan speed with the most stable results.

Change the accuracy code to Accuracy: 0. To do this *click* on the accuracy *dropdown list box* on the *settings bar* then *click* on the Accuracy: 0 item. Note that the speed of the scan dot has increased. If you did not notice the increase in scan speed switch between Accuracy: 5 and Accuracy: 0 a few times. When you have finished playing with the Accuracy code be sure to leave it set to Accuracy: 0. This will ensure that the total protect mechanism will operate as quickly as possible when the filament is turned on.

4.11.2. Changing the mass span

Locate the mass span button group. *Click* on the increment (\uparrow) button and notice how the Mass (a.m.u.) scale has increased from 0 through 50 to 0 through 100. Now *click* on the decrement (\downarrow) button and see the Mass (a.m.u.) scale return to 0 through 50, *click* on the decrement (\downarrow) arrow two more times the scale should change to 0 through 20 and then 0 through 10. The scan dot should now be moving very quickly, leave the mass span set to 0 to 10 amu. Again, this will ensure that the total pressure trip operates as quickly as possible.

4.11.3. Total pressure measurement

At this point it is worth mentioning the total pressure measurement facility. The quadrupole mass spectrometer is really a partial pressure measuring device and the total pressure measurement capability can be thought of a “bonus” feature. You may have noticed that when the scan dot reaches the end of the mass scale it pauses before starting the next scan. This is when the total pressure measurement is taken. By setting up the instrument so that it

scans as quickly as possible (accuracy code 0, mass span 10) the maximum possible number of total pressure readings per unit time are being taken. Therefore, the Total Pressure trip will operate as quickly as possible giving the greatest chance of switching off the filaments before they burn out if the pressure in the vacuum chamber is too high.

4.12. Switching a Filament On

CAUTION

Operating the instrument at pressures higher than those specified in section Maximum pressure limitations will lead to unreliable operation and will damage the filaments and multiplier

Before mass spectra can be produced a filament must be switched on and the emission should be stable at the normal operating level. At this point you should check that the analyser is under suitable vacuum conditions.

Click the "Filament #1" button to switch filament #1 on. The Filament warming up *dialog box* is displayed for about 8 seconds. At the end of this period the *dialog box* will disappear and the Filament button will stay depressed indicating that the supply to Filament #1 is on. If the emission is within acceptable limits, the filament icon on the filament #1 button will change colour from blue to red. If a filament alert *Message bar* is displayed at this time you should refer to the Trouble shooting section for information about how to proceed. The filament alert message bar is a red bar which appears near to the top of the screen and contains a description of the fault.

4.12.1. Reading the total pressure

The total pressure reading displayed should now have changed from 0.0E-5. The exact value will depend on the pressure in your vacuum chamber. If you watch the reading for several scans, you will probably see the pressure rise. This is due to outgassing of the source which is common to this type of equipment when it is first installed. The total pressure reading will peak and then start to fall again.

After checking the total pressure reading you should change the Accuracy code back to the standard **Accuracy: 3** and the mass span back to **50** amu before proceeding.

4.12.2. Using the autorange feature

Although you are getting a total pressure reading you might not see any partial pressures plotted on the display, or if you are, they may be very small. This is because the instrument is set to its least sensitive range, E-5. The current setting of the instrument is displayed in the Range *dropdown list box* situated on the *setting bar*.

The autorange feature can be used to ensure that a suitable detection range is selected. The range selected will ensure that the largest peak detected is "on scale" with a mantissa in the range of 0.70 to 9.99. To switch on the autorange feature *click* the Auto range button. At the end of each scan the range will be adjusted, up or down, until the largest peak is on scale.

When the range has stabilised at a particular setting, *click* the Auto range button to turn off the autorange feature. This will hold the current range setting irrespective of any further fluctuations in partial pressures.

4.12.3. Checking the multiplier

If you did not purchase the dual detector option you should skip this section.

Before switching on the multiplier check that the current detector range shown in the range *drop down list box* is in the range of E-7 to E-11. If it is not, manually increase the range to E-7. To do this *click* the **Range:** *dropdown list box* then *click* the **Range:E-7** item.

CAUTION

Before you switch on the multiplier you should ensure that the total pressure reading is below the limits specified.

Click the "Multiplier on/off" button to turn on the multiplier. You should notice that the scan dot moves faster when the multiplier is on. You can *click* the "Multiplier on/off" button a few times to switch the multiplier off and on so that the difference in scan speed can be seen. The size of the peaks reported with the multiplier on should be very roughly the same as those measured using the faraday detector. There will always be some difference between the results obtained using the different detection methods but they are likely to be reduced when you calibrate the multiplier.

If the peaks disappear when you turn on the multiplier you should refer to

the Trouble shooting section.

4.13. Changing the Mass Scan

Two controls are provided to enable different masses to be scanned. These are the First mass and the Mass span button groups which appear on the *setting bar*. You will have already used the Mass span buttons. *Click* the (↑) button in the First mass button group. Now the x-axis label starts at 1 and ends at 51 instead of 0 and 50 as before. The masses now being scanned are masses 2..51 inclusive. You should note that the first mass indicated on the x-axis is not being scanned.

To change the first mass setting by a large amount, *click* on the Set first mass button, which is in the middle of the First mass button group. This will open the Bar Chart Settings *dialog box* with the insertion point set to the First Mass *text box*. You can now enter a new first mass from the keyboard. Enter the value 20 into the first mass *text box* and then *click* the **Ok** button or press the Enter key. The *dialog box* will be closed and the first mass displayed on the x-axis will be set to 19, mass 20 will be the first mass scanned.

The number of masses included in the scan can be varied by selecting one of a fixed number of options. The total number of options available will depend on the maximum mass range capability of the analyser you have purchased. The mass spans available on a 300 amu analyser are 10, 20, 50, 100, 200 and 300. Spans larger than the capability of your analyser are not available. To select a different span use the Mass span button group.

This completes the guided tour. If you have worked through this section and the system is functioning as described, then you should have no problems experimenting with the other scanning modes and features. A detailed description of all the features available is given in section 4.

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Section 5.

Reference

This section of the manual describes all of the RGA for Windows functions. We envisage users referring to this section when they need specific information rather than reading the section in detail from start to finish.

5.1. General Features

5.1.1. Help

On line help may be accessed at any time while RGA for Windows is running by pressing the F1 key. The help files may be opened without starting RGA for Windows by *double clicking* the RGA Help program item icon in the Spectra program group. Alternately in the scanning modes you can *click* on the Help button or use the **H**elp | **C**ontents menu. For details about how to use the on line help select **H**elp | **U**sing help from the *menu bar*.

5.1.2. Reset

The various parameters the user sets up while working with RGA for Windows are stored and used when a mode or RGA for Windows is re-started. For example, in the Bar Chart mode the range, mass span and first mass valves set-up in the last session will be used when the mode is started. This happens when RGA for Windows is started using the RGA (RGA Multiplexer, Group 1 or Group 2 in multi RGA for Windows) program item icon in the Spectra program group.

Another set of values for all the parameters, referred to as the factory defaults, is also stored, these values are used when RGA for Windows is started using the RGA Reset (RGA Multiplexer Reset, Group 1 Reset or Group 2 Reset for multi RGA for Windows) program item icon. The reset is achieved by adding the /R switch to the command line for the various reset icons.

Reset should be used following any software change or upgrade, the system being halted by a loss of mains power or in the unlikely event of the instrument “crashing”.

5.1.3. Multiplexer and Loader

This section only applies to multi headed versions of the RGA for Windows software.

There are two ways to start Multi RGA for Windows either to use the Multiplexer or to use the Loader. In the Spectra program group there are six program item icons all of which will start RGA for Windows, RGA Multiplexer, RGA Multiplexer Reset, Group 1, Group 1 Reset, Group 2 and Group 2 Reset.

Win95

The six items are in the Spectra folder which can be accessed by *clicking* on the **Start** button on the Taskbar and selecting **Programs | Spectra**.

Multiplexer

The Multiplexer allows you to run one “instance” of RGA for Windows and selectively switch to any available control unit. *Double click* on the RGA Multiplexer (RGA Multiplexer Reset if a reset is required) program item and the first head in the system will be started. The first head will be the head set up as Group 1, Head 1 in the Configure program.

Notice the Head Select button on the *setting bar*, this is only available when the system has been started using the Multiplexer. In single headed systems or if the Loader has been used this button will not appear.

If you *click* on the Head Select button the Head Select *dialog box* will be displayed. *Click* on the Heads *dropdown list box* and a list will be displayed showing heads 1 to 8. Select the desired head by *clicking* on it then, *click* the **Ok** button. If RGA for Windows cannot connect to the new head, if the control unit is switched off for instance, then it will re-connect to the previous head.

Loader

The Loader is a software routine which starts all the heads in a group sequentially and allows them to run simultaneously by running multiple “instances” of RGA for Windows. Due to the limitations of Windows only four heads may be run simultaneously so the maximum number of eight heads is split into two groups, Group 1 and Group 2, each containing a maximum of four heads.

To start RGA for Windows using the Loader *double click* on the appropriate Group program item icon (or Reset icon if a reset is required). The first head in the group will be started and once its mode select screen has been displayed the second head in the group will be started. This procedure will continue until all the heads in the group have been started. Note that the mode select screens will be displayed in a reduced size so that all four screens can be *tiled* and displayed simultaneously.

If a head cannot be started, for instance it may have been disconnected, a warning box will be displayed. You can attempt to start the head again by *clicking* on the **R**etry button. If you *click* on the **C**ancel button the next head in the group will be started.

5.1.4. Exit

When RGA for Windows is started the first screen is called the Mode Select window. To close RGA for Windows either *click* on the Exit button in the Mode Select window or select **F**ile | **E**xit from the *menu bar*.

From any mode other than the Mode Select window *clicking* on the Exit button or selecting **F**ile | **E**xit from the *menu bar* will return you to the Mode Select window from where you may close RGA for Windows.

5.1.5. Preferences

The preferences menu allows various RGA for Windows parameters to be set up to meet the user's needs. All of the preference are available by selecting **F**ile | **P**references from the *menu bar* in the Mode Select window, they are not available from any of the scanning modes.

Save settings on exit

When Save Settings on Exit is enabled all of the parameters in the various operating modes will be stored and the settings will be used the next time RGA for Windows is run. If Save Settings on Exit is disabled any changes made to the operating parameters such as gain range, accuracy, mass span etc. will be lost when you close RGA for Windows. To disable Save Settings on Exit from the mode select screen select **F**ile | **P**references | **S**ave Settings on Exit, a 4 (tick) will be shown next to **S**ave Settings on Exit when the feature is enabled. The default settings is Save Settings on Exit enabled.

Channel mode multiplier warnings

If the detector for a channel is set to multiplier but the multiplier is not switched on then that channel will not read a partial pressure and a message box will be displayed to warn the user. This message box may be enabled or disabled by selecting **File | Preferences | Channel Mode Multiplier Warnings** in the mode select screen. When a **4** (tick) is shown the message box will be displayed, this is the default setting.

Pressure units

Three sets of units are available; Torr, mBar and Pascal. To change the units in the mode select screen select **File | Preferences | Units** then *click* on the required unit to select it. The currently selected units will be shown by a **4** (tick). The y-axis text will change depending on the units selected. Since Pascal units are numerically 100 times larger when they are selected the gain ranges alter accordingly. The type of pressure units used is recorded in the header section of data files with the statement "[Pressure Units]","nnnn".

Disconnect

The disconnect feature is designed to allow the RGA to go into a “standby” mode when the RGA for Windows program is closed. This means that all the mass spectrometer supplies will be maintained and the filaments will remain on. If the optional RVC package is fitted then the pumps will remain on as well as the filaments while full protection and control of the system is maintained.

To enable the disconnect feature select **File | Preferences | Disconnect Satellite On Exit** from the menu bar in the Mode Select screen. When disconnect is enabled a **4** will be shown before **Disconnect Satellite On Exit**. When you exit RGA for Windows the Disconnect warning box will be displayed. *Click* on the **Ok** button to disconnect the Satellite, *click* on the **Cancel** button to shut down the Satellite and exit RGA for Windows.

Vertical labels

The pressure label on the graphs in all scanning modes is vertical to save screen space for plotting and the time axis in Multi Trend may be either horizontal to give maximum screen area to the plot or vertical to allow the maximum number of time labels to be displayed. While a standard installation of Windows will have fonts that can be rotated some PC's do not. To prevent display problems the vertical labels may be disabled. To do this select **File | Preferences | Vertical Labels** from the *menu bar* in the Mode Select screen.

To select Vertical labels for the time axis in Multi Trend, vertical labels

must be enabled in the **F**ile | **P**references menu item in the Mode Select screen, and the **V**iew | **T**ime Label | **V**ertical Label in Multi Trend must also be enabled.

The other reason for the labels to display horizontally is if windows is running low on resources, vertical labels do use more resources. To check this select **H**elp | **A**bout . . . just above the **O**k button will be the line System xx% Free. If the System Resources show much below 20% free you should close down one or more applications.

Decimal places

Readings can be displayed to an accuracy of one decimal place rather than the usual two decimal places. To do this select **F**ile | **P**references | **D**isplay **O**ne **D**ecimal **P**lace from the *menu bar* in the Mode Select screen.

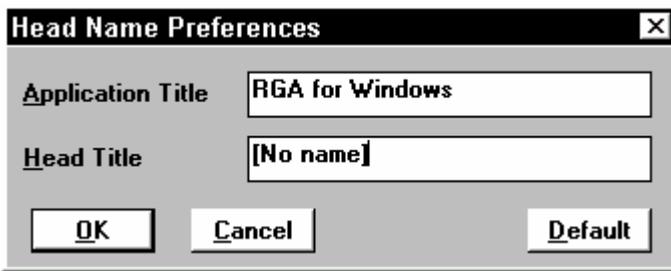
Select icons

Three styles of buttons used on the *icon bar* and *setting bar* are available. The **N**ormal icons are predominantly grey and blue in keeping with the current trend in Windows software packages. The **B**right icons use more colours in an attempt to group buttons with related functions together. The **M**ono icons are black and white, primarily used to provide screens to print in this manual but users with mono chrome monitors or mono chrome LCD laptops may find them useful.

To change the icon style select **F**ile | **P**references | **S**elect **I**con . . . from the *menu bar* in the Mode Select screen. The Select Icon Buttons window will be displayed *click* on the appropriate *radio button*, then *click* on the **O**k button.

Head names

To give an RGA Head a name which relates to its situation is a useful feature particularly in multi headed systems. Using the name Sputter Chamber maybe far more meaningful than Head 1. The head name is displayed at the very top of each screen in the *Title Bar* and is made up of four parts. The application name, which by default is RGA for Windows, the head name, the head number and the screen name. The screen name cannot be changed by the user but the other three can. The default is no name and the head number n.

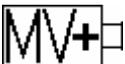


To change the head name select **File | Preferences | Head Name** from the *menu bar*, the Head Name Preferences *dialog box* will be displayed. The cursor will be positioned in the **Application Title** box and a new title may be typed in, use the Delete and Backspace keys to remove the existing title. Once the application title has been entered position the cursor in the **Head Name** box by moving the *mouse pointer* into the Head Name box and *clicking* the mouse button or press **ALT+H** on the keyboard. The new head name maybe entered which may be up to 24 characters long, again use the Delete and Backspace keys to remove the existing name.

Click on the **Ok** button to accept the names and exit the Head Name Preferences window, *clicking* on the **Cancel** button will exit without implementing any changes you have made. To exit and use the default application and head names *click* on the **Default** button.

The head name is stored in the battery backed RAM in the control unit and is read by the RGA for Windows software at boot-up. This means that the control unit will retain its name even if it is moved.

Zeroing accuracy



With Microvision Plus RGA control units the accuracy with which zeroing measurements are made may be altered. A choice of four settings 0,1,2 and 3 is available with 3 giving the most stable measurements but requiring the most time. To alter the zeroing accuracy from the mode select screen select **File | Preferences | Zeroing Accuracy** and *click* on the required setting, a 4(tick) will be shown next to the currently selected accuracy code. The

actual number of zero readings taken is:

2^(zeroing accuracy code)

Alarm and analogue output

The Aux I/O port on the RGA control unit may be used to provide alarm output signals or it may be used to drive an Analogue Output Module. To use the port for alarm outputs from the mode select screen select **File | Preferences | Satellite Analogue Output**. To use the port to drive an Analogue Output Module select **File | Preferences | Satellite Alarm Output** from the mode select screen. If a Remote Vacuum Controller is connected to the Aux I/O port of your control unit neither of the above options will be available.

Password and Lock

To prevent unauthorised use of the PC running RGA for Windows the system can be locked using a password. When locked all mouse and key strokes are disabled for windows applications. Any input will cause the System Locked window to be displayed for 5 Seconds during which time the correct password can be entered and the <ENTER> key pressed to unlock the system.

Initially no password is defined. If you attempt to lock the system with no password defined you will be prompted to enter a new password. The password may be changed by selecting **File | Set Password** from the *menu bar* in the Mode Select window. If a password has been set you will be asked to enter the current password before entering the new password. You will be prompted to enter the password a second time, this reduces the chance of typing errors being included in your password. *Click* on the **Ok** button to accept the password, *clicking* on the **Cancel** button will close the Password *dialog box* without the password being saved.

To lock the system select the **File | Lock System** menu item from the *menu bar* or press CTRL+L from the keyboard. This can be done from any mode, you will be asked to enter the password, then *click* on the **Ok** button to lock the system.

This feature cannot prevent the rebooting of the system using a Hardware reset, <CTRL><ALT><DELETE> software reset or switching off the PC! Should any of these methods be used when the system was locked when RGA for Windows is next run the system will lock automatically.

It is recommended that the RGA for Windows password not be used in conjunction with the windows screen saver with password. If it is it, and the screen saver is active it will be necessary to move the mouse, enter the Windows screen saver password followed by the RGA for Windows password.

Clipboard

RGA for Windows is able to copy whole scans to the *clipboard*. This feature is designed to be used with Recall where the current scan in Bar Chart, Peak Jump, Multi-trend or Fast Scan can be copied to the clipboard and then pasted straight into Recall. Once in Recall the data can be analysed or stored into the library database. Of course scans can be copied into other applications using this feature, a word processor for instance when writing reports.

To copy the current scan to the clipboard select **File | Copy to Clipboard** from the *menu bar* or press CTRL+C

View Menu

The View menu allows the user control over some items displayed on the RGA for Windows screen. In the Mode Select screen the Icon Bar and the Help Bar may be hidden. To hide the Icon Bar select **View | Icon Bar** from the *menu bar* or press **CTRL+I**. When display of the Icon Bar is enabled a **4** (tick) is shown by Icon Bar in the *View menu*.

To hide the Help Bar select **View | Help Bar** from the *menu bar* or press **CTRL+H**. When display of the Help Bar is enabled a **4** (tick) is shown by Help Bar in the *View menu*.

In the scanning modes where the Settings Bar is displayed this may be hidden as well as the Icon and Help Bars. To hide the Settings Bar select **View | Settings Bar** from the *menu bar* or press **CTRL+S**. When display of the Settings Bar is enabled a **4** (tick) is shown by Settings Bar in the *View menu*.

The Grid and the Cursor may be enabled and disabled from the View menu see Cursor and Grid .

Each time one of the Bars is hidden the additional screen space is used by RGA for Windows to display data, this can be very useful with multi-headed systems where multiple data displays can be shown simultaneously.

The default setting is:
Icon, Help and Settings Bars enabled
Grid and Cursor disabled.

5.1.6. Filaments

The instrument is fitted with two filaments of which only one may be on at any one time.

Switching on and off

The easiest way to switch on a filament is to *click* on a Filament button on the *icon bar*. Alternatively select **Filament | Filaments On/Off . . .** from the *menu bar*, select either **Filament #1 On** or **Filament #2 On** from the Filament *dialog box* and *click* on the **Ok** button. The filament setting will not be changed until the **Ok** button is pressed. To provide maximum protection to the filaments and to extend their life the electronics allows the filament to gradually warm up by slowly increasing the filament current. While this takes place a message box will be displayed. If the emission from the filament reaches the pre-set value the yellow Filament Warm-up message box will be cleared, the Filament button will remain depressed and the filament will be red rather than blue to show that the filament is on and working.

If the filament is not functioning correctly after eight seconds the Filament Failed *message bar* will be displayed.

To turn a filament off *click* its button a second time or select **Filament | Filament On/Off** from the *menu bar* and *click* the **Filaments Off radio button** followed by **Ok**. Note that switching a filament off will cause the multiplier to trip if it was on. See section Error! Reference source not found..

To avoid shortening filament life we recommend that filaments are switched off 10 to 15 minutes before a vacuum system is vented to atmosphere.

Filament states

The filament buttons show which filament is selected (filaments off, filament 1 on or filament 2 on) and the state of the selected filament. The states that the filaments can be in are:-

OFF

Both filaments are off, no partial or total pressure measurements can be

made. Both buttons are raised.

ON

The selected filament is operating correctly, the button is depressed and the filament is red showing a working filament.

FAILED

This shows that the filament supply is on but the emission current is outside the normal operating range. Possible reasons for this are:-

The filament has blown.

The RF head is not connected to the control unit.

The RF head is not connected to the analyser.

A short circuit has occurred within the analyser.

The filament supply has failed.

The button will remain pressed but its picture will change to show that the filament is not operating correctly.

Note that a filament failing will cause the multiplier to trip if it was on. See section Multiplier Detector

For further information about how to proceed if a filament failed condition is present refer to the Trouble shooting section.

Also see Filament Trips .

5.1.7. Filament Trips

To help protect the filaments from over pressure they can be tripped (i.e. switched off) in five ways: emission trip, partial pressure trip, total pressure trip, external trip and RVC trip. Note that a filament tripping will cause the multiplier to trip if it was on. See section **Filament trips**.

E TRIP

The filaments have been switched off internally by the EMISSION TRIP facility. Insufficient emission current is flowing and the **Filament Off when failed** option in the **Filament | Protect Filaments** menu is *checked*.

P TRIP

The filaments have been switched off internally by the PARTIAL PRESSURE TRIP facility. See section **Partial pressure trip**.

T TRIP

The filaments have been switched off by the internal TOTAL PRESSURE TRIP facility. See section **Total pressure trip**.

X TRIP

The filaments have been switched off by the EXTERNAL TRIP facility. See section **External trip**.

RVC TRIP

The filaments have been switched off because the vacuum conditions being monitored by the optional Remote Vacuum Controller are incorrect for filament operation. i.e. the RGA chamber pumping system is not on and up to speed.

This will only occur if your system is fitted with a Remote Vacuum Controller.

Emission trip

When a filament is operating normally approximately 1mA of emission current flows from the filament to the source grid. This current is monitored continuously and if it cannot be maintained at the correct level this condition is detected. One of two possible actions will occur depending on the setting of the **Filament Off when failed** *check box* in the **Filament | Protect Filament . . .** menu.

When enabled (default setting) the filament will be switched off by an emission trip, and the Filament Protect Trip: "Fault detected with filament emission" message will be displayed. The Filament button will indicate an off and broken filament.

When not enabled the filament supply will remain on and the message "The filament emission is incorrect. Check filaments and refer to the manual." will be displayed. The Filament button will indicate an on and broken filament. If the emission current returns to normal then the filament button will return to "On and working" but the warning message will remain until it is acknowledged or the filament buttons are *clicked*.

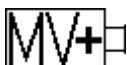
Partial pressure trip

When the partial pressure trip is enabled, any partial pressure measurement exceeding full scale will cause the filament to be switched off and the Filament Protect Trip: "Check the partial pressure trip" message will be displayed. The Filament button will indicate that the filament is off.

The partial pressure trip is only active when partial pressures are being measured and it will give no protection in the Mode Select page for example.

Note that if a logarithmic axis is being displayed and the partial pressure trip is enabled a trip will occur when a partial pressure exceeds the lowest pressure range. Therefore, we advise users not to use the partial pressure trip facility with the logarithmic axis.

To enable partial pressure trips select **Filament | Protect Filament** from the *menu bar* and click **Partial Trip Enabled** followed by **Ok**.



The Partial Pressure trip is not available with Microvision Plus RGA control units

Total pressure trip

When the total pressure trip is enabled a total pressure measurement exceeding 5.0 on the selected range will cause the filament to be switched off and the Filament Protect Trip: "Check the total pressure trip" message will be displayed. The Filament button will indicate that the filament is off.

The total pressure trip is only active when total pressure is being measured. Total pressure is only measured at the start of each scan in Bar Chart, Peak Jump, Multi Trend, Fast Scan and Analogue, so no protection is given if the pressure rises during a scan, between making total pressure measurement readings.

To enable the total pressure trip select **Filament | Protect Filaments** from the *menu bar*, choose the range that the total trip should operate on, then click **Total Trip Enabled** to *check* it, followed by **Ok**.

External trip

The external trip operates independently of the RGA for Windows software. Typically a jack plug wired to the normally closed contacts of a vacuum gauge is plugged into the External Trip socket on the rear of the control unit. When the contacts open the filament will be tripped. Alternatively the External Trip socket can be driven by a TTL signal if a relay contact is

unavailable.

When the external trip is active it is not possible to turn on a filament and should it become active when a filament is on it will cause the filament to be switched off and the Filament Protect Trip:

"Check the level of the external trip input"

message will be displayed. The Filament button will indicate that the filament is off.

The external trip gives maximum protection to the filaments, it is always active, it has minimal delays associated with the software and can be set to operate at any level. It is recommended that the external trip be used if possible.

RVC trip

When the optional Remote Vacuum Controller (RVC) is fitted the filaments have an additional level of protection. For filaments to be switched on the RGA chamber pumps must be on and up to working speed and, if used, the external trip input must be at the correct level.

When the RVC trip is active it is not possible to turn on a filament and should it become active when a filament is on it will cause the filament to be switched off and the Filament Protect Trip:

"Check the pumps are on and the level of the external trip"

message will be displayed. The Filament button will indicate that the filament is off.

5.1.8. Degas

Degas ion source

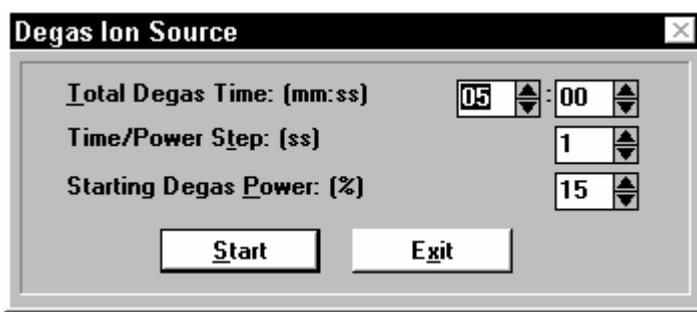
DEGAS is strictly a UHV operation. Only use this feature when the analyser is under vacuum of less than 1×10^{-7} Torr and will be used at total pressures of less than 1×10^{-8} Torr. Do not use Degas to remove contaminants from the analyser. That should be done by cleaning and/or baking.

DEGAS is the method by which absorbed atoms and molecules are removed from the analyser ion source by means of high energy electron bombardment.

The default period for DEGAS is 5 minutes but this may be set to any value up to 59 minutes.

In order to limit stress on the filaments and to minimise gas load, a ramped degas method is used which allows the power to be increased over the degas period. It allows you to set a start power level (in the range 15% to 100% full power), and the power ramp rate in power steps/second as well as the total degas period.

To enter the Degas Setup *dialog box* select **Filaments | Degas Ion Source...** from the *menu bar*. Before the *dialog box* is displayed, if the filaments are off, you will be given the option of turning on a filament before you proceed.



The **Time/Power Step: (ss)** is the time, in the range 1 to 59 seconds, spent at each power level. There are 256 power levels within the range of 15% to 100% of full power.

The **Total Degas Time: (mm:ss)** period (regardless of Time/Power Step time) can be set in the range 1 to 59 minutes.

The **Starting Degas Power: (%)** level may be set between 15% and 100% of full power in 1% steps.

The ramped degas facility is a feature of Windows Satellite, Microvision and Microvision Plus systems. It is not available when using RGA for Windows with other control units such as Vacscan and Vacscan Plus, these control units do not incorporate the necessary hardware.

RGA for Windows detects the type of control unit being used in the system and if it will not support ramped degas the **Time/Power Step:** and **Starting Degas Power:** options will not be displayed in the Degas Setup *dialog box*. The **Total Degas Time:** can be adjusted as described above.

5.1.9. Multiplier Detector

The multiplier (or secondary electron multiplier to give it its full name) is an optional second detector that is designed to amplify the ion beam signal without the drawbacks associated with electronic amplification. The Channel Plate type SEM with gains of 100 and 1000 is described in this manual. Single Channel Electron Multipliers with higher gains and requiring a high voltage power supply are supported by RGA for Windows but are not described in this manual.

To protect the multiplier from operation at high pressure the multiplier can only be switched on when a filament is on and working.

The multiplier gives two main advantages over a Faraday cup system. Firstly, smaller partial pressures can be measured ($2.0\text{E-}14$ compared with $2.0\text{E-}11$) and secondly, for a given partial pressure, measurements will be made more quickly, more accurately or both.

The multiplier on/off setting applies to all modes in the instrument (rather like filament). In the non-channel modes (i.e. Bar Chart, Leak Check and Analogue) the multiplier detector is simply on or off.

In the channel modes (Peak Jump, Multi Trend and Fast Scan) the multiplier on/off setting is an enabling switch for the individual detector settings in each channel. The multiplier on/off setting must be set to on to be able to switch the multiplier on in any of the channels. The multiplier gain setting ($\times 100$ or $\times 1000$) is set separately for each channel. In the channel modes the multiplier gain setting is no longer displayed above the M on the Multiplier button.

If the detector for a channel is set to multiplier but the multiplier is not switched on then that channel will not read a partial pressure and a message box will be displayed to warn the user. This message box may be enabled or disabled by selecting **File | Preferences | Channel Mode Multiplier Warnings** in the mode select screen. When a tick (4) is shown the message box will be displayed, this is the default setting.

CAUTION

The Electron Multiplier (SEM) MUST NOT be operated at temperatures above 50°C.

With dual (faraday and electron multiplier) detector instruments serious damage will be caused to the electron multiplier if it is operated at temperatures above 50⁰C. Where instruments use a standard RF power supply the RF must be removed to bake out so there is no chance of the multiplier inadvertently being switched on.

It is possible to run instruments using RF power supplies fitted with a bakeable adapter during a bake out. In this case only the faraday detector should be used NOT the multiplier.

No damage is caused to the multiplier by high temperatures provided it is not switched on.

The only remedy when a multiplier has been damaged due to being operated at higher temperatures is to replace it.

THIS IS AN EXPENSIVE REPAIR.

Switching off and on

To switch the multiplier on *click* on the Multiplier button on the *icon bar* or select **Multiplier** | **Multiplier On** from the *menu bar*. When the Multiplier button is depressed the multiplier is on. If the "M" on the Multiplier button and the **Multiplier** | **Multiplier On** are *grayed out* then either no filaments are on or the instrument only has a faraday detector. In the channel modes the detector for individual channels must also be selected from the Channel Setting *dialog box*.

Calibration

To set the gain of the multiplier to be a factor of x100 and x1000 it must be calibrated against the faraday detector. The multiplier calibrate can be used to calibrate at either x100 or x1000 gain and should be run with both these settings before the multiplier detector is used for partial pressure measurements.

A calibration consists of finding a peak in faraday, measuring its height, repeating the measurement to ensure the peak is stable, reducing the electronic gain by a factor of x100 or x1000, switching the multiplier on, and then adjusting the gain of the multiplier by increasing or decreasing the applied potential until the peak height is within 10% of that measured in faraday.

It is important to realise that the multiplier will only be calibrated at a gain of x100 or x1000 at the mass at which calibration took place. Generally masses lower than the calibration mass will have higher gains and masses greater than the calibration mass will have lower gains. As an approximation the gain of the multiplier when looking at a peak at a mass will be x100 or x1000 times the square root of the measured mass divided by the square root of the calibration mass.

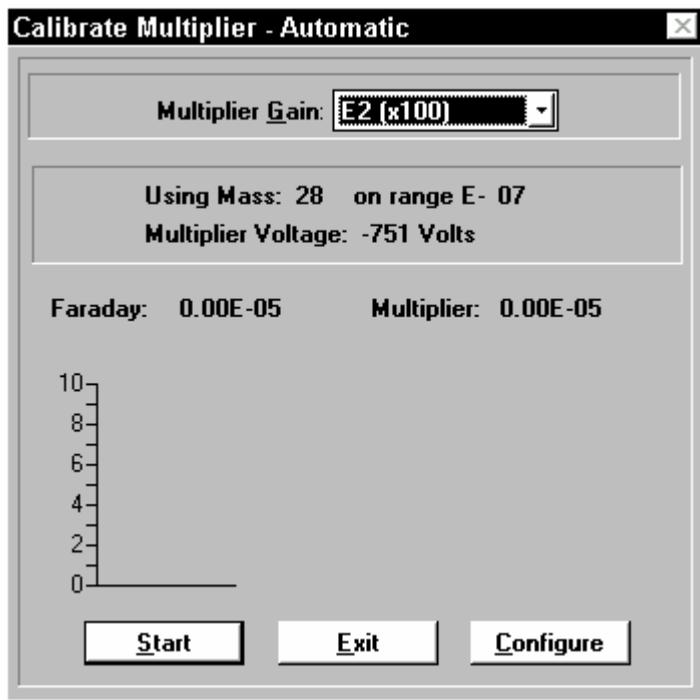
If the calibration fails for any reason the multiplier voltage (and hence gain) will be left unchanged.

When multiplier calibrate is run the mode currently running will stop and it will be restarted when multiplier calibrate is complete.

It is quite normal for the gain of the multiplier to fall as it gets older. It should, therefore, be re-calibrated periodically as a matter of routine. How often this will be required will depend on the particular operating conditions.

Automatic calibrate

To run the automatic multiplier calibrate select **M**ultiplier | **A**utomatic Calibrate Multiplier . . . from the *menu bar*. If no filaments are on you will be prompted to switch one on. The Calibrate Multiplier - Automatic *dialog box* displaying.

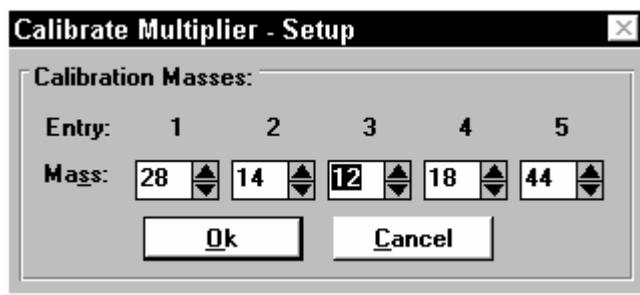


The current voltage applied to the multiplier, and the first mass in the mass list that will be used for calibration are shown.

To set the gain *click* on the **Multiplier Gain** *dropdown list box* and *click* on the required gain. To start the multiplier calibration *click* on the **Start** button.

The system searches for the calibration peak in the range E-08 to E-10. A valid peak must be between 9% and 90% of full scale. If entry 1 in the mass list is too large or too small then entry 2 will be tested and so on. There are five masses in the mass list.

To view or modify the mass list *click* on the **Configure** button.

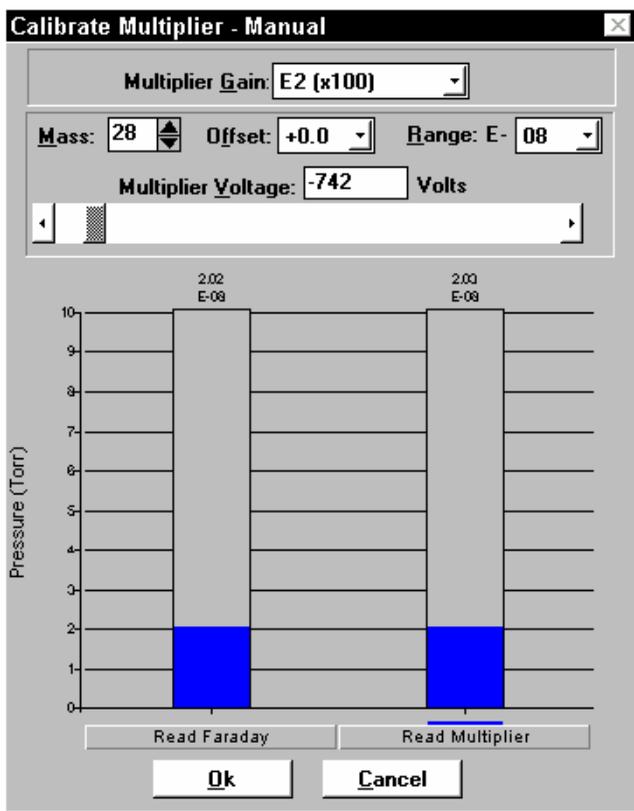


If the masses listed do not suit your vacuum system they may be changed either by typing in a new value or by *clicking* on the spin buttons. The masses used in calibrate may be set to any mass within the mass range of the instrument.

Manual calibrate

The basic procedure for a manual calibrate is to choose the mass, read the partial pressure using the faraday detector, adjust the range so that the faraday reading is in the range 0.9 to 9.0, reading the peak with the multiplier detector and adjust the multiplier voltage. The multiplier voltage is re-adjusted and the multiplier reading re-measured until it matches the faraday reading.

To manually calibrate the multiplier select **M**ultiplier | **M**anual **C**alibrate **M**ultiplier . . . from the *menu bar*, the Calibrate Multiplier - Manual *dialog box* will be displayed.



The multiplier gain can be selected from the **Multiplier Gain**: *dropdown list*. The required mass for the calibration can be typed in the **Mass**: box or entered using the spin buttons. As with the Leak check mode the mass can be fine tuned by selecting a valve between +0.5 and -0.47 from the **Offset** *dropdown list*. The range for the calibration can be selected from the **Range E-** *dropdown list*. This should be selected so that the faraday reading is in the range 0.9 to 9.0.

To make a faraday reading *click* on the **Read Faraday** button, to make a multiplier reading *click* on the **Read Multiplier** button. In manual calibrate the instrument is continually taking measurements either with the faraday detector or the multiplier detector depending which was last selected.

The multiplier voltage is adjusted by *clicking* on the arrows either side of the *scroll bar* or by *dragging* the *scroll bar*. As the scroll bar is moved the value

in the **Multiplier Voltage:** box will change. Alternatively a new value can be typed in the **Multiplier Voltage:** box this value should be in the range : -700 to -1500 volts.

Once the multiplier has been calibrated *click* on the **Ok** button to exit the calibrate multiplier routine. *Clicking* the **Cancel** button will exit without any of the changes you have made being implemented.

Multiplier gain

The amplification factor for the multiplier can be set to either x100 or x1000 by selecting **M**ultiplier | **M**ultiplier Gain from the *menu bar* and *clicking* on either **E2 (x100)** or **E3 (x1000)**. This gives working ranges of E-07 to E-13 for x100 or E-08 to E-14 for x1000 when the multiplier is switched on. (This can be compared with the working range of E-05 to E-11 in Faraday). Notice that above the M on the Multiplier button the multiplier range is shown, this will be either E2 or E3. The multiplier gain may only be changed when the multiplier is switch on, when the multiplier is off the **M**ultiplier Gain *menu item* is *grayed out*.

Multiplier Trips

The multiplier is a delicate device and to avoid damage it should not be switched on at high pressures. To help protect the multiplier and extend its life it may only be switched on when a filament is on and working. If the multiplier is on and the filament is switched off, fails or trips off then the multiplier will trip off. It may not be switched back on until a filament is back on and working.

5.1.10. RF Select

This feature is only available with RGA control units which support RF power supply tuning from the PC keyboard. RF select is available with all Microvision, Microvision Plus and Vac Check 100 instruments. RF select is not available with Vacscan and Vacscan Plus instruments but is available with Satellites with LM46- and LM61- serial numbers.

Mass alignment and resolution settings are stored as part of the RF tuning procedure and settings for various analyser/RF combinations may be saved. To change to a different set of tuning settings select **S**ettings | **R**F Select from the *menu bar*, the R.F. Select *dialog box* will be displayed. *Click* on the Current RF / Analyser Pair: *dropdown list box* then *click* on the required RF / Analyser combination then *click* **Ok**.

RF power supplies and analysers are referred to by their serial numbers. This feature is not required unless you are running several different RGA control units and/or RF head and analyser combinations from a single PC. Please refer to the RF Tuning section for further details.

5.1.11. Disk Store

The data from each of the scanning modes may be stored to disk for later review, analysis or comparison with other data. For details of disk recall refer to the Recall for Windows manual or the Recall for Windows on-line help.

It is important to note that slower machines may not be able to keep up with the data transmissions from the control unit, this is especially noticeable in Bar Chart, Leak Check and Analogue modes when low accuracy settings are selected. If this happens the control unit, will pause at the end of a scan until the PC is ready for more data. To improve disk storage performance store to a disk that has been cached using, e.g., SMARTDRV.

Data stored to disk consists of two parts:

Header. This contains information about the mode from which data was stored also more general details such as time, date, number of scans etc.

Scan data. Each scan stored will generate one line of scan data.

All data will be stored in ASCII format so it can be easily viewed or imported into a spreadsheet, database or text editor. The exact data stored varies from mode to mode. The graphic below shows part of a Peak Jump file viewed in Notepad.

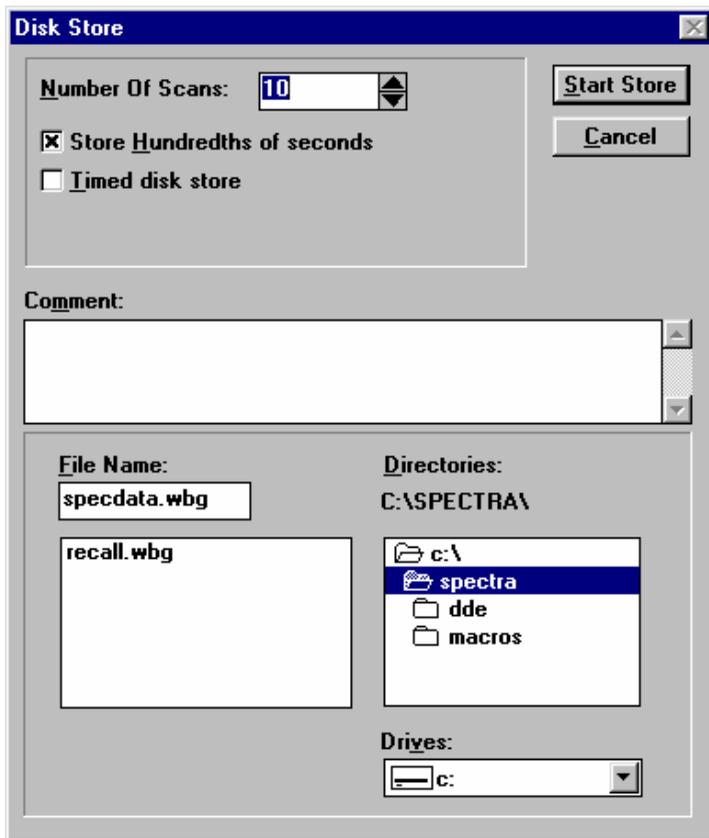
```

Specdata.wpj - Notepad
File Edit Search Help
"[FILE TYPE]", "Peak Jump"
"[SOFTWARE VERSION]", "RU-U2.45a-0-0-3000"
"[SATELLITE VERSION]", "ST-V1.52 -0-0 in Microvision Plus"
"[DATE]", "15/Jun/00"
"[TIME]", "14:40:52"
"[PRESSURE UNITS]", "Torr"
"[NUMBER OF SCANS]", 10
"[STORE INTERVAL]", "Every Scan"
"[STORE AT END OF SCAN]", "Yes"
"[FILAMENT]", "#1 1.00mA"
"[MULTIPLIER]", "OFF"
"[ELECTRON ENERGY]", "69.80V"
"[ION ENERGY]", "5.50V"
"[EXTRACT VOLTS]", "110.00V"
"[MODE DATA]"
"[PEAK DATA LENGTH]", 12
"[TOTAL ENABLED]", "On"
"[ACCURACY]", 3
"[CHANNEL DATA]"
"[CHANNEL MASS]", 2,4,12,14,15,16,17,18,28,35,40,55
"[CHANNEL ENABLED]", "Yes", "No", "No", "No", "No", "No", "Yes", "No", "Yes", "Yes", "No"
"[CHANNEL AUTORANGE]", "OFF", "OFF"
"[CHANNEL MULT GAIN]", "OFF", "OFF"
"[CHANNEL HIGH ALARM]", "OFF", "OFF"
"[CHANNEL LOW ALARM]", "OFF", "OFF"
"[SCAN DATA]"
"[SCAN NO]", 1, "[DATE]", "15/Jun/00", "[TIME]", "14:41:14.90", "[PEAK DATA]", 3.25E-09, 0.00E-00,
"[SCAN NO]", 2, "[DATE]", "15/Jun/00", "[TIME]", "14:41:40.50", "[PEAK DATA]", 3.27E-09, 0.00E-00,
"[SCAN NO]", 3, "[DATE]", "15/Jun/00", "[TIME]", "14:42:05.93", "[PEAK DATA]", 3.32E-09, 0.00E-00,
"[SCAN NO]", 4, "[DATE]", "15/Jun/00", "[TIME]", "14:42:31.85", "[PEAK DATA]", 3.29E-09, 0.00E-00,
"[SCAN NO]", 5, "[DATE]", "15/Jun/00", "[TIME]", "14:42:57.34", "[PEAK DATA]", 3.24E-09, 0.00E-00,

```

To start storing either *click* on the Disk button or select **File | Disk Store . . .** from the *menu bar* to bring up the Disk Store *dialog box*, as shown below.

Select the drive to store to by *clicking* on the **Drives:** *dropdown list box* then *click* on the required drive. A directory can be selected from the **Directories** *dropdown list box*. Type in a new filename or select an existing filename in the **File Name:** box. Typing or selecting an existing filename will cause a warning to be generated when **Ok** is pressed as the existing file will be overwritten. Note that a different default file extension is generated for each mode, it is not required to use it but keeping to the default makes it easier to select the correct files when the data is recalled. To enter the number of scans to be stored type in, or select with the spin buttons, a number in the range 1 to 32000.



It can be very useful to attach some descriptive text to the data file, for instance details of the circumstances under which the data was obtained. The user may attach up to 32,000 characters of text to the data file being stored. To do this position the cursor in the Comment box, by positioning the mouse pointer in the box and *clicking*, then type in the required text. The comment will be retrieved when the file is viewed in Recall.

Data may be stored either at the end of each scan (the default setting) or, after a user set time has elapsed. To store in timed mode *click* on the **Timed disk store check box** the **Store at end of scan check box** and **Interval (mm:ss)** box will now be displayed. Enter an Interval time in the range 1 second to 60 mins. 59 secs. When timed storage is selected data may either

be stored immediately the selected time has elapsed or at the end of the scan following the end of the time interval. To store at the end of the scan *click* on the **Store at end of scan** *check box*.

The time and date is stored with each scan. The time may be stored either to 1.00 or 0.05 seconds resolution depending on the setting of the Store Hundredths of seconds check box. To store to a resolution of 0.05secs *check* the **Store Hundredths of seconds** *check box* by *clicking* on it.

In addition, under DDE control, data storage may be configured, started and may also be triggered on a scan by scan basis with a DDE command.

When disk storage starts the status of the store will be displayed on a yellow disk storage status bar. If the mode is exited or the Terminate Disk Store button is pressed before the store is complete the file will be closed with the data already saved being kept.

When the selected number of scans have been stored the disk storage status bar is removed and the mode continues scanning.

5.1.12. Printing

In the scanning modes a printout of the data can be obtained. The user may incorporate a custom logo on the printout, this is described in the Customisation section of this manual.

Printing

A print always fills a page. Depending on whether more detail is required in the x-axis or y-axis, select either portrait or landscape orientation from the Program manager, Control panel, Printers *dialog box*.

Win95 *Click on the Start button on the Taskbar and select Settings | Printers. Click on the appropriate printer to highlight it then select File | Properties in the Printers window.*

To print either *click* the Printer button, select **File | Print** from the *menu bar* or press **CTRL+P** on the keyboard.

Printer selection

Any printer that has been installed under Windows may be used. To choose a printer run Control Panel in Windows Main group and select Printers.

Win95 *Click* on the **Start** button on the Taskbar and select **Settings | Printers**. *Click* on the appropriate printer to select it.

5.1.13. Total Pressure Measurement

A quadrupole mass spectrometer is essentially a device for measuring partial pressures. It can, however, be used to mimic the action of a total pressure gauge (e.g. an ion gauge). The method used by the quadrupole for measuring total pressure will give different results from those produced by a dedicated instrument. In particular it will not fully reflect the contributions of the components with masses less than 10 amu. This means that in UHV systems, where hydrogen predominates, the RGA will tend to report a low total pressure value.

The total pressure measurement is always made using the faraday detector at the start of the partial pressure scan and will always autorange provided a filament is on. It is available in all the main scanning modes except Leak Check.

In addition, in the channel modes (Peak Jump, Multi Trend and Fast Scan) a channel may be set to measure the total pressure. This is particularly useful in the Multi Trend mode if you need to plot the total pressure as a trend.

Relative to the partial pressures, the speed of total pressure measurements is slow. If you require to scan quickly and you are not interested in the total pressure in your system you should disable it. This effect will be highlighted if you are using the multiplier to measure the partial pressures. This is due to the time delay required when switching back to the faraday detector for the total pressure measurement.

Total pressure measurements may be enabled and disabled by either *clicking* the Total pressure button on the *setting bar* or by selecting **Settings | Total Pressure Enabled** from the *menu bar*.

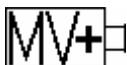
Total pressure scaling factor

A scaling factor can be applied to the Total pressure measurement. The Total pressure measurement is multiplied by the total pressure scaling factor and the result is displayed as the Total pressure reading. By default the total pressure calibration factor is 1.

To set a total pressure scaling factor add the following line to the [QUAD CALIBRATION] section of the RGA4WINn.INI file:

Total Calibration Factor = n

where n can be any value but will normally be in the range 0.01 to 100.



The scaling factor can be entered by using the Total Pressure Measurement *dialog box*, see next section.

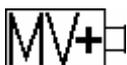
If a Quad Calibration section does not exist in the INI file (usually it will not) add the heading [QUAD CALIBRATION] and the above line immediately below it after the last section.

The Total protect trip will still operate at 5.0 on the selected range on the uncalibrated measurement. The actual value displayed for the Total trip level will be the calibrated value at which the trip will occur and the ranges are adjusted accordingly.

For example, with a Total calibration factor of 1 the level displayed is 5.0 and the range of decades is E-05 to E-11. If a Total calibration factor of 2.0 is used the Trip level will be 1.0 with the range of decades as E-04 to E-10.

Total pressure readings displayed in the Channel modes are the calibrated readings. Use care when setting the alarm levels in the channel modes since it is possible to set them to a level that can never occur when the Total calibration factor has been applied.

Total Pressure Microvision Plus



Total pressure can optionally be measured by an external gauge connected to

one of the four analogue inputs. To alter the total pressure measurement method select **File | Preferences | Total Pressure** from the *menu bar* in the mode select screen. The Total Pressure Measurement *dialog box* will be displayed as shown below.

With the Internal RGA selected (this is the default) as the measurement method the scaling factor may be applied by *clicking* on the arrows to the right and left of the **Scale Factor** *scroll bar*, *dragging* the cursor of the *scroll bar* or *clicking* on the **Scale Factor** value box and typing in the value. The operation of the scaling factor is described in the previous section.

An external total pressure gauge providing either a linear output or a logarithmic output may be used. To use a gauge with a linear output *click* on the **External (Linear Scale)** *radio button*, select the analogue input to which the gauge is connected from the **Connect to input** *dropdown list box* then enter the pressure which corresponds to a gauge output of 10V.

To use a gauge with a logarithmic output *click* on the **External (Log Scale)** *radio button*, select the analogue input to which the gauge is connected from the **Connect to input** *dropdown list box* then enter the pressures which correspond to a gauge output of 1V and 5V.

Details of the output voltage versus pressure should be obtained from the gauge manufacturers documentation.

Details of the analogue inputs can be found in the Microvision Plus manual.

5.1.14. Accuracy

The accuracy code allows a trade off to be made between overall scan speed and stability of results. It operates by modifying the sampling time at each discrete point in the mass scan. The highest accuracy code is 5 which gives the slowest scan speed with the most stable results, the lowest is 0 which gives the fastest scan speed with less stable results.

Although the actual scan speed of the instrument is always altered when this parameter is changed, you may not detect a change in the scan speed from the speed of the scan dot. If this occurs it will be due to the speed of your PC which is unable to process and plot the incoming data fast enough.

The accuracy may be changed either by *clicking* the Accuracy *dropdown list box* on the *setting bar* and picking a new accuracy or selecting **Settings | Accuracy . . .** from the *menu bar* to display the mode Settings *dialog box*. *Click* on **A**ccuracy and then *click* on the required accuracy code.

5.1.15. Range

The range parameter is the exponent of the partial pressure measured. The range setting determines the level of amplification applied to the signal. The amplification will be the sum of the detector gain and electronic gain of the instrument. It is variable in the range E-05..E-11 when the faraday detector is selected, E-07..E-13 when the multiplier detector is on with a gain of x100 or E-08..E-14 when the multiplier detector is on with a gain of x1000.

For any given range setting the detection system can detect signals in the range 0.00 to 9.99 in 0.01 steps i.e. 3 decades. Obviously results in the range 0.00 to 0.10 have coarse step sizes and may be obscured by random baseline noise. Peaks in the range 1.00 to 9.99 will give the best results in terms of signal to noise ratio and resolution.

In all modes the range is selected from a *dropdown list box* which always contains entries in the range E-5 to E-14. These values are not valid for certain Detector and Multiplier gain settings. You can select any range and you will be notified of the changes in Detector settings should they be required.

In the Bar Chart, Leak Check and Analogue modes the range may be changed either by *clicking* the range *dropdown list box* on the *setting bar* and *clicking* on a new range or by selecting **Settings | Range . . .** from the *menu bar*. The mode Setting *dialog box* will be displayed, *click* on the **Range E-** *dropdown list box* and *click* on the required range in the *dropdown list*.

In the Peak Jump mode the range may be changed by *clicking* on the Channel button for the desired channel. The Channel Setting *dialog box* will be displayed, *click* on the **Range E-** *dropdown list box* and then *click* on the desired value in the *dropdown list*.

In the Multi Trend and Fast Scan modes the range may be changed by *clicking* the appropriate Mass box in the Key panel for the desired channel. The Channel Setting *dialog box* will be displayed, *click* on the **Range E-** *dropdown list box* and then *click* on the desired value in the *dropdown list*.

5.1.16. Autorange

The autorange feature enables the range of the instrument to be adjusted

automatically as the partial pressures vary over a large number of decades. If a partial pressure exceeds a value of 9.60 the range will be decreased by one decade until the minimum range for the selected detector is reached. If the partial pressure is less than 0.70 then the range is increased by one decade until the range is one decade less than the maximum range for the selected detector. Autoranging will only occur when a filament is switched on.

Autorange performs the same basic function in all the scanning modes but the details vary slightly. In Bar Chart and Analogue modes an autorange operates on the value of the largest peak scanned, whereas in Peak Jump and Multi Trend modes each channel may be autoranged independently. In Leak Check the autorange feature operates on the selected probe gas.

In the Bar Chart, Leak Check and Analogue modes autoranging may be turned on and off either by *clicking* the Autorange button on the *setting bar* or by selecting **Settings | AutoRange Enabled** from the *menu bar*.

In Peak Jump the autorange may be enabled by *clicking* the appropriate Channel button for the desired channel the Channel Setting *dialog box* will be displayed, *click* on the **Autorange check box**.

In Multi Trend and Fast Scan the autorange may be enabled by *clicking* the appropriate Mass box for the desired channel the Channel Setting *dialog box* will be displayed, *click* on the Channel Enabled *check box*.

We recommend users not to use Autorange when leak checking.

5.1.17. Grid

A grid can be overlaid on the graphs of all scanning modes allowing partial pressures to be read more precisely. In the Multi Trend mode the grid is shown as a series of dots so that both partial pressure and scan time can be read.

For exact readings the Cursor feature should be used.

In all modes the grid can be enabled by either *clicking* on the Grid button on the *setting bar* or by selecting the **View | Grid Enabled** from the *menu bar*.

5.1.18. Cursor

A Cursor is available in all scanning modes allowing masses to be identified

and exact partial pressures to be read from the graph. When the cursor is enabled move the *mouse pointer* onto the graph and press the left mouse button and *drag* the mouse pointer across the peaks.

In the Multi Trend mode partial pressures for each enabled channel are shown on the expanded key panel along with the scan time. While the left mouse button is pressed you can drag the cursor to any position on the time axis to read the partial pressures of a particular scan. Releasing the left mouse button will cause the partial pressures and time of the current scan to be displayed.

In all other modes the cursor information is shown in the cursor panel at the top of the graph. As you *drag* the mouse from side to side the mouse cursor will "hop" to the top of the adjacent partial pressure reading and update the cursor information. In Bar Chart, Analogue and Peak Jump modes the cursor position is fixed to the current mass or channel when the left mouse button is released. The partial pressure reading is then updated each time that mass or channel is scanned. In Leak Check the current reading is displayed when the left mouse button is released.

In all modes the cursor can be enabled by either *clicking* on the Cursor button on the *setting bar* or selecting **V**iew | **C**ursor from the *menu bar*.

5.1.19. Set All

Selecting **S**ettings | **S**et All . . . or pressing CTRL+E causes the settings box for the current scanning mode to be displayed so that any of the operating parameters may be altered.

5.2. Operating Modes

5.2.1. Bar Chart

The following topics are specific to the Bar Chart mode.

Bar Chart Overview

First Mass Bar Chart

Mass Span Bar Chart

Logarithmic Axis Bar Chart

Library

Background

The following general topics apply to the Bar Chart mode.

Disk Store

Printing

Multiplier Detector

Accuracy

Range

Autorange

Total Pressure Measurement

Total Pressure Microvision Plus

Grid

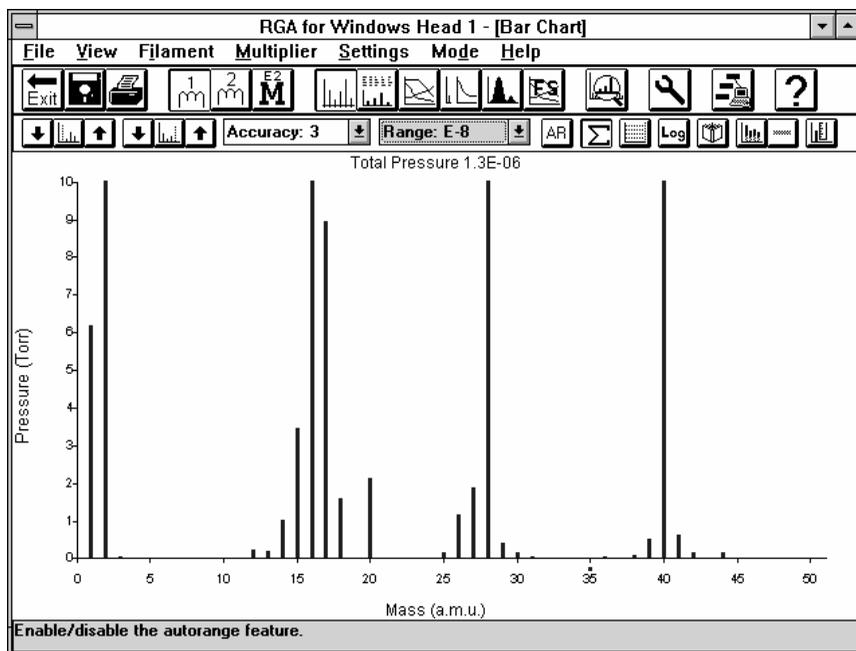
Cursor

RF Select

Set All

Bar Chart Overview

A typical Bar Chart display is shown below.



This mode allows one of a number of pre-set ranges of consecutive masses to be scanned. The starting mass (First mass) can also be specified. This

mode is used for taking a general overview of the vacuum system. The Bar Chart mode can operate with either a logarithmic or linear y-axis. Mass spectra library, background and background subtract facilities are also provided in this mode.

In the linear mode the scan is performed on a single range and the partial pressures measured are plotted on a linear y-axis in the range 0.00 to 9.99. The autorange feature can be used to automatically adjust the range at the end of each scan so that the largest peak will appear on scale.

The logarithmic mode allows partial pressures to be measured over a specified range between 1 and 7 decades and the results are displayed on a logarithmic scale.

The actual mass range scanned is (First mass - 0.5amu) to (First mass + Mass span +0.5amu). For each amu in the scan, the maximum intensity around the nominal peak centre is determined and it is this value which is plotted.

To start the Bar Chart mode either *click* on the Bar chart button on the *icon bar* or select **Mode | Bar Chart** from the *menu bar*.

First Mass Bar Chart

The starting mass of the scan is determined by this parameter. It is variable in the range of 1 to (maximum mass - mass span +1). The label on the x-axis will always start with a mass one less than the first mass and is not included in the scan. To increment and decrement the first mass, *click* the up (↑) and down (↓) arrow buttons next to the first mass button on the *setting bar*. To set it either *click* the first mass button or select **Settings | First Mass** from the *menu bar*. The Bar Chart Settings *dialog box* will be displayed. The first mass may be changed by *clicking* on the spin buttons or typing a new value. Selecting **Settings | Set All . . .** or pressing **CTRL+E** will also display the Bar Chart Settings *dialog box*.

Mass Span Bar Chart

This parameter determines the number of consecutive masses that will be scanned. It can be set to a value in the following list up to the maximum mass of your instrument:- 10, 20, 50, 100, 150, 200, 300. To increment or decrement the mass span, *click* the up (↑) and down (↓) buttons next to the mass span button on the *setting bar*. To set it either *click* the mass span button or select **Settings | Mass Span** from the *menu bar*. The Bar Chart

Settings *dialog box* will be displayed. *Click* on the mass span *dropdown list box* and then *click* on the required value.

Logarithmic Axis Bar Chart

The logarithmic mode can be enabled and disabled by either pressing the Log button on the *setting bar* or using the **Setting | Log Axis** *menu item*. There is also a Log Axis *checkbox* in the Bar Chart Settings window. When logarithmic mode is enabled the Range box on the *setting bar* will not be shown and Autoranging is automatically enabled.

Note that when the logarithmic axis is selected a complete scan will consist of a scan of the selected masses on each of the selected gain ranges. The scan dot may appear to pause and jump over masses, this is done to save time and increase the scan speed. The x-axis label will change between Mass (a.m.u.) and Scanning E-nn to re-assure the user that the instrument is functioning correctly.

Log axis start E-

This parameter is set from the **Settings | Log Start Range...** or from the Bar Chart Setting window which is accessed using the **Settings | Set All** *menu item*. It is the highest pressure range that will be used during the scan, and partial pressures up to 9.99 on this range will be displayed. This control is only enabled when Logarithmic mode is selected. To set it *click* on the **Log Axis Start E-** *dropdown list box* and then *click* on the required value.

Log axis end E-

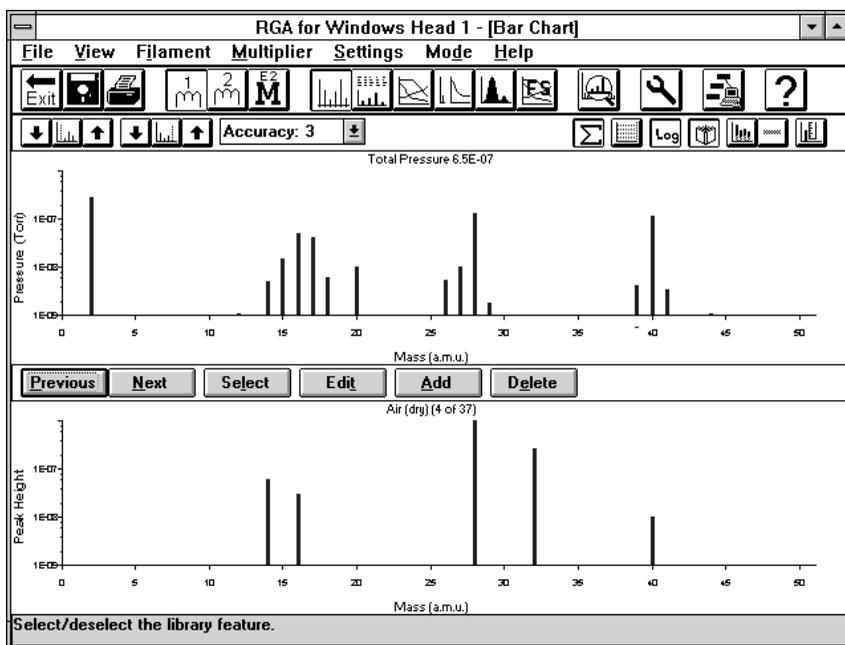
This parameter is set from the **Settings | Log End Range...** or from the Bar Chart Setting window which is accessed using the **Settings | Set All** *menu item*. It is the lowest pressure range that will be used during the scan, and partial pressures down to 1.00 on this range will be displayed. This control is only enabled when Logarithmic mode is selected. To set it *click* on the **Log Axis End E-** *dropdown list box* and then *click* on the required value.

Library

Within the Bar Chart mode a standard library of 62 common mass spectra is provided which may be extended to include your own custom spectra. It is possible to search the library for occurrences of a particular mass as either the major peak or for any occurrence of that peak. This is achieved through the "Select Library Entries". Only the spectra that meet these criteria will be available as you step through the library entries.

The Library functions are accessed by pressing the Library button on the *setting bar* or by selecting **Mode | Library** from the *menu bar*.

When the library is displayed the window is split into two with the live spectra on top and the library and its controls below, as shown in below. Above the library spectra, a label in the form "name (n of m)" is displayed, where name is the entry name, n is the entry number and m the number of entries meeting the select criteria. The library spectra are always normalised when plotted so that the major peak is full scale and the minor peaks are scaled relative to the major peaks.



The y-axis for the library spectra is always the same as the y-axis for the live spectra. Suppose the log axis starts at E-6 and ends at E-9 and we select the Carbon Dioxide library entry. The major peak of Carbon Dioxide is mass 44 so this will be displayed as 1×10^{-5} . The second peak occurs at mass 28 and is 11% (to view the various masses and their intensities *click* on the Edit button) of the 44 peak so will be displayed as a pressure of 1.1×10^{-6} . If we change the y-axis to start at E-7 and end at E-10 the 44 will now be shown as a pressure of 1×10^{-6} and the 28 peak as a pressure of 1.1×10^{-7} . The same

follows when using the linear axis, the major peak will always be shown as a pressure of 10 on the selected gain range.

When the library is enabled the Cursor will operate on both the live spectra and the library spectra.

The following is a description of the functions of the library buttons:-

Previous

Press this button to move to the previous library entry that meets the select criteria.

Next

Press this button to move to the next library entry that meets the select criteria.

Select

Used to open the "Select Library Entries" window to enable the select criteria to be set. The library select feature is explained in section **Library select**.

Edit

Used to open the "Library Edit" window which allows an existing library entry to be modified. The library edit feature is described in section **Library edit**.

Add

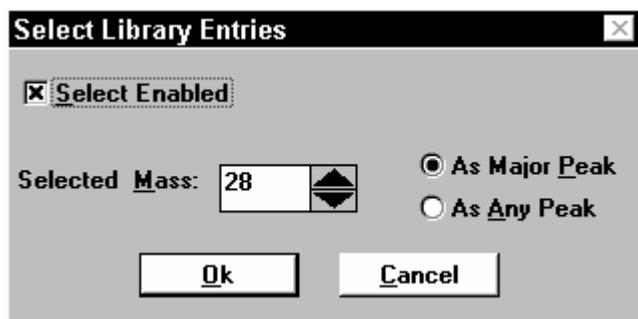
Used to open the "Add Library Entry" window which allows a new library entry to be created. Section **Library add** describes adding spectra.

Delete

Used to delete the current library entry. Any of the library spectra may be deleted so it may be worth making a backup copy of the library before you start deleting entries. To back up the library make a copy of the file spectra.mdb which can be found in the same directory as RGA for Windows, C:\SPECTRA if you have used the default setting when installing the software.

Library select

Click on the **Select** button to display the Library Select dialog box, shown below.



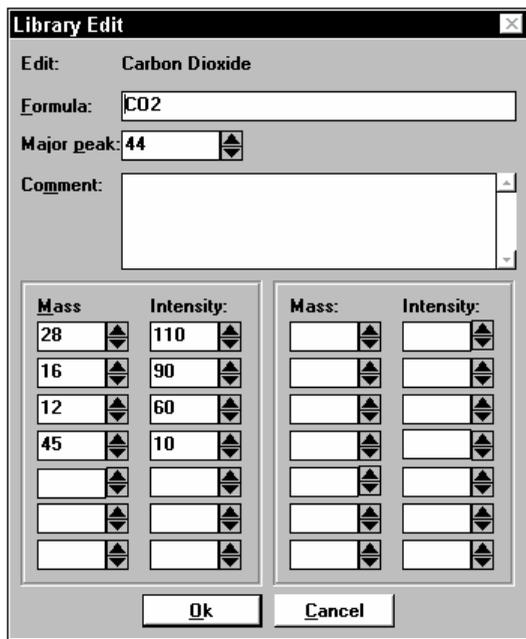
Select Library Entries operates as a filter on the library entries, initially 62 spectra. With select disabled all 62 entries are available and Carbon Dioxide for example will be displayed as (12 of 62). With select enabled only spectra containing a chosen mass or a chosen mass as the major peak will be available.

To enable Select Library Entries *click* on the **Select** button in the Library window to display the Select Library Entries *dialog box*. Check **Select Enabled** then, enter the mass of interest in the **Selected Mass:** box either by typing the value or by using the spin buttons. *Click* on the **As Major Peak** radio button to display only those spectra where the chosen mass is the major peak or *click* on the **As Any Peak** radio button.

For example, choose mass 28 and select As Any Peak the 62 entries in the standard library will be filtered down to 15 which contain a peak at mass 28. Select mass 28 as the major peak and there will be 5 library entries available.

Library edit

To edit a library entry select the required spectrum by using the **Next** and **Previous** buttons in the library window then *click* on the **Edit** button. The Library Edit *dialog box* will be displayed as shown below.



All of the entries may be edited except for the name (Carbon Dioxide in the above graphic). Position the cursor in the appropriate box and type the required value or text or use the *spin buttons*. Once you have completed the changes *click* on the **Ok** button.

Library add

To add a library entry *click* on the **Add** button in the library window. A *dialog box* virtually identical to the Library Edit *dialog box* will be displayed. Proceed in the same way as for editing a library entry except you must now add a name.

Library files

The Library data is contained in the file spectra.mdb. You can add, modify or delete library entries using the library features provided in RGA for Windows, but it is also possible to modify the library database using Microsoft Access.

The information contained in the Library database is:

Entry name:

This is the name which is displayed under the library spectrum when it is viewed and must uniquely identify the entry.

Formula:

An optional formula can be entered in this field.

Comment:

Optional comment can be entered in this field.

Major Peak:

The amu value of the major peak is entered in this field. It has an implied intensity of 1000.

Minor Peaks:

Up to 14 additional minor peaks can be included in a library spectrum. To specify a minor peak the amu and the intensity of the peak relative to the major peak (intensity 1000) must be specified. The minor peaks intensities can be set to values between 1 and 1000.

Background

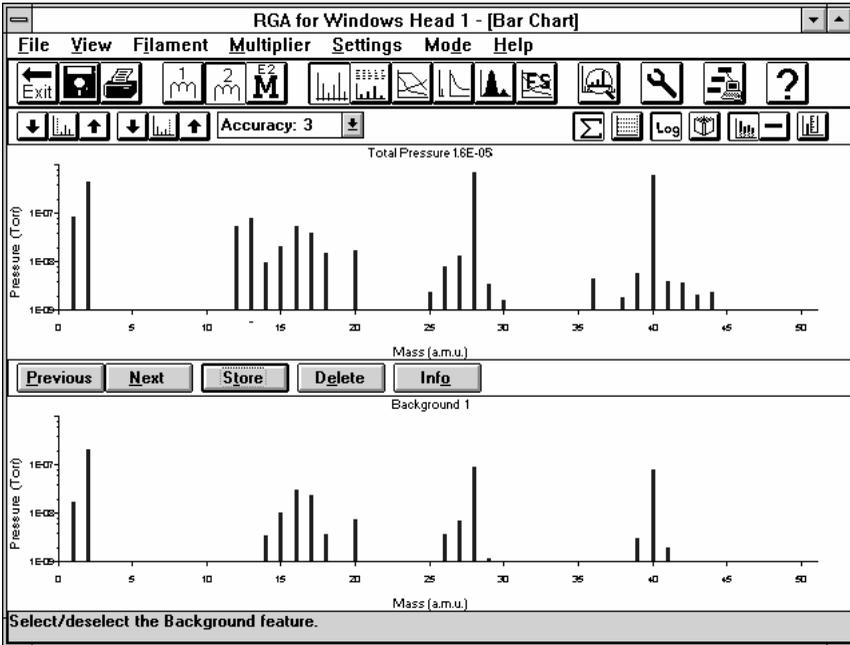
In the Bar Chart mode the Background facility provides a method of visually comparing the active spectra with a previously stored scan. In addition, using the Background Subtract feature, it is possible to subtract the currently selected background from the active spectra.

Backgrounds function in both Linear and Logarithmic modes of Bar Chart but it is recommended that the Logarithmic setting be used, since if a peak is outside the range 0.01 to 9.99 on the current gain range, it is of no use.

A background stored in Linear mode may be used in a Logarithmic mode and vice-versa, subject to the limitations described above.

The background is accessed by pressing the Background button on the *setting bar* or by selecting **Mode | Background** from the *menu bar*.

When a background is active the display is split into two, see the graphic below, with the live spectra on top and the background and its controls below. Above the background spectrum, a label giving the background name is displayed.



The following is a description of the function of the background buttons:-

Previous

Press this button to move to the previous background entry.

Next

Press this button to move to the next background entry.

Store

Used to save the current spectrum to a background. The default background name can be used or a user defined name may be entered. In addition an optional comment may be entered at this time. When store is selected the entire scan is transferred into the background. If all peaks have a peak height of 0.00 then the background will not be stored.

Delete

Used to delete the current background entry. A confirmation is requested but once this is accepted RGA for Windows cannot recover the information deleted.

Info

Used to open the "Background Information" window that gives details on the conditions under which the background was stored along with the any comments.

The background data is contained in the file spectra.mdb. You can add or delete backgrounds in RGA for Windows, but it is also possible to modify the background database using Microsoft Access.

The information contained in the database is stored in the two tables Background Header and Background Peaks.

Background header

The Background Header information indexes into one or more entries in the Background Peaks table. Other information is stored in the header which relates to the system settings when the background was stored. The fields included are Background ID, Name, Comment, Mode, Software Version, Date/Time, Filament State, Multiplier State, Multiplier Gain, Accuracy, Display Axis, High Gain, Low Gain, Last Mass, First Mass, Total Enabled and Total Pressure.

Background peaks

An entry is made in this table for every peak that has a non zero value in the background. It is linked to the header table with the Background ID. The entry consists of the mass number and its intensity.

Background subtract

The background subtract feature allows any stored background to be subtracted from the active spectra. If no background spectra have been stored the background subtract button will be *grayed out*.

While it is allowed to subtract a background stored in Linear mode from a Logarithmic scan and vice versa it is not recommended as this will lead to a reduction in accuracy.

To subtract a background first enable background display, select the desired background, then either *click* on the background subtract button on the *setting bar* or select **Mode | Background Subtract** from the *menu bar*. Backgrounds may be subtracted either with or without a background displayed.

Note: It is not possible to subtract library spectra from the active spectra.

When a background is being subtracted from the active spectra the x-axis label will change from "Mass a.m.u." to "Live - Background Name"

5.2.2. Peak Jump

Peak Jump

The following topics are specific to the Peak Jump mode.

Peak Jump Overview

Peak Jump Channel Features

Alarms

Peak Jump Features

The following general topics apply to the Peak Jump mode.

Disk Store

Printing

Multiplier Detector

Accuracy

Total Pressure Measurement

Total Pressure Microvision Plus

Grid

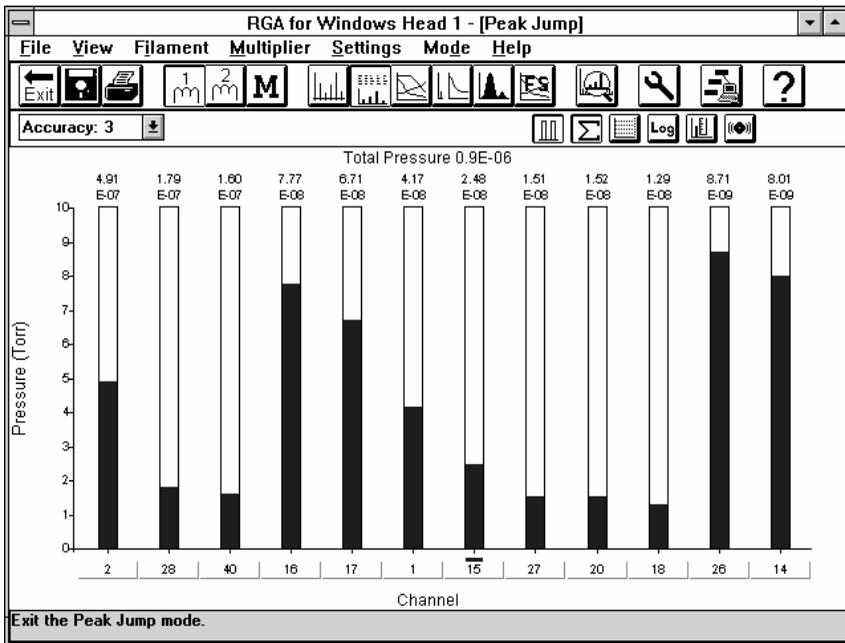
Cursor

RF Select

Set All

Peak Jump Overview

Peak Jump is a channel based scanning mode. A typical Peak Jump display is shown below. Twelve channels are available which are scanned in sequence. Each of the channels has a set of parameters which may be set independently.



Peak Jump has two display modes. The results may be plotted on either a Logarithmic y-axis with a selectable number of decades or on a linear y-axis showing the results in the range 0.00 to 9.99. When Logarithmic mode is selected, autorange is automatically enabled for all channels. This allows partial pressures to be measured and stored over the full range of the selected detector, while only the decades of immediate interest are displayed.

This mode enables you to individually set the mass in any channel for partial pressure measurement. Alternatively you may select either total pressure (TOT) or, one of the built in analogue inputs. You can assign a channel to either a fixed range or, set the channel into autorange and select the detector to be used.

This mode also has a high and low alarm capability for each channel. The alarm condition is triggered if the magnitude of a peak exceeds the high alarm setting or falls below the low alarm setting. The peak is plotted in red if its magnitude falls inside the alarm range, an audio tone will sound if the audio alarm is enabled and an output is set true on the relevant pin of the AUX I/O connector on the control unit.

Alarms

High alarm

The High Alarm Enable and the High Alarm parameters are displayed in the Channel Settings *dialog box*. The High Alarm parameter is the partial pressure that must be exceeded to activate the alarm. When enabled the High Alarm arrow symbol will appear to the right of the peak plot. When disabled the High Alarm arrow symbol will disappear.

The range over which the High Alarm operates depends on the type of detector the instrument is fitted with. For all detectors the highest pressure setting is $9.9\text{E-}05$. The lowest setting is $0.1\text{E-}11$ for faraday only systems, $0.1\text{E-}13$ for x100 gain multipliers and $0.1\text{E-}14$ for x1000 gain multipliers. The alarm value may be set in 0.1 steps.

To enable the High Alarm *click* on the **High Alarm** *check box* in the Channel Settings *dialog box* to *check* it. The High Alarm setting may then be entered via the **Mantissa** box and the **Range E-** *dropdown list box*. *Click* on the spin buttons to adjust the Mantissa. *Click* on the **Range E-** *dropdown list box* and select the required value from the *dropdown list* by *clicking* on it. The values in the **Range E-** *dropdown list* will depend on the type of detector your system is fitted with.

The other way of setting the High Alarm once it has been enabled is to *drag* the High Alarm symbol to change its value. If the alarm value is outside the current display range it will be shown at either the top or the bottom of the graph but the actual value can still be increased or decreased further by continuing to move the mouse. With this method of setting the High Alarm the maximum possible range of values $9.9\text{E-}05$ to $1.0\text{E-}18$ is shown.

Low alarm

The Low Alarm Enable and the Low Alarm parameters are displayed in the Channel Settings *dialog box*. The Low Alarm parameter is the partial pressure that must be exceeded to deactivate the alarm. When enabled the Low Alarm arrow symbol will appear to the right of the peak plot. When disabled the Low Alarm arrow symbol will disappear.

The range over which the Low Alarm operates depends on the type of detector the instrument is fitted with. For all detectors the highest pressure setting is $9.9\text{E-}05$ with 0.1 steps. The lowest setting is $0.1\text{E-}11$ for faraday only systems, $0.1\text{E-}13$ for x100 gain multipliers and $0.1\text{E-}14$ for x1000 gain multipliers.

To enable the Low Alarm *click* on the **Low Alarm** *checkbox* in the Channel Settings *dialog box* to *check* it. The Low Alarm setting may then be entered via the **Mantissa** box and the **Range E-** *dropdown list box*. *Click* on the spin buttons to adjust the Mantissa. *Click* on the **Range E-** *dropdown list box* and select the required value from the *dropdown list* by *clicking* on it. The values in the **Range E-** *dropdown list* will depend on the type of detector your system is fitted with.

The other way of setting the Low Alarm once it has been enabled is to *drag* the Low Alarm symbol to change its value. If the alarm value is outside the current display range it will be shown at either the top or the bottom of the graph but the actual value can still be increased or decreased further by continuing to move the mouse. With this method of setting the Low Alarm the maximum possible range of values 9.9E-05 to 1.0E-18 is shown.

Peak Jump Channel Features

In this mode, most of the parameters and controls relate to individual channels. All channel parameters can be set from the Channel Settings *dialog box* which is accessed by *clicking* on the channel button. The channel button is the button under the peak indicating the mass number for that channel.

Channel enabled

The channel enabled parameter in the Channel Settings *dialog box* allows the channel to be enabled or disabled. When disabled the channel will be omitted from the scan and the Peak surround (if enabled) will not be displayed. To enable the channel *check* **Channel Enabled**.

Range

The range feature operates in a similar way to the other modes except each channel can have its own range. To select a range *click* on the **Range E-** *dropdown list box* in the Channel Settings *dialog box*, then *click* on the required range from the *dropdown list*.

Autorange

The Autorange feature operates in a similar way to the other modes except each channel can be set to autorange independently. In logarithmic mode all channels autorange automatically regardless of the setting. To switch Autoranging on in the Channel Settings *dialog box* *click* on **Autorange** to *check* it.

Mass

The mass parameter determines the type of measurement made in the channel. Normally it will be the mass number when a partial pressure measurement is to be performed (e.g. 28 for Nitrogen, 32 for Oxygen, 18 for Water etc.). To adjust the mass in the Channel Settings *dialog box* *click* on the increment or decrement *spin button* or *click* on the mass number box and type in the required value. Alternatively you may select either total pressure (TOT) or one of the built in analogue inputs. When using the increment/decrement buttons TOT, AI1 and AI2 can be selected by decrementing below mass 1 or they may be typed in.

Multiplier

Each channel can use either the faraday or multiplier detector independently. The **Multiplier** *check box* is used to enable or disable the multiplier detector. If it is not *checked* the peak will be measured using the faraday detector. When *checked* the multiplier detector will be used for that channel providing the global multiplier control has been enabled. The multiplier button on the *icon bar* controls and indicates the current global multiplier setting. If the global multiplier is not enabled when multiplier is selected in a channel, that channel will not be read.

As with other modes the multiplier gain can be set to x100 or x1000. To select the gain *click* on the **Multiplier Gain:** *dropdown list box* and then *click* on the required gain in the *dropdown list*. The **Multiplier Gain:** control is only available when the multiplier detector is selected.

Peak Jump Features

Ratio with channel

This feature is not available in the Peak Jump mode.

Specific features

Peak surround

This feature can be enabled or disabled by selecting **View | Peak Surround** from the *menu bar* or by *clicking* on the Peak surround button on the *setting bar*. When enabled the value of the partial pressure is displayed above the peak and a box is drawn around the peak. When enabled, Peak surround is only applied to enabled channels.

Audio alarm

An audio alarm can be enabled so that the control unit produces a tone whenever the high or low alarm settings are exceeded. *Click* on the Audio

Alarm button on the *settings bar* or select **Settings** | **Audio Alarm Enabled** from the *menu bar* to enable/disable this feature.

Logarithmic axis

The results in Peak Jump may be plotted on either a Logarithmic y-axis with a selectable number of decades or on a Linear y-axis showing results in the range 0.00 to 9.99. To change the displayed axis *click* on the Log button on the *setting bar* or select **Settings** | **Log Axis** from the *menu bar*. When the axis style is changed the existing peak data will be redrawn with the new axis style.

Log display decades

In log mode two *dropdown list boxes* similar to the Range control in other modes are displayed on the *setting bar*. These determine which decades are displayed. They can also be set from the Peak Jump Settings *dialog box*. To change the **To:** or **From:** range *click* on the appropriate box then *click* on the required range in the *dropdown list*.

The **From:** range must be less than or equal to the **To:** range.

In log mode data will be acquired over all ranges available for the selected detector regardless of the displayed decades.

5.2.3. Multi-Trend

The following topics are specific to the Multi Trend mode.

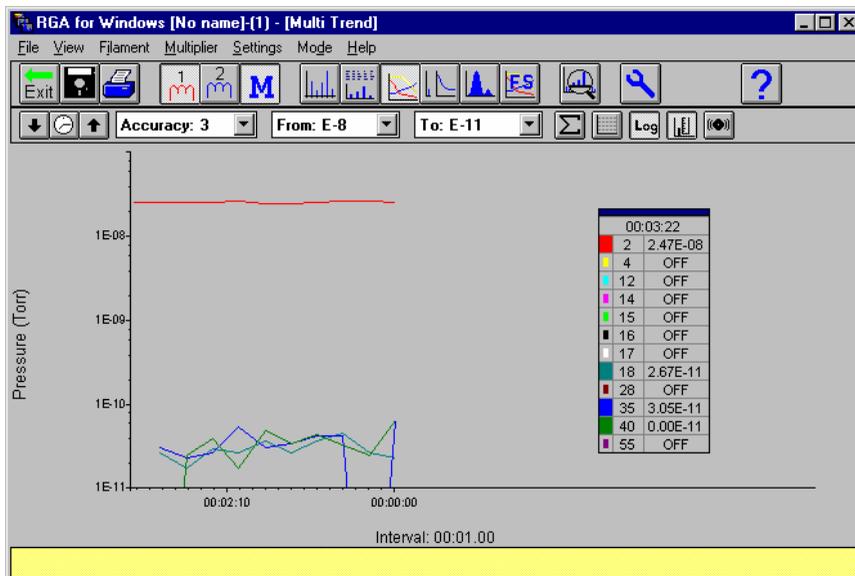
- Mutli Trend Overview
- Multi Trend Channel Features
- Alarms in Multi Trend
- Specific Multi Trend Features

The following general topics apply to the Multi Trend mode.

- Disk Store
- Printing
- Multiplier Detector
- Accuracy
- Total Pressure Measurement
- Total Pressure Microvision Plus
- Grid
- Cursor

Mutli Trend Overview

A typical Multi trend display is shown below. Multi Trend is a channel based scanning mode. Twelve channels are available which are scanned in sequence. Each of the channels has a set of parameters which may be set independently. It is similar to the Peak Jump mode in operation but the results are displayed as a scrolling trend of pressure versus time.



Multi Trend has two display modes. The results may be plotted on either a Logarithmic y-axis with a selectable number of decades or on a Linear y-axis showing results in the range 0.00 to 9.99.

The results from each enabled channel are plotted in the colour shown on the Key panel. The results from the channels are plotted as they are scanned. If the time interval selected is shorter than the time required to complete the scan, then the results will be plotted as soon as they become available.

The time axis can be labelled with either the real time or the time elapsed from starting the mode. The time axis will be marked with a tick when a period of 10 times the time interval has elapsed. At this time, if there is sufficient space, the tick will be labelled with either the elapsed or real time.

The results plotted scroll from left to right with the newest results appearing

at the left of the display to emulate a chart recorder display.

This mode enables you to individually set the mass in any channel for partial pressure measurement. Alternatively you may select either total pressure (TOT) or, one of the built in analogue inputs. You can assign a channel to either a fixed range, or set the channel to autorange and select the detector to be used.

This mode has a high and low alarm facility for each channel. If the partial pressure measured exceeds the high alarm setting or falls below the low alarm setting the output of the relevant Aux I/O pin is set true and an audio tone is generated if audio tone is enabled.

Multi Trend Channel Features

In this mode, most of the parameters and controls relate to individual channels. All channel parameters can be set from the Channel Settings *dialog box* which is accessed by *clicking* on the mass label on the Key Panel. The trend data is plotted in the colours indicated in the Key Panel.

Channel enabled

The channel enabled parameter in the Channel Setting *dialog box* and the Colour panel in the Key Panel allow individual channels to be enabled or disabled. To enable a channel *check* the Channel Enabled *check box* in the Channel Settings *dialog box* or *click* on the plot colour box in the Key Panel. When disabled the plot colour box is reduced in size and the channel will be omitted from the scan.

Range

When using the linear axis, the range feature operates in a similar way to the other modes except each channel can have its own range. To change the range *click* on the mass label in the Key Panel, in the Channel Settings *dialog box* *click* on the **Range E-** *dropdown list box* and then *click* on the required range in the *drop down list box*. In Log Axis display all channels automatically autorange.

Autorange

The Autorange feature operates in a similar way to the other modes except each channel can be set to autorange independently unless Log Axis display is used, when all channels automatically Autorange. *Click* on the **Autorange** *check box* in the Channel Settings *dialog box* to enable autoranging for a channel.

Mass

The mass parameter determines the type of measurement made in the channel. Normally it will be the mass number when a partial pressure measurement is to be performed (e.g. 28 for Nitrogen, 32 for Oxygen, 18 for Water etc.). To adjust the mass in the Channel Settings *dialog box* click on the increment or decrement *spin button* or click on the **Mass** box and type in the required value. Alternatively you may select either total pressure (TOT) or one of the built in analogue inputs. When using the increment/decrement buttons TOT, AI1 and AI2 can be selected by decrementing below mass 1 or they may be typed in.

Multiplier

Each channel can use either the faraday or multiplier detector independently. The **Multiplier** *check box* is used to enable or disable the multiplier detector. If it is not *checked* the peak will be measured using the faraday detector. When *checked* the multiplier detector will be used for that channel providing the global multiplier control has been enabled. The multiplier button on the *icon bar* controls and indicates the current global multiplier setting. If the global multiplier is not enabled when multiplier is selected in a channel, that channel will not be read.

As with other modes the multiplier gain can be set to x100 or x1000. To select the gain click on the **Multiplier Gain:** *dropdown list box* and then click on the required gain in the *dropdown list*. The **Multiplier Gain:** control is only available when the multiplier detector is selected.

Alarms in Multi Trend

High alarm

The High Alarm Enable and the High Alarm parameters are displayed in the Channel Settings *dialog box*. The High Alarm parameter is the partial pressure that must be exceeded to activate the alarm.

The range over which the High Alarm operates depends on the type of detector the instrument is fitted with. For all detectors the highest pressure setting is 9.9E-05. The lowest setting is 0.1E-11 for faraday only systems, 0.1E-13 for x100 gain multipliers and 0.1E-14 for x1000 gain multipliers. The alarm value may be set in 0.1 steps.

To enable the High Alarm click on the **High Alarm** *check box* in the Channel Settings *dialog box* to *check* it. The High Alarm setting may then be entered via the **Mantissa** box and the **Range E-** *dropdown list box*. Click on

the spin buttons to adjust the Mantissa. *Click* on the **Range E- dropdown list box** and select the required value from the *dropdown list* by *clicking* on it. The values in the **Range E- dropdown list** will depend on the type of detector your system is fitted with.

Low alarm

The Low Alarm Enable and the Low Alarm parameters are displayed in the Channel Settings *dialog box*. The Low Alarm parameter is the partial pressure that must be exceeded to deactivate the alarm.

The range over which the Low Alarm operates depends on the type of detector the instrument is fitted with. For all detectors the highest pressure setting is 9.9E-05 with 0.1 steps. The lowest setting is 0.1E-11 for faraday only systems, 0.1E-13 for x100 gain multipliers and 0.1E-14 for x1000 gain multipliers.

To enable the Low Alarm *click* on the **Low Alarm check box** in the Channel Settings *dialog box* to *check* it. The Low Alarm setting may then be entered via the **Mantissa** box and the **Range E- dropdown list box**. *Click* on the spin buttons to adjust the Mantissa. *Click* on the **Range E- dropdown list box** and select the required value from the *dropdown list* by *clicking* on it. The values in the **Range E- dropdown list** will depend on the type of detector your system is fitted with.

Specific Multi Trend Features

Ratio with channel

This allows the cursor value displayed in the Key panel to be expressed as a ratio of that channel's reading and another selected channel's reading. To enable ratio *click* on the **Ratio with channel check box** to *check* it, then *click* on the *dropdown list box* and select the channel to ratio with from the list by *clicking* on it. The channel identifier in the Key panel will change from one colour to two colours to indicate which channels are being ratioed. The channel used for the ratio must be enabled in order to obtain a ratio value. The trend displayed will be the partial pressure measurement not the ratio.

For example:

Channel 1 is set to mass 28 and is measuring 6×10^{-7} mBar. Channel 2 is set to mass 32 and is measuring 1.5×10^{-7} mbar. In the Channel 1 settings *dialog box* **Ratio with channel** is *checked* and in the *dropdown list* channel 2 (mass 32) is selected.

The channel identifier for channel one will be red and yellow and the cursor value displayed in the Key panel next to channel 1 will be:

$$4 \times 10^{+0} \quad (\text{from } 6 \times 10^{-7} / 1.5 \times 10^{-7})$$

Time interval

The time between plotting the scans on the screen may be set anywhere between one second and 30 minutes, in one second increments. To increment or decrement the interval, *click* the up and down buttons next to the interval button on the *setting bar*. To set the interval either *click* the Interval button or select **Settings | Interval . . .** from the *menu bar*.

Elapsed time

Every 10 times the time interval, the trend will be marked with a tick on the time axis, and if there is sufficient space, the time is printed. You may elect to show this time either as the time elapsed from the start of the mode or as real time taken from your PC's clock. If the real time clock is incorrect, select Control Panel in Windows main group, then select Time/Date and set the correct time and date.

Win95 *Click* on the **Start** button on the Taskbar then select **Settings | Control Panel**. *Double click* on the Time/Date icon in the Control Panel window.

When the elapsed time is changed, the existing peak data will be redrawn with the new time displayed. To change from elapsed to real displayed time select **View | Time Label | Display Elapsed Time** from the *menu bar*.

Vertical label

The time labels can be displayed vertically or horizontally. To enable the vertical label select **View | Time Label | Vertical Label** from the *menu bar*. Vertical time labels are not available if all vertical labels have been disabled from the **File | Preferences | Vertical Labels** menu item in the Mode Select screen. Vertical labels use more Windows system resources.

Continuous trace

The trace can be plotted as either dots, with one dot representing each measurement, or as a series of lines joining the dots. To enable the continuous trace select **View | Continuous Trace** from the *menu bar*.

Label trace

When printing a trend to a black and white printer it is possible to label each

trace with its channel number. To enable this feature select **File | Label Trace** from the *menu bar*. When enabled, this feature will increase the printout time considerably on some printers.

Colour trace

If you have a colour printer installed you can print the trend traces in colour. Similar colours are used on the printout to those displayed on the screen except for white which will appear as grey. To enable/disable this feature select **File | Colour Trace** from the *menu bar*.

Log axis

The results in Multi Trend may be plotted on either a Logarithmic y-axis with a selectable number of decades or on a linear y-axis showing results in the range 0.00 to 9.99. To change the displayed axis *click* on the Log button on the *setting bar* or select **Settings | Log Axis** from the *menu bar*. In Log axis display all channels will autorange within the limits of Log Axis Start range to Log Axis End range. When the axis style is changed the existing trend data will be redrawn with the new axis style.

Log display decades

In log mode two *dropdown list boxes* similar to the Range control in other modes are displayed. These determine which decades are displayed. To change the **From:** or **To:** range *click* on the appropriate *dropdown list box* on the *setting bar* then *click* on the required value in the list. They can also be set from the Channel Settings *dialog box*.

The **From:** range must be less than or equal to the **To:** range.

In Log mode data will be acquired over all ranges available for the selected detector regardless of the displayed decades.

5.2.4. Leak Check

The following topics are specific to the Leak Check mode.

Leak Check Overview

Specific Leak Check Features

The following general topics apply to the Leak Check mode.

Disk Store

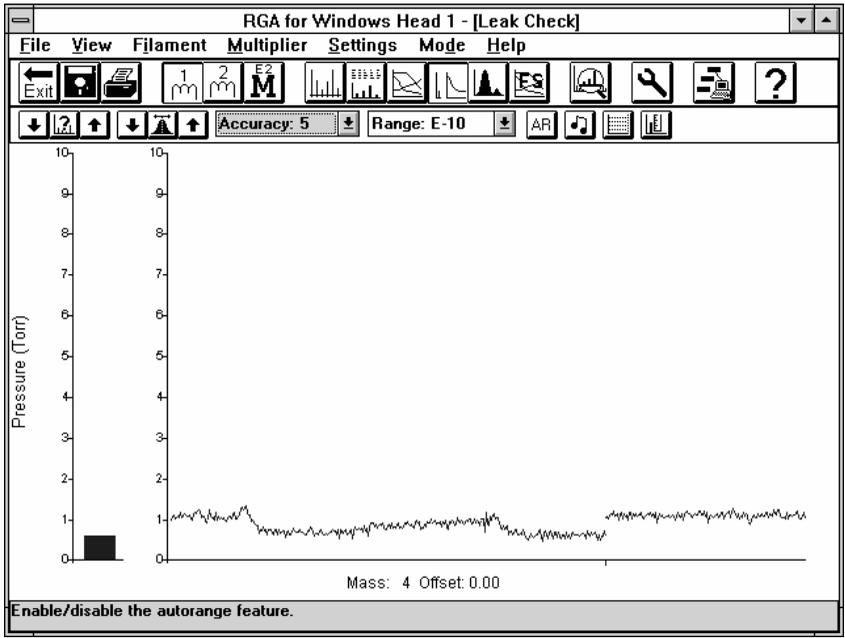
Printing

Multiplier Detector

Accuracy
Range
Autorange
Grid
Cursor

Leak Check Overview

A typical Leak Check display is shown below. This mode's main use, as the name implies, is to locate real leaks in your vacuum chamber. In general this is done by taking a bottle of probe gas, usually helium and tuning the RGA to that probe gas. The probe gas is then sprayed over the vacuum chamber, especially near flanges, feedthroughs and welds, until an increase in the peak height is observed. To assist when you are out of sight of the screen an audio tone can be selected. For really large chambers an optional remote headset is available.



The second use of Leak Check is as a general purpose monitor of single peak height with either very fast response or very stable readings.

The peak height is displayed both as a trend to give an historical record and as a vertical bar clearly showing the current value.

This mode does not scan across the width of a peak and report the maximum value but instead it sits at one point on the peak. This point is specified by the mass offset parameter and may be adjusted to ensure the centre of the peak is being measured. For normal leak checking the offset may be set to zero.

The accuracy parameter allows readings to be taken at up to 156 times per second (accuracy 0) or to integrate each reading for 0.25 seconds (accuracy 5).

The mode also has the ability to autorange, however this feature should be used with care as it is possible for a peak to change in value by close to one (or more) decades and this change be missed.

Specific Leak Check Features

Probe gas mass

This is the mass of the gas being used to do the leak checking. This is usually Helium (mass 4) but for systems where it is undesirable to allow Helium into the vacuum chamber, such as cryo-pumped systems, then Argon (mass 40) is often used. The probe gas is variable in the range of 1 to the maximum mass of the instrument. To increment or decrement the probe gas mass, *click* the up and down buttons next to the probe gas mass button on the *setting bar*. To set it either *click* the probe gas mass button or select **Settings** | **Probe Mass . . .** from the *menu bar*.

Mass offset

This parameter determines the exact point on the peak where measurements will be made. It can be set to a value between -0.5 amu and +0.47 amu in steps of approximately 0.03 amu. To increment or decrement the mass offset, *click* the up and down buttons next to the mass offset button on the *setting bar*. To set it either *click* the mass offset button or select **Settings** | **Mass Offset . . .** from the *menu bar*.

Audio tone

An audio tone with a frequency (pitch) proportional to the peak height currently being measured may be enabled or disabled, the higher the frequency the larger the peak is. To switch it on and off either *click* the Audio Tone button on the *setting bar* or select **Settings** | **Audio Enabled** from the *menu bar*.

Continuous trace

The trace can be plotted as either dots or as lines joining the dots. To enable/disable this feature select **View | Continuous Trace** from the *menu bar*.

5.2.5. Analogue

The following topics are specific to the Analogue mode.

Analogue Overview

Specific Analogue Features

The following general topics apply to the Analogue mode.

Disk Store

Printing

Multiplier Detector

Accuracy

Range

Autorange

Total Pressure Measurement

Total Pressure Microvision Plus

Grid

Cursor

RF Select

Set All

Analogue Overview

A typical Analogue display is shown below. This mode allows one of a number of pre-set ranges of consecutive masses to be scanned. The starting mass (First mass) can also be specified. It is generally used to confirm that the RGA is functioning correctly and to allow adjustments to resolution and mass alignment to be made.

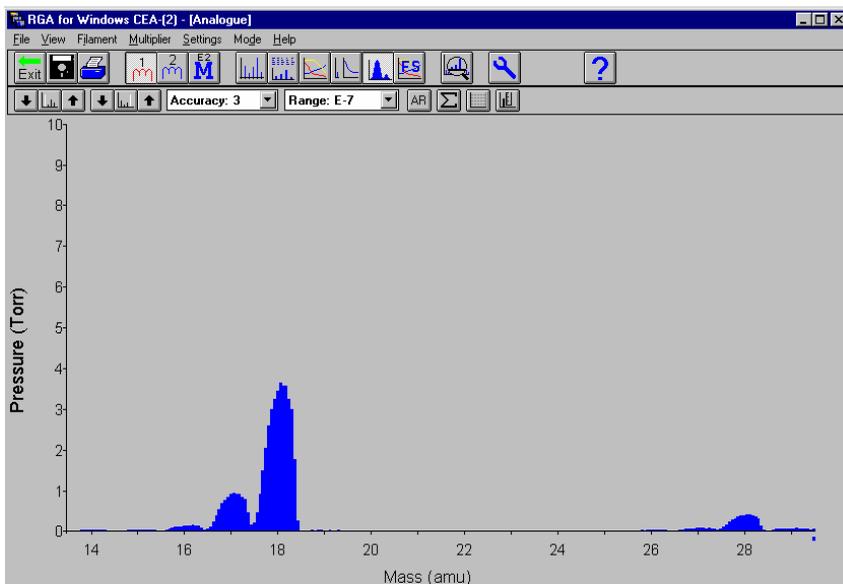
The actual mass range scanned is (First mass - 0.5amu) to (First mass + Mass span - 0.5amu). For each amu in the scan the complete peak profile is plotted.

Specific Analogue Features

First mass

The starting mass of the scan is determined by this parameter. It is variable in the range of 1 to (maximum mass - mass span + 1). The label on the x-axis will always start with one half amu less than the first mass. To

increment or decrement the first mass, *click* the up and down buttons either side of the first mass button on the *setting bar*. To set the first mass either *click* the first mass button or select **Settings | First Mass . . .** from the *menu bar*.



Mass span

This parameter determines the number of consecutive masses that will be scanned. It can be set to a value in the following list:- 8, 16, 32, 64. To increment or decrement the mass span, *click* the up and down buttons either side of the mass span button on the *setting bar*. To set it either *click* the mass span button or select **Settings | Mass Span . . .** from the *menu bar*.

RF tuning

This feature is only available when; using a Satellite control unit with a LM46-, LM61- or LM65- serial number which was sold with the Windows Satellite software, and an RF head which has been supplied as part of a complete RGA for Windows package or a Microvision, Microvision Plus, Vac Check 100. It is not available with Vacscan Plus or Vacscan control units. If RF Tuning cannot be used the *menu item* will be *grayed out*. The facility allows the RF head to be tuned for mass alignment and resolution. Under normal operating conditions you should not need to adjust these settings from the factory pre-set default values for a particular RF head and

analyser combination. To open the RF Tuning *dialog box* select **Setting | RF tuning** from the *menu bar*.

see RF Tuning for more details

5.2.6. Fast Scan

The following topics are specific to the Fast Scan mode.

Fast Scan Overview

Fast Scan Channel Features

Fast Scan Specific Features

The following general topics apply to the Fast Scan mode.

Disk Store

Printing

Multiplier Detector

Accuracy

Total Pressure Measurement

Total Pressure Microvision Plus

Grid

Cursor

Fast Scan Overview

Fast Scan as the name implies is a mode designed to acquire data as fast as possible. Up to twelve channels are scanned in sequence, each channel has a set of parameters which may be set independently. The results are displayed as a scrolling trend. The accuracy setting found in other modes is abandoned and replaced with Dwell and Settle settings for each channel giving the user maximum control over the scan speed. These settings are adjusted to give the required trade off between stability of the readings and scan speed.

In other modes an amplifier zero routine is carried out at the end of each scan. To reduce the scan time in Fast Scan the zero is done when you enter the mode and thereafter only when the user selects amplifier zero.

Other features are very similar to the Multi Trend mode. The results may be plotted on either a Logarithmic y-axis with a selectable number of decades or on a Linear y-axis showing results in the range 0.00 to 9.99.

The results from each enabled channel are plotted in the colour shown on the Key panel. The results from the channels are plotted as they are scanned. If

the time interval selected is shorter than the time required to complete the scan, then the results will be plotted as soon as they become available.

The time axis can be labelled with either the real time or the time elapsed from starting the mode. The time axis will be marked with a tick when a period of 10 times the time interval has elapsed. At this time, if there is sufficient space, the tick will be labelled with either the elapsed or real time.

The results plotted scroll from left to right with the newest results appearing at the left of the display to emulate a chart recorder display.

This mode enables you to individually set the mass in any channel for partial pressure measurement. Alternatively you may select either total pressure (TOT) or, one of the built in analogue inputs. You can assign a channel to either a fixed range, or set the channel into autorange and select the detector to be used.

Fast Scan Channel Features

In the Fast Scan mode, most of the parameters and controls relate to individual channels. All channel parameters can be set from the Channel Settings *dialog box* which is accessed by *clicking* on the mass label on the Key Panel. The trend data is plotted in the colours indicated in the Key Panel.

Channel enabled

The channel enabled parameter in the Channel Setting *dialog box* and the Colour panel in the Key Panel allow individual channels to be enabled or disabled. To enable a channel *check* the Channel Enabled *checkbox* in the Channel Settings *dialog box* or *click* on the plot colour box in the Key Panel. When disabled the plot colour box is reduced in size and the channel will be omitted from the scan.

Range

When using the linear axis, the range feature operates in a similar way to the other modes except each channel can have its own range. To change the range *click* on the mass label in the Key Panel, in the Channel Setting *dialog box* *click* on the **Range E-** *dropdown list box* and then *click* on the required range in the *dropdown list box*. In Log Axis display all channels automatically autorange.

Autorange

The Autorange feature operates in a similar way to the other modes except each channel can be set to autorange independently unless Log Axis display is used, when all channels automatically Autorange. *Click* on the **Autorange check box** in the Channel Settings *dialog box* to enable autoranging for a channel. The settle time required to get good results may change as the range changes, this should be taken into account if autoranging is enabled.

Mass

The mass parameter determines the type of measurement made in the channel. Normally it will be the mass number when a partial pressure measurement is to be performed (e.g. 28 for Nitrogen, 32 for Oxygen, 18 for Water etc.). To adjust the mass in the Channel Settings *dialog box* *click* on the increment or decrement *spin button* or *click* on the **Mass** box and type in the required value. Alternatively you may select either total pressure (TOT) or one of the built in analogue inputs. When using the increment/decrement buttons TOT, AI1 and AI2 can be selected by decrementing below mass 1 or they may be typed in.

Multiplier

Each channel can use either the faraday or multiplier detector independently. The multiplier *check box* is used to enable or disable the multiplier detector. If it is not *checked* the peak will be measured using the faraday detector. When *checked* the multiplier detector will be used for that channel providing the global multiplier control has been enabled. The multiplier button on the *icon bar* controls and indicates the current global multiplier setting. If the global multiplier is not enabled when multiplier is selected in a channel, that channel will not be read.

As with other modes the multiplier gain can be set to x100 or x1000. To select the gain *click* on the **Multiplier Gain: dropdown list box** and then *click* on the required gain in the *dropdown list*.

Dwell time

This is the time the instrument spends on the selected channel taking readings. The shorter the dwell time the faster the scanning but the fewer the number of readings therefore, the less stable the result. To set the dwell time *click* on the **Dwell mS dropdown list box** and then *click* on the required time from the *dropdown list*. Only times from the list maybe set other values may not be typed in.

Settle time

This is the time the instrument spends after switching to the next channel and tuning to a new mass value before starting to take measurements. The shorter the settle time the faster the instrument will scan but the greater the chance of the results being unstable. To set the settle time *click* on the appropriate spin button to the right of the **Settle mS** box or *click* on the box and type in the required value in the range 8 to 9900. If autoranging is enabled the settle time should take into account the worst case (highest gain range) in order to guarantee consistent results.

Ratio with channel

This allows the cursor value displayed in the Key panel to be expressed as a ratio of that channel's reading and another selected channel's reading. It operates in the same way as it does in Multi-Trend. To enable ratio *click* on the **Ratio with channel** *check box* to *check* it, then *click* on the *dropdown list box* and select the channel to ratio with from the list by *clicking* on it. The channel identifier in the Key panel will change from one colour to two colours to indicate which channels are being ratioed. The channel used for the ratio must be enabled in order to obtain a ratio value. The trend displayed will be the partial pressure measurement not the ratio.

High alarm

The High Alarm Enable and the High Alarm parameters are displayed in the Channel Settings *dialog box*. The High Alarm parameter is the partial pressure that must be exceeded to activate the alarm.

The range over which the High Alarm operates depends on the type of detector the instrument is fitted with. For all detectors the highest pressure setting is 9.9E-05. The lowest setting is 0.1E-11 for faraday only systems, 0.1E-13 for x100 gain multipliers and 0.1E-14 for x1000 gain multipliers. The alarm value may be set in 0.1 steps.

To enable the High Alarm *click* on the **High Alarm** *check box* in the Channel Settings *dialog box* to *check* it. The High Alarm setting may then be entered via the **Mantissa** box and the **Range E-** *dropdown list box*. *Click* on the spin buttons to adjust the Mantissa. *Click* on the **Range E-** *dropdown list box* and select the required value from the *dropdown list* by *clicking* on it. The values in the **Range E-** *dropdown list* will depend on the type of detector your system is fitted with.

Low alarm

The Low Alarm Enable and the Low Alarm parameters are displayed in the

Channel Settings *dialog box*. The Low Alarm parameter is the partial pressure that must be exceeded to deactivate the alarm.

The range over which the Low Alarm operates depends on the type of detector the instrument is fitted with. For all detectors the highest pressure setting is 9.9E-05 with 0.1 steps. The lowest setting is 0.1E-11 for faraday only systems, 0.1E-13 for x100 gain multipliers and 0.1E-14 for x1000 gain multipliers.

To enable the Low Alarm *click* on the **Low Alarm check box** in the Channel Settings *dialog box* to *check* it. The Low Alarm setting may then be entered via the **Mantissa** box and the **Range E- dropdown list box**. *Click* on the spin buttons to adjust the Mantissa. *Click* on the **Range E- dropdown list box** and select the required value from the *dropdown list* by *clicking* on it. The values in the **Range E- dropdown list** will depend on the type of detector your system is fitted with.

Fast Scan Specific Features

Zero amplifier

To increase the scan speed the amplifier is only zeroed when the user selects a zero, rather than at the end of each scan as in other modes. To perform an amplifier zero *click* on the Zero Amplifier button on the setting bar or select **Settings | Zero Amplifier** from the *menu bar*.

Time interval

The time between plotting the scans on the screen may be set anywhere between one hundredth of a second and 30 minutes, in one hundredth of a second increments. To increment or decrement the interval, *click* the up and down buttons next to the interval button on the *setting bar*. To set the interval either *click* the Interval button or select **Settings | Interval . . .** from the *menu bar*.

Elapsed time

Every 10 times the time interval, the trend will be marked with a tick on the time axis, and if there is sufficient space, the time is printed. You may elect to show this time either as the time elapsed from the start of the mode or as real time taken from your PC's clock. If the real time clock is incorrect, select Control Panel in Windows main group, then select Time/Date and set the correct time and date.

Win95 *Click* on the **Start** button on the Taskbar then select **Settings |**

Control Panel. *Double click* on the Time/Date icon in the Control Panel window.

When the elapsed time is changed, the existing peak data will be redrawn with the new time displayed. To change from elapsed to real displayed time select **V**iew | **T**ime Label | **D**isplay **E**lapsed Time from the *menu bar*.

Vertical label

The time labels can be displayed vertically or horizontally. To enable the vertical label select **V**iew | **T**ime Label | **V**ertical Label from the *menu bar*. Vertical time labels are not available if all vertical labels have been disabled from the **F**ile | **P**references | **V**ertical Labels menu item in the Mode Select screen. Vertical labels will use more Windows system resources.

Continuous trace

The trace can be plotted as either dots, with one dot representing each measurement, or as a series of lines joining the dots. To enable the continuous trace select **V**iew | **C**ontinuous Trace from the *menu bar*.

Label trace

When printing to a black and white printer it is possible to label each trace with its channel number. To enable this feature select **F**ile | **L**abel **T**race from the *menu bar*. When enabled, this feature will increase the printout time considerably on some printers.

Colour trace

If you have a colour printer installed you can print the trend traces in colour. Similar colours are used on the printout to those displayed on the screen except for white which will appear as grey. To enable/disable this feature select **F**ile | **C**olour Trace from the *menu bar*.

Logarithmic axis

The results in Fast Scan may be plotted on either a Logarithmic y-axis with a selectable number of decades or on a linear y-axis showing results in the range 0.00 to 9.99. To change the displayed axis *click* on the Log button on the *setting bar* or select **S**ettings | **L**og Axis from the *menu bar*. In Log axis display all channels will autorange within the limits of Log Axis Start range to Log Axis End range. When the axis style is changed the existing trend data will be redrawn with the new axis style.

Log display decades

In log mode two *dropdown list boxes* similar to the Range control in other modes are displayed. These determine which decades are displayed. They can also be set from the Channel Settings *dialog box*.

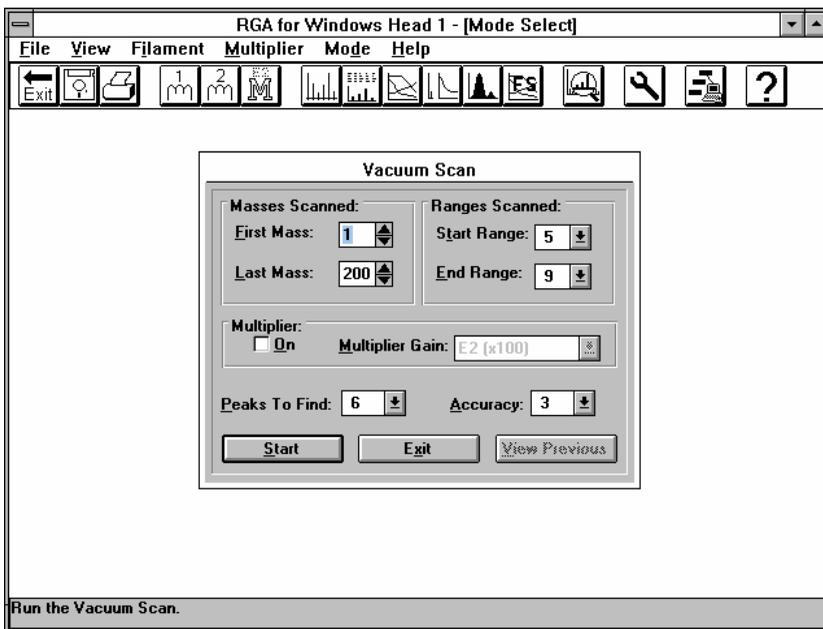
The **From:** range must be less than or equal to the **To:** range.

In Log mode data will be acquired over all ranges available for the selected detector regardless of the displayed decades.

5.2.7. Vacuum Scan

The vacuum scan mode is designed to determine the major peaks in your vacuum chamber, display them and, on request, offer suggestions for the probable names of the gasses. The list of common gasses is contained in the COMGAS.TXT file and may be customised using a text editor e.g. Notepad.exe. In addition the results from the previous vacuum scan may be reviewed and the peaks found can be loaded into the Peak Jump and Multi Trend modes for more detailed measurement.

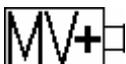
To enter Vacuum scan *click* on the Vacuum Scan button on the *setting bar* or select **Mode** | **V**acuum Scan from the *menu bar*. The Vacuum Scan Setup *dialog box* will be displayed as shown below.



Vacuum scan setup

Vacuum scan mode by default scans the whole mass range of the instrument over a wide dynamic range. If you know, for example, that only peaks below mass 50 in the ranges E-06 to E-08 are of interest then vacuum scan can be programmed to look just at peaks that meet these criteria. This will significantly reduce the time taken to perform the vacuum scan.

The first and last masses to be scanned can be entered in the **Masses Scanned: First Mass:** and **Masses Scanned: Last Mass:** boxes respectively by typing in the value or using the *spin buttons*. The first gain range to be used in the vacuum scan can be selected by *clicking* on **Start Range:** and then *clicking* on the required value from the *dropdown list*. The last range may be selected in a similar manner by using the **End Range:** *dropdown list box*.



There are only two start ranges and two finish ranges available due to the wide dynamic range of the amplifier system used in the Microvision Plus. The exact ranges available will vary depending on the detector selected.

The detector may be set to either faraday, multiplier x100 or multiplier x1000 and the accuracy may be set to between 0 and 5. To perform the vacuum scan using the Multiplier *click* on the **Multiplier On** box to *check* it otherwise the faraday detector will be used. Select the gain range by *clicking* on the **Multiplier Gain: dropdown list box** and then *click* on the required gain in the *dropdown list*. In faraday only systems **Multiplier On** will be *grayed out* as this will not be available.

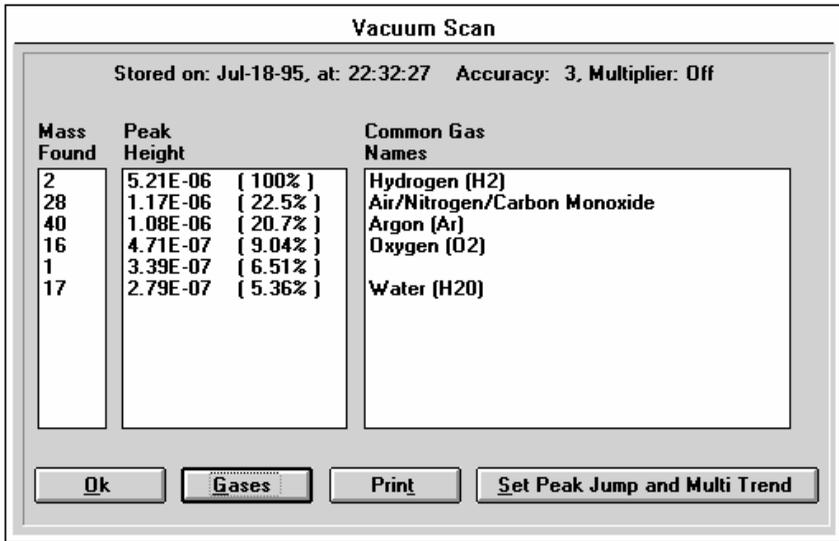
The mode can look for up to twelve gasses but this may be set to be anywhere between one and twelve. To do this *click* on the **Peaks To Find: dropdown list box** and then *click* on the required number.

To set the accuracy code *click* on the **Accuracy:** box and then *click* on the required value from the *dropdown list*. Accuracy is fully explained in section Error! Reference source not found..

Click on the **Start** button to begin scanning, if the filaments are off you will be prompted to switch a filament on. *Click* on the **View Previous** button to see the results of the last vacuum scan. The **View Previous** button will be disabled (button text shown in grey) if Vacuum Scan has not been run since performing a power up reset. *Clicking* the **Exit** button will close the Vacuum Scan Setup *dialog box* without the vacuum scan being run.

Running

After **Start** has been selected in the Vacuum Scan Setup *dialog box* the Vacuum Scan Results *dialog box* will be displayed and the instrument will scan the requested masses displaying any that exceed 7% and are less than 99.9% of full scale on the current range. When the requested number of peaks to find have been located and the scan on the current range is completed, the scan stops. A typical results window is shown below.



Note that by default peaks exceeding full scale are not included in the analysis.

If no peaks are found that fulfil the above criteria then a warning message will be displayed and vacuum scan will end.

Viewing the results

The results of the latest vacuum scan are displayed in order of magnitude as a partial pressure and as a percentage of the largest peak found. The gasses most commonly associated with the peaks found may be displayed by *clicking* on the **Gases** button.

The peaks found may be loaded into the Peak Jump and Multi Trend modes by *clicking* on the **Set Peak Jump and Multi Trend** button. The peaks will have the same range as found in vacuum scan and autorange will be enabled. If less than twelve peaks were found then channel numbers greater than the number found will be disabled.

A printout of the results may be obtained by *clicking* on the **Print** button.

5.3. Analogue Output Module

The Aux. I/O port on the back of the RGA control unit is used as TTL alarm outputs in the standard configuration. If the optional Analogue Output Module is fitted then the alarm TTL outputs must be disabled by selecting **File | Preferences | Satellite Analogue Output** from the *menu bar* in the Mode Select screen. The alarm function in Peak Jump will be available but without the TTL outputs.

If an expansion module such as an RVC or Valve Controller is connected to the Aux. I/O port the **File | Preferences | Satellite Analogue Output** menu item will not be available. If the **File | Preferences | Satellite Alarm Output** menu item is checked it must first be un-checked and then the **File | Preferences | Satellite Analogue Output** menu item may be *checked*.

The Analogue Output Module has its own manual reference LP102020, please refer to this for more information.

5.4. Valve Actuator

The Valve Actuator Unit is a self contained accessory unit that enables solenoids, actuators, valves etc. to be controlled via the Aux. I/O ports of Vacscans, Satellites and Microvisions.

In the Peak Jump mode there is the facility to set up high and low alarm levels for each channel. The alarm signals that are sent out by the control unit are unbuffered TTL levels, via the Aux. I/O connector. As such, these signals are only suitable for driving TTL gates or very low power relays.

The Valve Actuator Unit buffers and amplifies these signals to drive power solenoids. There are 12 identical channels, corresponding to the 12 peak jump channels (excepting Vacscan, which has only 6 channels). In the case of Vacscan, the first 6 channels are active, channels 7 to 12 are inactive.

The unit is designed so that users may, in conjunction with the relevant sections of this manual, set up their own process control/monitoring system hardware.

The Valve Actuator has no effect on the RGA for Windows software.

The Valve Actuator has its own manual reference LP102007, please refer to this for more information.

5.5. Digital I/O Card

The Aux. I/O port on the RGA control unit may be used to connect an expansion module such as an RVC or Analogue Output Module or as an Alarm Output port. If an expansion module is fitted and alarm output signals are also required then a Digital I/O card must be fitted to the PC to provide alarm output signals.

Any make of digital I/O card may be used provided they use 8255 programmable peripheral chips or emulate the 8255 in its mode 0. The cards we would recommend are the PC DIO24, the PC DIO48 and the PC DIO192 manufactured by Brain Boxes. The number of outputs required will depend on the number of RGA heads and the number of channels being used. The number of outputs each card can give is indicated in the name e.g. PC DIO48 gives 48 outputs which can be used as alarm outputs.

The 8255 has a total of 24 bits divided into three ports, each bit may be configured as an output or input. Port A and Port B are each eight bit ports. Port C can be considered as two 4 bit ports referred to as CL and CH. RGA for Windows only uses the ports as alarm outputs so they may all be configured as outputs. It is possible to configure one or more ports as inputs if you do not require them for alarm outputs. This may be useful if you are using another application on your PC which can use digital inputs.

5.5.1. Installing the card

To install the digital I/O card you should follow the instructions that come with it. Before fitting it make a note of the port addresses, you will need these when configuring RGA for Windows. If the card provides interrupts these must be disabled.

5.5.2. Configuring alarm outputs

Before you can get your digital I/O card to give you any alarm signals you need to configure RGA for Windows so that it is aware of your alarm output requirements.

There are three parts to this configuration process:

1. Specify the number of 8255s fitted, specify the base address of each one and configure all the ports to be outputs.

2. Allocate a unique “signal” number to a single bit on a specific port.
3. Set-up the channels to use the required “Signal” for their alarm output.

5.5.3. Port configuration

During the RGA for Windows installation procedure a file named DIGIO.INI was installed in the Spectra directory, a printout of this file can be found at the end of this section. To configure the ports the [PORTS] section of the DIGIO.INI file must be edited. To do this open the DIGIO.INI in a text editor such as Notepad which comes with the Windows software. A [PORTS] section is listed below with an explanation of each line following it.

```
[PORTS]
Number of 8255 = 1
8255 1 Base= &H300
; 0 = Output, 1 = Input
8255 1 PortA = 0
8255 1 PortB = 0
8255 1 PortCH = 0
8255 1 PortCL = 0
```

The first line “Number of 8255 = n” indicates how many 8255s are fitted which are going to be used for alarm outputs.

In the second line “8255 n Base= address” n is an incremental number which should be 1 for the first 8255, 2 for the second 8255 and so on. The address is the base address for the particular 8255 and should match the setting of your digital I/O card. You can prefix the address with &H to indicate that it is a hex. number.

The third line is a comment. Comments may be inserted in the DIGIO.INI they should be on a separate line and must begin with a semicolon (;).

The last four lines set each of the 8255 ports as outputs (=0). You will need one entry per 8255 port i.e. if there are two 8255s there will be eight entries.

Signal allocation

The signal allocation is defined by editing the [SIGNAL] section of the DIGIO.INI file, please refer to the printout of this file at the end of this section. The first line is:

No Of Signals = nmax

Where nmax is the maximum signal number you are to define. This will usually be the same as the number of output bits on the digital i/o card.

In the DIGIO.INI file printed at the end of this section No Of Signals = 24.

For each signal two entries are required. The first entry defines the address of the port to be used the second is the bit mask to identify the bit within the port which is to be used. The format of the two entries are:

Port Address n = port address

Bit Mask n = mask

Where n is the signal number being defined.

Port Address is the hex. address of the required port.

Mask is a byte mask with the required bit set. A binary 1 sets the bit and the mask is expressed as a hex. number.

In the DIGIO.INI file at the end of this section 24 signals are defined for a PC DIO24 card with a base address of &H300.

Signals 1 to 8 are on the 8255 port A bits 0 to7 respectively.

Signals 9 to 16 are on the 8255 port B bits 0 to7 respectively.

Signals 17 to 24 are on the 8255 port C bits 0 to7 respectively.

Channel to signal allocation

The last part of the configuration process is to attach the alarm output from each channel in the Peak Jump, Multi Trend and Fast Scan modes to one of the signals specified in the DIGIO.INI file. The association is specified in the [CHANNELS] section of the RGA4WIN.INI (RGA4WINn.INI for Multi RGA for Windows) file using the following format:

‘PC Alarm Signal = s1;s2; . . . s12’

Where

s1 = Signal number for Channel 1 alarm output

s2 = Signal number for Channel 2 alarm output

The default settings in a single headed system are:

Channels 1 to 12 are associated with Signals 1 to 12 respectively.

The entry in the [CHANNELS] section of the RGA4WIN.INI file would be:

PC Alarm Signal = 1,2,3,4,5,6,7,8,9,10,11,12

The default settings in a multi-headed system are:

Channels 1 to 12 on head 1 are associated with Signals 1 to 12 respectively

Channels 1 to 12 on head 2 are associated with Signals 13 to 24 respectively

Channels 1 to 12 on head 3 are associated with Signals 25 to 36 respectively

Channels 1 to 12 on head 4 are associated with Signals 37 to 48 respectively

5.5.4. DIGIO.INI file

Below is a listing of the DIGIO.INI file.

[PORTS]

Number of 8255 = 1

8255 1 Base= &H300

; 0 = Output, 1 = Input

8255 1 PortA = 0

8255 1 PortB = 0

8255 1 PortCH = 0

8255 1 PortCL = 0

[SIGNALS]

No Of Signals = 24

Port Address 1 = &H300

Bit Mask 1 = &H01

Port Address 2 = &H300

Bit Mask 2 = &H02

Port Address 3 = &H300

Bit Mask 3 = &H04

Port Address 4 = &H300

Bit Mask 4 = &H08

Port Address 5 = &H300

Bit Mask 5 = &H10

Port Address 6 = &H300

Bit Mask 6 = &H20

Port Address 7 = &H300

Bit Mask 7 = &H40

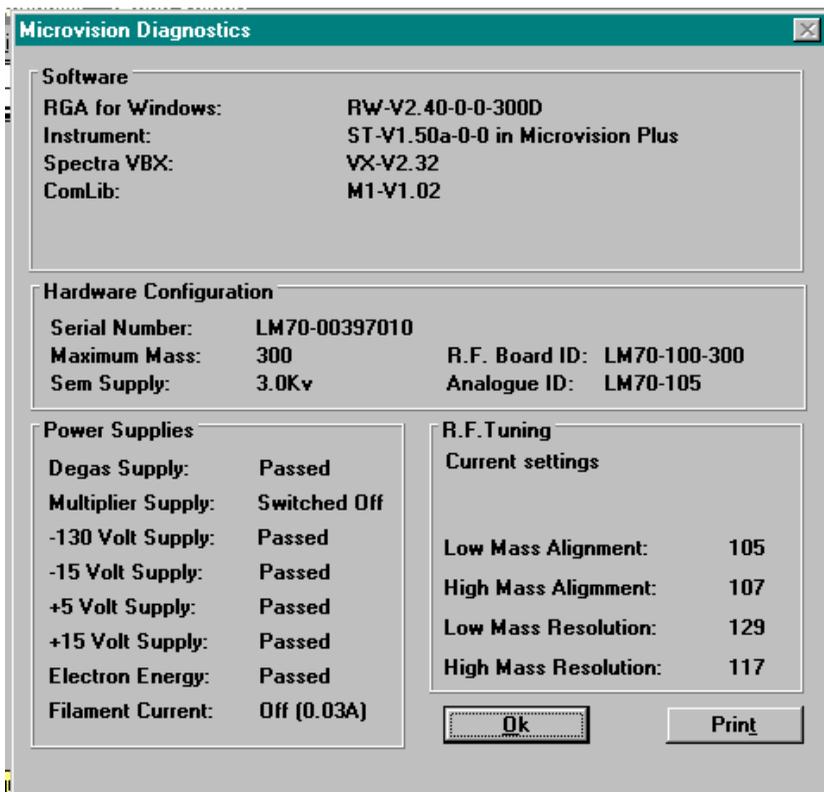
Port Address 8 = &H300

Bit Mask 8 = &H80

Port Address 9 = &H301
Bit Mask 9 = &H01
Port Address 10 = &H301
Bit Mask 10 = &H02
Port Address 11 = &H301
Bit Mask 11 = &H04
Port Address 12 = &H301
Bit Mask 12 = &H08
Port Address 13 = &H301
Bit Mask 13 = &H10
Port Address 14 = &H301
Bit Mask 14 = &H20
Port Address 15 = &H301
Bit Mask 15 = &H40
Port Address 16 = &H301
Bit Mask 16 = &H80
Port Address 17 = &H302
Bit Mask 17 = &H01
Port Address 18 = &H302
Bit Mask 18 = &H02
Port Address 19 = &H302
Bit Mask 19 = &H04
Port Address 20 = &H302
Bit Mask 20 = &H08
Port Address 21 = &H302
Bit Mask 21 = &H10
Port Address 22 = &H302
Bit Mask 22 = &H20
Port Address 23 = &H302
Bit Mask 23 = &H40
Port Address 24 = &H302
Bit Mask 24 = &H80

5.6. Diagnostics

The Diagnostics window displays the software versions of various key modules along with RF Tuning parameters if applicable and the results of diagnostics tests of seven key electronic power supplies. A typical diagnostics window is shown in below. To obtain a printout of this information press the **Print** button. It is most important to have this information available when calling your local service centre.



To run Diagnostics either *click* the Diagnostics button or select **Mode | Diagnostics** from the *menu bar*.

Each supply will show either passed or failed except the multiplier power supply (see below for details).

If a supply shows failed first try running diagnostics again with the RF head disconnected from the analyser, then with the RF head disconnected from the control unit. This will isolate the problem to either the control unit, the RF head or the analyser. With Microvision and Microvision Plus instruments just try with the control unit disconnected from the analyser.

For faraday instruments the multiplier power supply is not checked. For dual (multiplier and faraday) instruments the multiplier power supply can only be checked if the multiplier is switched on. If it is off but a filament is on then it will be briefly switched on, tested and switched off. If there are no filaments

on then it will be reported as "Switched Off".

The RF Tuning parameters are explained in RF Tuning .

5.7. Analog Inputs

Microvision, Vac Check 100, Satellite, Vacscan Plus and Vacscan instruments are fitted with two analogue inputs, signals from which may be monitored in the channel based modes by selecting AI1 or AI2.

Microvision Plus instruments are fitted with four analogue inputs, signals from which may be monitored in the channel based modes by selecting AI1 to AI4.

Further details about analogue inputs can be found in the relevant control unit manual.

5.8. Ini File

All of the settings for RGA for Windows are saved in a file called "RGA4WIN.INI" for single head operation or in "RGA4WINx.INI" where x = head number for multi head operation. These files should not be edited directly. When a Power Up Reset is performed these files will be written back to factory values and all user set information will be lost. It is advisable to keep a recent copy of any ini files in case this happens. More information on ini files is given in the Customisation section of this manual.

5.9. RF Failed Trip

This applies to Microvision and Microvision Plus control units only.

The RF fail input to the Microvision will be asserted whenever the RF generator goes out of tune. This will occur if the Microvision is not tune for the analyser it is connected to or, more likely, if the Microvision is not connected to an analyser. The RF failed condition is displayed on the alert bar with the message:

“The RF has Failed”.

Whenever the RF failed condition occurs the RF generator is prevented from operating and causing any damage to the electronics.

When the trip is acknowledged by *clicking* on the **Ok** button on the alert bar

the instrument will attempt to scan normally once more.

This normal operating mode can be overridden by adding the following line to the [CONFIGURATION] section in the RGA4WINn.INI file:-

RF Protect On = 0

This line should only be used by a production or service engineer to assist in tuning or fault finding. This will result in the alert bar message still being displayed but the RF generator will not be prevented from operating.

Section 6.

Macros

6.1. Macros

One of the major additions to version 2.30 RGA for Windows is the Macro facility where various functions can be carried out automatically based on instructions held in a macro file. The macro language is similar to the DDE language but is not capable of conditional flow control (if, then, else type statements) and cannot support variables. The basic procedure for using macros is to write the macro as a text file, give it and its button a name then *click* on the button to run the macro. A series of example macros, which are printed at the end of this section are provided to help you get started.

6.1.1. Creating a macro

To create the macro enter a text editor such as Notepad which is supplied as part of the Windows software package and type the macro using the macro commands as described later in this section. Save the macro in the directory where you want to keep your macros. The example macros are in a directory called C:\SPECTRA\MACROS\ which was created when RGA for Windows was installed and all the examples have the file name extension **.mac**.

To create a macro button select **File | Add Macro** from the *menu bar* in the Mode Select screen, the Add Macro *dialog box* will be displayed.

Once you have created the macro a button will be placed on the screen which you *click* on to run the macro, the text you enter in the **Button Title** box is the text that will appear on this button. The cursor will be positioned in this box, type in the text that you want to appear on the button. By placing an **&** before a character in the Button Title the character will be shown underlined on the button and the macro can be run by pressing ALT + the underlined character as a keyboard shortcut.

Once the button title text has been entered position the cursor in the **Macro File** box by positioning the *mouse pointer* in the box and *clicking* or press **ALT+M**. This is where you will enter the file name for the macro. *Click* on the **Browse . . .** button to look through the directories on your disk for the

macro file you require. You can now enter the Help Text by positioning the cursor in the **H**elp **T**ext box. This is the text which will appear in the help bar when you move the mouse pointer over the macro button.

Click on the **O**k button to exit the Add Macro Button *dialog box* and create the macro button, *clicking* on the **C**ancel button will exit without creating the macro button. Click on the **E**dit button to enter the text editor associated with .TXT files (normally Notepad) to make any changes to the macro text file. If no file exists you will be prompted to create one, *clicking* on the **Y**es button will open the text editor and you can type the macro text file.

6.1.2. Removing and editing macros

Once one or more macro buttons have been created they can be removed by selecting **F**ile | **R**emove **M**acro from the *menu bar* in the Mode Select screen. This menu item is *grayed out* when there are no macro buttons. The Remove Macro *dialog box* will be displayed, *click* on the required macro then *click* on the **O**k button. *Clicking* on the **C**ancel button will close the *dialog box* without removing the macro.

To edit a macro select **F**ile | **E**dit **M**acro from the *menu bar*. The Edit Macro *dialog box* will be displayed and the Button Title, Macro File and Help Text can all be changed. When complete *click* on the **O**k button to implement the changes, *click* on the **C**ancel button to exit without implementing the changes.

The above procedures to remove and edit macros relate only to the macro button which appears on the screen not to the macro text file. If you remove the macro as outlined above the macro text file will not be deleted, this can only be done from the text editor. To edit the macro text file select **F**ile | **E**dit **M**acro from the *menu bar* and *click* on the **E**dit button to open the text editor and the macro text file to make any changes.

Remember to use the save command in the text editor to save any changes to the macro text file.

6.2. Macro Commands

The following is a list of the available macro commands. The commands are not case sensitive so may be written in upper or lower case. All the parameters are separated by a ; (semicolon). All parameters must be

specified in each command in the macro file. Comments may be inserted anywhere in the macro text file, even in the middle of commands. A comment is text enclosed in {} (curly brackets) used to explain and clarify the macro.

6.2.1. Mode Select Command

This command will switch the instrument into one of its main operating modes and set the parameters associated with that mode.

Command: MODE=

Mode	Parameter	Variable	
ANALOGUE	First Mass	1 to (max mass - mass span)	
	Mass Span	8,16,32,64	
	Accuracy	0,1,2,3,4,5	
	Total	0 = disabled 1= enabled	
	Grid	0 = off 1 = on	
	Cursor	0 = off 1 = on	
	Detector Gain	0=faraday 2=mult x100 3=mult x1000	
	Range	5 to 14 = E-05 to E-14	
	Autorange	0 = off 1= on	
	BARChart	First Mass	1 to (max mass - mass span)
		Mass Zoom	10,20,50,100,150,200,300
		Accuracy	0,1,2,3,4,5
		Total	0 = disabled 1= enabled
Grid		0 = off 1 = on	
Cursor		0 = off 1 = on	
Detector Gain		0=faraday 2=mult x100 3=mult x1000	
Range		5 to 14 = E-05 to E-14	
Autorange		0 = off 1= on	
In Log		0 = Linear x-axis 1= Log x-axis	
Log Low Range		5-14 = E-05 to E-14 and must be less than	
see note 1		Log High Range value	
Log High Range		5-14 = E-05 to E-14 and must be greater than	
see note 1	Log Low Range value		
MULTITREND	Accuracy	0,1,2,3,4,5	
	Grid	0 = off 1 = on	
	Cursor	0 = off 1 = on	
	Global	0 = disabled 1 = enabled	
	Multiplier		
	Continuous	0 = Disabled 1 = Enabled	
	Trace		
	Interval	1 to 3600 = 1 second to 1 hour	
	Label Trace	0 = off 1 = on	
	Time Relative	0 = Real Time x-axis 1 = Relative Time axis	

	Time Vertical	0 = Time Label Horizontal 1 = Time Label Vertical
	Total	0 = disabled 1 = enabled
	In Log	0 = Linear y-axis 1 = Log y-axis
	Log Low Range	5-14 = E-05 to E-14 and must be less than
	see note 1	Log High Range value
	Log High Range	5-14 = E-05 to E-14 and must be less than
	see note 1	Log Low Range value
PEAKJUMP	Accuracy	0,1,2,3,4,5
	Grid	0 = off 1 = on
	Cursor	0 = off 1 = on
	Global	0 = disabled 1 = enabled
	Multiplier	
	Peak Surround	0 = Off 1 = On
	Total	0 = disabled 1 = enabled
	In Log	0 = Linear y-axis 1 = Log y-axis
	Log Low Range	5-14 = E-05 to E-14 and must be less than
	see note 1	Log High Range value
	Log High Range	5-14 = E-05 to E-14 and must be less than
	see note 1	Log Low Range value
FASTSCAN	Accuracy	0,1,2,3,4,5
	Grid	0 = off 1 = on
	Cursor	0 = off 1 = on
	Global	0 = disabled 1 = enabled
	Multiplier	
	Continuous	0 = Disabled 1 = Enabled
	Trace	
	Interval	1 to 3600 = 1 second to 1 hour
	Label Trace	0 = off 1 = on
	Time Relative	0 = Real Time x-axis 1 = Relative Time axis
	Time Vertical	0 = Time Label Horizontal 1 = Time Label Vertical
	In Log	0 = Linear y-axis 1 = Log y-axis
	Log Low Range	5-14 = E-05 to E-14 and must be less than
	see note 1	Log High Range value
	Log High Range	5-14 = E-05 to E-14 and must be less than
	see note 1	Log Low Range value
LEAKCHECK	Probe mass	1 to max. mass
	Mass offset	-0.47 to +0.5 in 0.03 steps
	Accuracy	0,1,2,3,4,5
	Audio	0 = disabled 1 = enabled
	Grid	0 = Off 1 = On
	Cursor	0 = disabled 1 = enabled
	Detector Gain	0 = faraday 2 = mult x100 3 = mult x1000
	Range	5-14 = E-05 to E-14
	Autorange	0 = off 1 = on
	Continuous	0 = off 1 = on
	trace	

note 1 this parameter need only be specified if the Log axis is enabled.

6.2.2. Filament Command

The filament command switches on or off one of the two filaments.

Command Variable

FILAMENT= 0 = Filaments off 1 = Filament 1 on 2 = Filament 2 on

6.2.3. Disk Store Command

The disk store command is used to start a disk store and set up the various parameters associated with storing to disk.

Command: DISKSTORE=

Parameter Variable

Filename full path and filename in the format *drive:\directory\sub-directory\filename.extension*

Number of scans any integer in the range 1 to 32000

Timed disk store 0 = not a timed disk store 1 = timed disk store

Store interval interval between storing scans, number of scans in the range 1 to 32000 or number of seconds depending on Timed disk store setting.

Store hundredths stores the time to 1/100 seconds 0 = disabled 1 = enabled

6.2.4. Set Chanel Command

Each channel used in the multi-trend, peak jump and fast scan modes has a series of parameters associated with it. These parameters are the same for each of the three modes but are different to the global mode parameters set up using the set mode command. Generally a macro will set up the various channel parameters before switching to the required channel mode, see the following examples.

Command: MODE=SETCHANNEL

Mode Parameter

Channel number 1 to 12

Enabled	0 = disabled 1 = enabled
Mass	1 to max mass of instrument, 0=total pressure,-1&-2 = analogue input 1 and 2
Display Range	5 to 14 = E-05 to E-14
SEM setting	0=faraday 2=mult x100 3=mult x1000
Autorange	0 = disabled 1 = enabled
Low Alarm	
High Alarm	
Dwell	
Settle	

6.2.5. Channel Write Commands

The channel write commands are used to set a particular parameter in all 12 channels. e.g. Channel Write Enabled is used to set each of the twelve channels off or on. When used in a macro each command will be followed by a string of 12 variables, one for each channel, each separated by a ; (semicolon).

CHANNEL WRITE Commands

Command	Description	Variable
CHANNELWRITE ENABLED=	sets each channel off or on	0=channel disabled 1= channel enabled
CHANNELWRITE MASS=	12 mass settings one for each channel	1 to max mass of instrument, 0=total pressure,-1&-2 = analogue input 1 and 2
CHANNELWRITE RANGE=	sets the range for each channel	5 to 14 = 10^{-5} to 10^{-14}
CHANNELWRITE AUTORANGE=	auto range off or on	0 = off 1 = on
CHANNELWRITE SEM=	selects the detector	0=faraday, 2=mult x100, 3=mult x1000
CHANNELWRITE HIALARM=	sets the high alarm value	0 = off
CHANNELWRITE LOALARM=	sets low alarm value	0 = off
CHANNELWRITE DWELL=	dwell times 200microsecs x 2^dwell value	values 0-14
CHANNELWRITE	settle time in	8-9900

SETTLE= milliseconds

6.2.6. Print Command

Command: **PRINT**

In a macro a line containing the single word command PRINT will cause the current scan to be printed. The effect of this command is the same as *clicking* on the Print button. See example 6.

Command: MOVEFORM=x;y;width;height

This command is used to re-size and position the RGA for Windows window.

x is the horizontal distance from the top left hand corner of the screen

y is the vertical distance from the top left hand corner of the screen

width is the width of the RGA screen

height is the height of the RGA screen

All four values are expressed in pixels.

6.2.7. Head Command

Command: **HEAD=n**

The Head command is used to change to another RGA head in a multi headed system. The number n will be the head number. See example 3.

6.2.8. Moveform Command

Command: MOVEFORM=x;y;width;height

This command is used to re-size and position the RGA for Windows window.

x is the horizontal distance from the top left hand corner of the screen

y is the vertical distance from the top left hand corner of the screen

width is the width of the RGA screen

height is the height of the RGA screen

All four values are expressed in pixels.

6.2.9. Scan Delay Command

Command: `SCANDELAY=x`

where x is a number of scans

This command is used to introduce a time delay expressed as a number of scans into the macro. It will cause the macro to wait for the number of scans stated before continuing with the next instruction.

6.2.10. Time Delay Command

Command: `TIMEDELAY=x`

where x is a time expressed in seconds

This command is used to introduce a time delay expressed as a time in seconds into the macro. It will cause the macro to wait for the specified time before continuing with the next instruction.

6.2.11. Go To Command

Command: `GOTO=label`

This command is used as part of a loop and will cause the macro to branch to the label. See examples 4 and 6. Labels must go on a separate line and be followed by a : (colon). When the label is used following GOTO the colon should be omitted.

6.2.12. Restart Command

Command: `RESTART`

This is a single word command which will cause the macro to begin again from the start.

6.2.13. Macro Examples

Example 1

This macro contains a single line and will do the following:

switch to the analogue mode, starting mass is 15, the mass span is 32, the accuracy is set to 3, the total pressure is enabled, the grid is off, the cursor is off, the detector is set to faraday, the range is E-09 and autoranging is

enabled.

```
MODE=ANALOGUE;15;32;3;1;0;0;9;1
```

Example 2

This macro contains a single line and will do the following:

switch to the bar chart mode, set the starting mass to 15, set the mass span to 50, set the accuracy to 3, enable total pressure, switch the grid on, switch the cursor off, set the detector to faraday, start scanning with a gain range of E-09, enable autoranging, switch logarithmic mode off.

```
MODE=BARCHART;15;50;3;1;1;0;0;9;1;0
```

Example 3

This macro contains a single line which will switch from the current head to head 1.

```
HEAD=1
```

Example 4

The following macro begins by configuring the first six channels for the multi trend mode. The first line sets channel 1 to enabled, the mass to 5, the gain range to 5, the detector is set to faraday, auto ranging is disabled, low alarm is off and the high alarm is off. The next 5 lines configure channels 2 to 6.

The macro then switches the instrument to the bar chart mode with the first mass set to 15amu, the span set to 50 amu, the accuracy set to 3, total pressure is on, the grid enabled, the cursor is off, the faraday detector is selected, the gain range is set to 6, autoranging is disabled, the linear y-axis is selected. The macro then does a disk store to a file named C:\SPECTRA\BARDATA.WBG storing 10 scans, with timed disk store disabled, storing each scan and storing the time with hundredths of seconds. After waiting for 1 scan the macro then enters the main loop and switches to the multi-trend mode with the accuracy set to 3, the grid enabled, the cursor disabled, the global multiplier disabled, continuous trace on, the time interval is set to 1 second, label trace is off, the time axis is set to real not relative, the time axis label is horizontal, total pressure is enabled and the linear y-axis is enabled. The instrument will remain in the multi-trend mode for 20 seconds before switching to the bar chart mode. The set up for the bar chart mode is the same as above. When one bar chart scan has been completed it will be stored to disk provided the 10 scans have not already

been completed. The macro then loops back and switches the instrument to multi-trend mode.

```
SETCHANNEL=1;1;5;5;0;0;0;0
SETCHANNEL=2;1;10;6;0;0;0;0
SETCHANNEL=3;1;15;7;0;0;0;0
SETCHANNEL=4;1;20;5;0;0;0;0
SETCHANNEL=5;1;25;6;0;0;0;0
SETCHANNEL=6;1;30;7;0;0;0;0
MODE=BARChart;15;50;3;1;1;0;0;6;0;0
DISKSTORE=C:\SPECTRA\BARData.WBG;10;0;1;1
SCANDELAY=1
MAINLOOP:
MODE=MULTITREND;3;1;0;0;1;1;0;0;0;1;0
TIMEDELAY=20
MODE=BARChart;15;50;3;1;1;0;0;6;0;0
SCANDELAY=1
GOTO=MAINLOOP
```

Example 5

The following macro starts by configuring the first six channels used in the multi-trend and peak jump modes. The sixth line of the macro sets the parameters in channel 6 by: selecting channel 6, enabling this channel, setting the mass to 30 amu, setting the range to 10, the faraday detector is selected, auto ranging is disabled, the low alarm setting is set to 1×10^{-8} mbar and the high alarm setting is set to 1×10^{-6} mbar.

The last line of the macro switches the instrument to the peak jump mode and the channel settings in the first six lines of the macro will be used. In the peak jump mode the accuracy will be set to 3, the grid will be on, the cursor will be off, the global multiplier setting will be off, peak surround will be set to on, the total pressure measurement will be on, the logarithmic mode is selected, the low log. range is 10^{-5} and the high log. range 10^{-10} .

```
SETCHANNEL=1;1;5;5;0;0;0;0
SETCHANNEL=2;1;10;6;0;0;0;0
SETCHANNEL=3;1;15;7;0;0;0;0
SETCHANNEL=4;1;20;8;0;0;0;1.0E-6
SETCHANNEL=5;1;25;9;0;0;1.0E-8;0
SETCHANNEL=6;1;30;10;0;0;1.0E-8;1.0E-6
MODE=PEAKJUMP;3;1;0;0;1;1;1;5;10
```

Example 6

This macro will start by switching the instrument into the barchart mode, then enters a loop which will wait for 2 minutes before printing the scan. It then continues to print a scan every two minutes.

```
MODE=BARChart  
MAINLOOP:  
TIMEDELAY=120  
PRINT  
GOTO=MAINLOOP
```

This page is deliberately left blank.

Section 7.

DDE Links

New to V2.30

If you are already using RGA for Windows and are upgrading to version 2.30 you may wish to make note of the following new commands and changes.

The Fast Scan mode is now supported with DDE Links.

A new Set Channel command has been added.

Channel Write Dwell and Channel Write Settle commands have been added to support the Fast Scan mode.

In the Select Mode command for the channel modes Detector gain can now only be set to 0 or 1 to select faraday or multiplier. Using 2 or 3 will cause an error.

7.1. Introduction

Dynamic Data Exchange (DDE) is a mechanism by which Windows programs running on the same computer may exchange information. RGA for Windows uses DDE in two ways: firstly it acts as a data server providing, for example, Peak heights, scan number etc. and secondly it accepts commands e.g. Set mode, Read Filament status etc.

When RGA for Windows is acting either as a DDE server or when it is accepting "Execute" commands it must be referred to using the Application/Topic/Item notation. The exact detail of how they are put together depends on the client application being used.

For example Microsoft Excel uses the form:-

`{=Application|Topic|Item}`

Quattro Pro for Windows uses:

`@DDELINK([Application|Topic]Item")`

Visual Basic uses:

Control.LinkTopic = "Application|Topic"
Control.LinkItem = "Item"

7.2. Application and Topics

Application

The application name used by RGA for Windows is (unsurprisingly):-
RGA4WIN

It does not matter if uppercase or lowercase is used.

Topics

Topic Names

The following topics are supported:

RGA	At all times
Bar Chart	Only when Bar Chart mode is active
Peak Jump	Only when Peak Jump mode is active
Multi Trend	Only when Multi Trend mode is active
Leak Check	Only when Leak Check mode is active
Analogue	Only when Analogue mode is active
Fast Scan	Only when Fast Scan mode is active

Note that topic names consisting of two words have exactly one space between the first and second words.

If multiple heads are being run then the topic name will have a single digit number between 1 and 9 that corresponds to the head number, appended.
E.g. Peak Jump3

Like application name, the topic name can be in upper or lower case.

7.3. Items

To allow easy access to peak data and system information, a number of items are available which may be read at anytime using DDE links into other programs e.g. Excel, Quattro Pro, Lotus 1-2-3 or your own custom program. The following items are available in the topics indicated:-

Topic: RGA

Item:DDEData

This is a general purpose item which is used to hold the results of various commands. e.g. [READMODE] and [READFILAMENT]. It also contains the error message if a DDE command fails.

Topic: ANALOGUE

Item:TotalPressure

The total pressure value is available in this item if total pressure measurement is enabled.

Item:ScanNumber

This item is set to zero when the mode starts and is incremented each time a scan ends. It is useful for synchronising reads of the PeakData and TotalPressure items.

Item:PeakOffset

In Analogue each scan consists of 256 data points. Due to the amount of data it cannot all be made available at once. One of 256 data points may be read from the PeakData item which is indicated by the PeakOffset item, and set using the [SETOFFSET=n] command. The PeakOffset defaults to 0.

Item:PeakData

This item is the peak height of the data point indicated in the PeakOffset item.

Topic: BAR CHART

Item:TotalPressure

The total pressure value is available in this item if total pressure measurement is enabled.

Item:ScanNumber

This item is set to zero when the mode starts and is incremented each time a scan ends. It is useful for synchronising reads of the PeakData and TotalPressure items.

Item:PeakMass

In Bar Chart each scan consists of up to 300 peaks. Due to the amount of data it cannot all be made available at once. One of the peaks may be read from the PeakData item which is Indicated by the PeakMass item and set

using the [SETOFFSET=n] command. The PeakMass defaults to First Mass.

Item:PeakData

This item is the peak height of the mass indicated in the PeakMass item.

Topic: LEAK CHECK

Item:PeakData

This item is the peak height of the mass currently being scanned.

Topic: MULTI TREND

Item:TotalPressure

The total pressure value is available in this item if total pressure measurement is enabled.

Item:ScanNumber

This item is set to zero when the mode starts and is incremented each time a scan ends. It is useful for synchronising reads of the PeakData and TotalPressure items.

Item:PeakData(1..12)

These items are the peak heights for the twelve channels.

Topic: PEAK JUMP

Item:TotalPressure

The total pressure value is available in this item if total pressure measurement is enabled.

Item:ScanNumber

This item is set to zero when the mode starts and is incremented each time a scan ends. It is useful for synchronising reads of the PeakData and TotalPressure items.

Item:PeakData(1..12)

These items are the peak heights for the twelve channels.

7.4. Commands

All DDE commands are sent to RGA for Windows using the DDE Execute

function. This is available from most programming languages as well as many spreadsheets. Consult your applications documentation for details.

All commands start with a [(ASCII 91) and end with a] (ASCII 93).

In a command upper or lower case (or a mixture of both) are allowed and spaces are allowed anywhere inside a command.

e.g. [PRINT], [Print] and [print] are all valid commands.

If an invalid command or a valid command with invalid data is sent then RGA for Windows will fail to respond to the DDE Execute and your program should be prepared to deal with this.

The first command sent must be a [DDE Enabled=1] because until it is received by RGA for Windows all other commands will be ignored.

To assist you in becoming familiar with DDE for RGA for Windows a simple application called DDETEST.EXE may be installed. It can send either single commands or can play a script of commands. It deals automatically with sending a [DDE Enabled=1] command.

Enable DDE

Application: RGA4WIN

Topic: RGA

[DDE Enabled=n]

n = 0 DDE disabled

n = 1 DDE enabled

This command must be sent with n=1 before any other commands can be used. It causes RGA for Windows to operate in a different way.

All message boxes are disabled.

Help bar shows "DDE Enabled" and does not change if the mouse pointer is moved over Icon or Setting buttons.

Filament warm-up forms are unloaded immediately although filaments still come slowly up to full power.

Modes do not save their settings when they exit.

7.5. Select Mode Command

Selecting modes

Application: RGA4WIN

Topic: RGA

Any one of the six scanning modes or the non-scanning Mode Select mode can be started with the mode command.

In addition to starting the mode, none, some or all of the parameters associated with that mode may be specified.

All parameters are optional and if not sent the last saved values will be used. Any parameter in the list may be skipped by putting nothing between consecutive semicolons.

[MODE=mode;p1;p2..pn]

mode = MODE SELECT, ANALOGUE, BAR CHART, LEAK CHECK, MULTI TREND, PEAK JUMP or FAST SCAN.
p1..pn are the optional mode specific parameters.

SELECT MODE COMMAND

Application	Topic	Item	Parameter	Variable
RGA4WIN	RGA	Mode Select	none	set to mode select screen
		Analogue	First mass	1 to (max mass-mass span)
			Mass span	8,16,32,64
			Accuracy	0,1,2,3,4,5
			Total	0=disabled 1=enabled
			Grid	0=disabled 1=enabled
			Cursor	0=disabled 1=enabled
			Detector gain	0=faraday, 2=mult x100, 3=mult x1000
			Range	5 to 14 = E-05 to E-14
			Autorange	0=disabled 1=enabled
		Bar Chart	First mass	1 to (max mass - mass span)
			Mass span	10,20,50,100,150, 200,300

RGA4WIN	RGA	Bar Chart	Accuracy	0,1,2,3,4,5
			Total	0=disabled 1=enabled
			Grid	0=disabled 1=enabled
			Cursor	0=disabled 1=enabled
			Detector gain	0=faraday, 2=mult x100, 3=mult x1000
			Range	5 to 14 = E-05 to E-14
			Autorange	0=disabled 1=enabled
			InLog	0=Linear y-axis 1=Log y-axis
			LogLowERange	5 to 14 = E-05 to E-14
			LogHighERange	5 to 14 = E-05 to E-14
RGA4WIN	RGA	Leak Check	Probe mass	1 to max mass
			Mass offset	0 to 31 = -0.47 to +0.5
			Accuracy	0,1,2,3,4,5
			Audio	0=off 1=on
			Grid	0=disabled, 1=enabled
			Cursor	0=disabled, 1=enabled
			Detector gain	0=faraday 1=multiplier
			Range	5 to 14 = E-05 to E-14
			Autorange	0=disabled, 1=enabled
			RGA4WIN	RGA
Multi Trend	Accuracy	0,1,2,3,4,5		
	Grid	0=disabled 1=enabled		
Cursor	0=disabled 1=enabled			
Detector gain	0=faraday 1=multiplier			
Continuous trace	0=disabled 1=enabled			
Interval	1 to 3600 = 1 to 3600 seconds			
Label trace	0=disabled 1=enabled			
Time relative	0 = Real time 1 = Relative time			
Time vertical label	0=horizontal 1=verticle			
Total	0=disabled 1=enabled			
InLog	0=Linear 1 = Log			
LogLowERange	5 to 14 = E-05 to E-14			
LogHighERange	5 to 14 = E-05 to E-14			
Peak Jump	Accuracy	0,1,2,3,4,5		
	Grid	0=disabled 1=enabled		

			Cursor	0=disabled 1=enabled
			Detector gain	0=faraday 1=multiplier
RGA4WIN	RGA	Peak Jump	Peak surround	0=disabled 1=enabled
			Total	0=disabled 1=enabled
			InLog	0=Linear 1=Log
			LogLowERange	5-14 = E-05 to E-14 & must be less than LogHighERange
			LogHighERange	5-14 = E-05 to E-14 & must be greater than LogLowERange
		Fast Scan	Grid	0=off, 1=on
			Cursor	0=off, 1=on
			Global	0=disabled,
			Multiplier	1=enabled
			Continuous	0=disabled,
			Trace	1=enabled
			Interval	1 to 3600 = 1 second to 1 hour
			Label Trace	0=off, 1=on
			Time Relative	0=real time x-axis, 1=relative time x-axis
			Time Vertical	0=time label horizontal, 1=time label vertical
			In Log	0=linear y-axis, 1=log y-axis
			Log Range	Low 5 to 14 = E-05 to E-14, must be less than Log High Range
RGA4WIN	RGA	Fast Scan	Log Range	High 5 to 14 = E-05 to E-14, must be greater than Log Low Range

7.6. Set Channel Command DDE

This command is used to set all of the various parameters in a channel.

SET CHANNEL COMMAND

Application	Topic	Command	Parameter	Variable
RGA4WIN	RGA	SETCHAN	Channel	1 to 12
		NEL=	number	
			Enabled	0 = disabled 1 =

				enabled
			Mass	1 to max mass of instrument, 0=total pressure,-1&-2 = analogue input 1 and 2
			Display Range	5 to 14 = E-05 to E-14
			Mass	1 to max mass of instrument, 0=total pressure,-1&-2 = analogue input 1 and 2
			Display Range	5 to 14 = E-05 to E-14
RGA4WIN	RGA	SETCHAN NEL=	SEM setting	0=faraday 2=mult x100 3=mult x1000
			Autorange	0 = disabled 1 = enabled
			Low Alarm	0=off, 9.9E-05 to 0.1E-14
			High Alarm	0=off, 9.9E-05 to 0.1E-14
			Dwell	2 ⁿ x0.2 milliseconds where n=0 to 14
			Settle	8 to 9900 milliseconds

7.7. Disk Command

Application: RGA4WIN
 Topic: ANALOGUE
 LEAK CHECK
 BAR CHART
 PEAK JUMP
 MULTI TREND
 FAST SCAN

[DISKFILENAME=filename]

Set the filename including drive and path specification to be used for the disk store. Note: No confirmation will be given before an existing file is overwritten. If the path does not exist or an invalid filename is specified then the command will fail.

[DISKSCANS=n]

n = 1 .. 32000 scans

This is the maximum number of scans to be stored. You can terminate a disk store at any time using the [DISKSTOP] command.

[DISKSTORETYPE=n]

n = 0 ..Every scan

n = 1 ..Timed Storage

n = 2 ..DDE triggered store

The Every scan and TimedStorage modes are similar to the standard disk store modes selected from the Disk Store dialogue box. The DDE triggered store allows a single scan to be stored each time the [DISKSTORESCAN] command is executed.

[DISKINTERVAL=n]

n = 1 .. 3600 seconds

When Timed Storage mode has been specified, the time specified using this command will elapse between disk stores.

[DISKSTOREATEND=n]

n = 0 ..Store immediate

n = 1 ..Store at end of scan

This sets the store at end of scan option which will cause the disk store triggered by a [DISKSTORESCAN] or a Timed Storage to occur at the end of the current scan.

[DISKCOMMENT=comment]

An optional comment which will be stored in the files comment field can be sent using this command. The comment must be enclosed between " " (ASCII 34).

[DISKSTART]

Use this command to start a disk store when all parameters have been set.

[DISKSTORESCAN]

If the DDE triggered store mode has been set and the disk store started with the [DISKSTART] command, then a scan will be stored each time this command is executed.

[DISKSTOP]

This command will terminate the disk store saving all data acquired up to the start of the current scan.

7.8. Channel Commands

Application: RGA4WIN
Topic: RGA

These commands are sent to the RGA topic but actually set the channel parameters in the Peak Jump, Multi Trend and Fast Scan modes. To set the channel parameters you should send these commands from the Mode Select mode and then enter the required mode. If these commands are sent while Peak Jump, Multi Trend or Fast Scan modes are running then any changes made will not take effect until you restart the mode.

[CHANNELWRITEENABLED=c1;c2;...c12]

cn = 0 Channel n Disabled

cn = 1 Channel n Enabled

[CHANNELWRITERANGE=c1;c2;...c12]

cn = 5..14

[CHANNELWRITEAUTORANGE=c1;c2;...c12]

cn = 0 Channel n Autorange Disabled

cn = 1 Channel n Autorange Enabled

[CHANNELWRITESEM=c1;c2;...c12]

cn = 0, 2 or 3. This should be used to set the multiplier gain.

[CHANNELWRITEMASS=c1;c2;...c12]

cn = Channel n Mass Number

[CHANNELWRITEHIALARM=c1;c2;...c12]

cn = 0 Off, $9.9E-5 \geq cn \geq 0.1E-14$

[CHANNELWRITELOALARM=c1;c2;...c12]

cn = 0 Off, $9.9E-5 \geq cn \geq 0.1E-14$

[CHANNELWRITEDWELL=c1;c2;c3;...c12]

cn = $2^n \times 0.2$ milliseconds where n = 0 to 14

[CHANNELWRITESETTLE=c1;c2;c3;...c12]

cn = 8 to 9900 milliseconds

7.9. General Commands

[FILAMENT=n]

n = 0 Off

n = 1 Filament 1 On

n = 2 Filament 2 On

Use this command to control the filaments.

[LOCKTASK=n]

n = 0 Unlock Task

n = 1 Lock Task

To prevent interaction with RGA for Windows using the Mouse and Keyboard while it is being controlled via DDE, the Lock Task feature may be used. It is similar to the Password lock system except no password is required and only RGA for Windows will be locked.

[MOVEFORM=l;t;w;h]

l = Window Left pixel co-ordinate

t = Window Top pixel co-ordinate

w = Window Width in pixels

h = Window Height in pixels

RGA for Windows can be moved and sized using this command.

[PRINT]

This command has the same effect as pressing the Print button on the Icon bar.

[READFILAMENT]

This command causes the current filament status to be written into the RGA Topic DDEDATA item which can then be read. The possible states are:-

Changing
Filaments Off
FilamentX Trip: Emission
FilamentX Failed
FilamentX Trip: External
FilamentX Trip: Total
FilamentX Trip: Partial
FialmentX: On

Where X = 1 or 2

[READMODE]

This command causes the current mode to be written into the RGA Topic DDEDATA item which can then be read. The possible states are:-

Changing
MODE SELECT
ANALOGUE
LEAK CHECK
BAR CHART
PEAK JUMP
MULTI TREND
FAST SCAN

[SETOFFSET=n]

Topic: Analogue

n = 0..255

Topic: BAR CHART

n = First Mass..Last Mass

This sets the index for the PeakData item in Bar Chart and Analogue modes.

7.10. Valve Controller Commands

[VALVE=n]

n = 0 no valves open

n = 1 valve 1 open

n = 2 valve 2 open

.....

n = 16 valve 16 open

This sets the valve specified by n open and it will remain open until another command is sent. This command is only valid if a valve controller is connected to the RGA control unit.

7.11. DDE Examples

To make DDE Links easier to use various example files have been included with RGA for Windows. During the installation process a directory named C:\SPECTRA\DDE was created and the following files were copied to it:

DDETEST.EXE
DDETEST1.TXT
DDETEST2.TXT

FILAMENT.TXT
LOCK.TXT
MODES.TXT
ANALOG.XLM
ANALOG.XLS
BARCHART.XLM
BARCHART.XLS
PEAKJUMP.XLM
PEAKJUMP.XLS
TREND.XLS
V5PKJDDE.XLS

DDETEST.EXE is a small program that allows you to send individual commands to

RGA for Windows or groups of commands in a script file. It is used in conjunction with the files with the extension .TXT. The .TXT example files are listed later in this section. Before running DDETEST make sure that RGA for Windows is running. To run DDETEST *double click* the DDE Test program item icon in the Spectra program group.

When the program starts you will be presented with a window with three buttons, **Run Script**, **Single Command** and **Exit**.

Single command

To run Single Command *click* on the **Single Command** button. When Single Command is selected you may type individual DDE commands and see their result. The **Topic** text box will default to RGA4WIN|RGA for a single headed installation, this can be changed but the vast majority of commands use the RGA topic.

In the **Command** text box you can type your command and then *click* on the execute button to send the command.

e.g. typing [MODE=BAR CHART] will put RGA for windows in Bar Chart mode.

Run Script

When Run Script is selected you can type the name of a file that contains commands to be executed in sequence. Each line of the script file contains an instruction to execute or a comment. Comments are preceded by a semicolon character. Four special DDETEST commands that are NOT RGA

for Windows DDE commands can be used to set the speed of execution for the script and the topic that the DDE commands are on. These special commands are preceded by an asterisk :-

```
*INTERVAL=<Number of seconds>
*DELAY=<Number of seconds>
*TOPIC=<Application and topic for following DDE commands>
*EXIT
```

*INTERVAL sets the delay between each command being sent, e.g.
*INTERVAL=0.1 gives a 0.1 second delay between successive commands.

*DELAY inserts a one off delay. e.g. *DELAY=10 will wait 10 seconds before continuing with the rest of the script.

*EXIT ends the script file.

Example DDETEST1.TXT

```
;DDE Example 1.
;Puts RGA for Windows in Bar Chart mode and starts off diskstore for 5
scans.
*INTERVAL=0.1
*TOPIC=RGA4WIN|RGA
[Mode=BARCHART]
*TOPIC=RGA4WIN|BAR CHART
[DISKFILENAME=C:\SPECTRA\DDE\DDE1.WBG]
[DISKSCANS=5]
[DISKSTORETYPE=0]
[DISKSTART]
*EXIT
```

Example DDETEST2.TXT

```
;DDE Example 2.
;Puts RGA for Windows in Multi Trend mode and triggers timed disk store
for 5 scans.
*INTERVAL=0.1
*TOPIC=RGA4WIN|RGA
[Mode=MULTI TREND]
*TOPIC=RGA4WIN|MULTI TREND
[DISKFILENAME=C:\SPECTRA\DDE\DDE2.WMT]
[DISKSCANS=5]
```

```
[DISKSTORETYPE=1]
[DISKINTERVAL=5]
[DISKSTOREATEND=1]
[DISKSTART]
*EXIT
```

Example FILAMENT.TXT

```
;Filament DDE.
; Turns on the filament and reads its status, waits 10 seconds and reads its
status again.
; The first read of the filament status returns Changing...
; The second read should return On in the DDE Status line of the
DDETEST.EXE window.
*INTERVAL=0.1
*TOPIC=RGA4WIN|RGA
[READFILAMENT]
[FILAMENT=1]
[READFILAMENT]
*DELAY=10
[READFILAMENT]
*EXIT
```

Example LOCK.TXT

```
; Lock.DDE
; Switches mode to Analogue and locks the program so that
; settings may not be changed with the mouse and keyboard.
;
; Send DDE commands at 0.1 second intervals and talk on
; RGA4WIN|RGA topic.
*INTERVAL=0.1
*TOPIC=RGA4WIN|RGA
; Change mode to analogue :-
;   First Mass      =      50
;   Mass Zoom       =      16
;   Accuracy        =       3
;   Total           =     1 (ON)
;   Grid            =     0 (OFF)
;   Cursor          =     0 (OFF)
;   Detector Gain   =     0 (Faraday)
;   Range           =       6
;   AutoRange       =     0 (OFF)
```

```

[MODE=ANALOGUE;50;16;3;1;0;0;6;0]
; Send commands now at 30 second intervals...
*INTERVAL=30
; Lock RGA For Windows from user control
[LOCKTASK=1]
; Back to 0.1 second command interval and unlock RGA For Windows
*INTERVAL=0.1
[LOCKTASK=0]
; Set Mode back to Mode Select
[MODE=MODE SELECT]
*EXIT

```

Example MODES.TXT

```

; Modes.DDE
; Switches RGA For Windows into each mode for 20 seconds.
;
; 20 Seconds interval between each DDE command on the RGA4WIN|RGA
topic
*INTERVAL=20
*TOPIC=RGA4WIN|RGA
; Change mode to Analogue :-
;
[MODE=ANALOGUE;12;8;3;1;1;0;6;0]
; Change mode to Barchart :-
;
[MODE=BAR CHART;12;50;3;1;1;0;6;0;1;5;8]
; Change mode to Leak Check :-
;
[MODE=LEAK CHECK;18;15;3;0;1;0;6;0;1]
; Change mode to Multi Trend :-
;
[MODE=MULTI TREND;3;1;0;0;1;1;0;0;1;0]
; Change mode to Peak Jump :-
;
[MODE=PEAK JUMP;3;0;0;0;1;1;0]
; Change mode to the Mode Select screen
[MODE=MODE SELECT]
*EXIT

```

The second set of files are Microsoft Excel files that show how to use DDE

from within Excel version 4.0 or higher:-

ANALOG.XLM
ANALOG.XLS
BARChart.XLM
BARChart.XLS
PEAKJUMP.XLM
PEAKJUMP.XLS
TREND.XLS

The macros (XLM files) show how to send commands to RGA for Windows and the worksheets (XLS files) show how to read data back into Excel from RGA for Windows. The macros are fully commented to show what they do.

One further file V5PKJDDE.XLS demonstrates an Excel version 5 Visual Basic for Applications macro which obtains data from RGA for Windows in Peak Jump mode. Data from all 12 channels is collected and each scan given a relative time since starting the macro.

For more information about the possible DDE commands supported by RGA for Windows refer to the DDE sections of the on line help.

Section 8.

Customisation

There are a number of facilities in RGA for Windows which may be configured to suit individual users requirements. This section will explain this customisation capability.

Refer to:

INI File Settings

Print Company Logo

Software Switches

8.1. INI File Settings

The RGA for Windows Initialisation file (RGA4WIN.INI) contains all the parameters and settings used by the RGA for Windows software in single headed applications. In the case of Multi RGA for Windows there will be eight ini files called RGA4WIN1.INI through to RGA4WIN8.INI and no file called RGA4WIN.INI. Most changes are made to the ini file by the RGA for Windows program or by the Configure utility. Direct editing of the ini file should be avoided and if it is edited this should only be done only by experienced computer and Windows literate people. Before carrying out any editing you should copy the existing RGA for Windows ini file to another directory but...

if you needed to be told that you shouldn't be attempting any editing.

The Configuration section of the ini file contains particularly important information which should not be changed once the software has left our production facility.

Version 2.20 RGA for Windows software introduced the "boot ini file". Under normal circumstances this file is identical to the ini file that is used throughout the rest of the program, e.g. RGA4WIN.INI for single headed operation or RGA4WINn.INI for multi headed operation. Where it becomes important is when the Multiplexer is used. In this case certain settings are always taken from the ini file that the multiplexer was booted from. So, for example when starting RGA for Windows with the /M1 switch the boot ini file is set to RGA4WIN1.INI, from this point on certain settings are always taken from the RGA4WIN1.INI file rather than the INI file for the head

being used. These settings are usually user preference type settings such as whether the icon bar is visible or not, the size and position of the window. Settings that are head and scan specific are read in from the INI file for that particular head. Settings that belong in the boot ini file are noted in the tables below.

You may find some items in the ini file which are not listed in the following tables these are put there by RGA for Windows and should not be changed.

[CONFIGURATION] Section			
Field	Default	Boot ini	Options
Background colour	&H00C0C0C0 &		Light grey background. This is the RGB value for the background of the display. 00 = zero, 80 = half, ff = full. The number of colours will depend on the video card.
Sem Protect On	1		0 = off, 1 = on Setting this to 0 disables the multiplier off when filaments off interlock. This is used to measure the level of multiplier noise. We recommend this is always set to 1.
Pressure Label	Y- Pressure (Torr)		Label text on the y-axis of charts
Library Label	Y- Peak Height		Label text on the y-axis of library charts
Mass Label	Mass (a.m.u.)		Label for x-axis of charts
Baud Rate	9600		2400, 9600, 19200. RS232 baud rate setting
Ignore CTS Manual Colours	0		0 = off, 1 = on 1 = monochrome display. This may be useful for printing out screen dumps.

We use it for printing the screens in this manual.

[SYSTEM] Section

Field	Default	Boot ini	Options
Monitor Comm Noise	1		0 = disabled 1 = enabled

[RVC] Section

Field	Default	Boot ini	Options
Title	Remote Vacuum Controller		Window title on top of page. max 50 characters

[PRINTER] Section

Field	Default	Boot ini	Options
Logo On	1	Yes	Whether the company logo is printed
Print Peak Colour	&HFF0000	Yes	Peak colour printed on printouts, blue.
Logo Colour	&HFFFF00	Yes	Logo colour printed on printouts, cyan.
Company Name	Leda Mass	Yes	Text printed at top of printouts. If = Leda Mass then logo will be printed graphically.
Company Font	Arial	Yes	Font used for company text. This could be a special truetype font in the style of a companies logo.
Portrait Size	20	Yes	Size of font used when printing portrait printouts
Landscape Size	32	Yes	Size of font used when printing landscape

printouts.

8.2. Print Company Logo

There is the option to customise the appearance of printouts produced from RGA for Windows by replacing the Spectra logo with other text or your own company logo.

Say we wanted to replace the Spectra logo with the text, “UNIVERSITY CHEMISTRY Department”. We want this text written in the font Times New Roman and to be 24 points high on portrait printouts and 16 points high on landscape printouts. Add the following section the RGA4WIN.INI file:

[PRINTER]

Company Name = UNIVERSITY CHEMISTRY Dept

Company Font = Times New Roman

Portrait Size = 24

Landscape Size = 16

You must ensure that the true type font you want to use is installed. To check this from Windows Program Manager choose **Main | Control Panel | Fonts**. Please refer to the Windows manual for further details on true type fonts.

Your company may have its own logo which you wish to use. It needs to be available as a true type font and then it is installed as any other font is (refer to Windows manual) and can be specified in the INI file as shown above.

8.3. Software Switches

There are a number of “software switches” used to control the way in which RGA for Windows starts up. Normally the user does not have to concern himself with these as they are automatically inserted during the installation and configuration process. The most common example of a software switch is the reset switch used to start RGA for Windows using the factory default settings. To check the use of the reset switch:

In the Spectra program group *click* on the RGA Reset (RGA Multiplex Rest for Multi Headed RGA for Windows) program item to make it active

select **F**ile | **P**roperties . . .

The **C**ommand Line will read C:\SPECTRA\RGA4WIN.EXE /R assuming the default directory is used

notice that there is a single space immediately before the /. The **C**ommand Line can be edited to remove or add software switches.

All the software switches begin with a / forward slash and there follows a single letter and possibly a single digit number, depending on the switch. More than one switch may be used in a command line and there is a space before each / .

8.3.1. Software switches

/Hn The Head switch, where n is the head number in the range 1 to 8. This forces RGA for Windows to start up a specific head as defined in the configuration process in multi-headed systems.

/R The Reset switch. This forces RGA for Windows to be started using the factory default settings.

/O The ROM Boot switch. This forces RGA for Windows to run using the Satellite code held in EPROM rather than the code held in the Satellite's battery backed RAM.

/L The Multi Loader switch. This will cause RGA for Windows to be started using the Loader program. This is used in multi-headed systems where all the headed are started automatically.

/Wn The Windows Layout switch. This is used to determine how the Spectra windows are laid out on the screen. n is a number in the range 0 to 3 where the numbers have the following meaning:

- 0 = cascade
- 1 = quartile
- 2 = split horizontal
- 3 = split vertical

/Nn Number of heads in a group.

/Qn Number in the group which determines the position on the screen.

/Mn The Multiplexer switch. Used in Multi-Headed systems to start RGA for Windows using the Multiplexer. n will be in the range 1 to 8 and determines which head is started when the RGA Multiplex program item is *double clicked*.

The RGA for Windows user is only ever likely to have to add the /O switch to the Command Line, and then only in special circumstances.

Section 9.

Troubleshooting

For trouble shooting the mass spectrometer hardware please refer to the instrument manual.

Refer to:

CTS Error Message

Overrun Error

Software Installation and Configuration

Background and Library Error

Fatal Error 53

Miscellaneous Errors

Mass Spectrometer

9.1. CTS Error Message

When RGA for Windows is installed on certain PCs a problem with the serial comms. may be encountered resulting in the following error message:

" Connection to the Satellite has been lost (CTS). Restart RGA for Windows?"

To overcome this it is necessary to add the following line to the [CONFIGURATION] section of the RGA4WIN.INI file :-

Ignore CTS =1

Note: There is a single space before CTS and a single space before =.
The statement should be written using upper and lower case characters as shown .
Remember that this will not be necessary for the vast majority of computers so do not alter the file unless you experience the above problem.

9.2. Overrun Error

On some slower PCs you may experience some problems with overrun errors, you may encounter the following error message:

" An overrun error has occurred. Refer to the trouble shooting section in the RGA for Windows manual. Restart RGA for Windows ?"

To solve this problem add the following line to the [CONFIGURATION] section in the RGA4WIN.INI file:

Baud Rate = 2400

Please use upper and lower case characters as shown and note the single spaces between Baud and Rate, before and after the =.

Remember that this will not be necessary for the majority of computers so do not alter the file unless you experience the above problem.

9.3. Software Installation and Configuration

9.3.1. No communication ports found

A dialog box with the message:

"No available communication ports have been found. Consult your RGA for Windows manual."

may be generated by the Configure RGA for Windows program. It occurs when all the COM ports on the system are in use by other programs. Most computers fitted with the standard two COM ports will use one for the mouse. The second COM port will be used to communicate with the Satellite. If the second port in your system is communicating with a modem, fax or any other device you will have to disable it while configuring or running RGA for Windows.

9.3.2. Link to the control unit

Satellite not responding

A dialog box with the message

"Satellite Not Responding. Check Connections To Satellite."

may be displayed when you run up RGA for Windows. *Click* on the **Retry** button and another attempt will be made to establish the link to the control unit. If the second attempt fails *click* on the **Cancel** button which will exit

the RGA for Windows program and proceed as follows:-

- Switch off the control unit.
- Check the connection between the PC and the control unit. Ensure that the connectors at each end are fully inserted, use the screws on the connectors to hold them in place.
- Make sure that you have correctly identified the COM port number on the PC to which the control unit is connected and that this COM port has been specified in the Configure program.
- Switch on the control unit and check that the POWER ON and FARADAY indicators on the front panel are lit.
- *Click* the RGA-Reset icon to start RGA for Windows.

If the fault persists it is possible that there is a problem with the COM ports on your PC. You should check to see if the COMMS OK indicator is lit on the control unit. If it is it means that the control unit has been able to receive data from the PC and the problem is associated with the PC receiving data from the control unit. If it is not lit then the control unit has not received data from the PC.

In either case the best approach is to try temporarily connecting the control unit to a different COM port. Preferably you should use one which you are confident is working correctly. In most cases this will probably require you to disable the mouse and use the COM port used by the mouse.

To achieve this you will have to change the systems settings so that windows is not expecting a mouse to be connected. Refer to the System Setup section in the Windows User Guide for details about how to use the System Setup program. Before you change the mouse setting note the current setting so that you can restore it correctly later.

Remember to run the Configure RGA for Windows program and select the new COM port number before you try to run RGA for Windows again.

If you find that RGA for Windows will run on one COM port but not on another, that port may be either faulty, disabled or configured incorrectly. You should refer to the information supplied with your computer or contact

the manufacturer or supplier for details about how to configure and test the COM ports.

Connection to the satellite has been lost

A dialog box with the message

"Connection to the Satellite has been lost. Restart RGA for Windows."

may appear if the control unit is switched off or the cable between the PC and control unit is unplugged. It should not occur under normal operating conditions.

An overrun error has occurred

This error may occur on some slower PCs or when other applications are using comm. ports. e.g. a modem.

To overcome this problem it will be necessary to use a high performance serial port board fitted with 16550 UARTs. We would also recommend the use of Turbo/Com2 Plus or Turbo Com Advanced Comm Drivers for Windows 3.1. These drivers are produced by Pacific Comware and may be obtained from your local representative or software retailer.

Comm. port not available

A dialog box with the message

"Comm port #n is not available. Use the configure utility to select another port."

may appear in which case the Comm. port defined for RGA for Windows is either currently being used by another application or is not available to Windows. Run the Configure utility to select another Comm. port.

Version x.xx required

If a dialog box with the message

"This RGA for Windows requires Version Vx.xx or later Satellite code."

(where x.xx equals 2.00 or greater)

appears, the software in the control unit is an old version. The latest Satellite code is supplied with V2.30 RGA for Windows software. You can usually download the program to a Satellite or Microvision using

the Download program supplied. If you are using a Vacscan Plus or another type of control unit it will be necessary to change the EPROMs, please contact your local Spectra facility.

To Download the program follow the instructions in section Error! Reference source not found..

Satellite sub-mode failed

A dialog box with one of the following messages may appear:

"Satellite sub-mode 166 failed. Check Connections To Satellite."

"Satellite sub-mode 167 failed. Check Connections To Satellite."

"Satellite sub-mode 188 failed. Check Connections To Satellite."

"Satellite version number not received. Check Connections To Satellite."

All of the above errors will occur if the control unit is unable to communicate with your PC.

Satellite reconnect failed

"Satellite reconnect failed. Check Connections To Satellite."

Under some circumstances it may not be possible to re-connect the control unit. In this case switch off the control unit, switch back on and start RGA for Windows from cold.

RF/Analyser mis-match

Error message:

"The selected RF/Analyser combination does not appear to match the actual RF/Analyser".

This warning may occur if you connect a PC running RGA for Windows to a different control unit. In multi-headed systems if the head to comm. port mapping has been altered or the control unit serial cables have been connected to different comm. ports the warning may also occur. To correct this situation refer to RF Tuning .

9.4. Background and Library Error

9.4.1. Corrupted database

Error message:

"The Library/Background database has been corrupted. Restore your backup copy of "PATH AND NAME OF LIBRARY""

If the Library/Background database has become corrupted it can no longer be read and you must over-write it with either a back up copy or the original Library database from the Distribution Disk.

9.4.2. VBDB300.DLL

Error message:

"Cannot find VBDB300.DLL The library feature is disabled."

A file needed to use the Background/Library database has been deleted, re-install from Distribution Disk.

9.4.3. Cannot find library

Error message:

"Cannot find library "PATH AND NAME OF LIBRARY" The library feature is disabled. "

The Library/Background database has been renamed or deleted. Either put the original file from the Distribution Disk into your RGA for Windows directory or restore your Library/Background database.

9.4.4. Library select failed

Error message:

"This library select failed to find any matching spectra. The select criteria has been disabled and all library spectra are selected."

A library search failed to find any matching spectra. In this case all library spectra are selected.

9.4.5. Background deleted

Error message:

"Selected background has been deleted from another head."

In a multi-headed configuration a background has been deleted from one head and selecting that background in another head has caused this error. No action need be taken.

9.4.6. Microvision error messages

There are three error messages associated with Microvision control units, these are listed below:

"The application program is not loaded in the Microvision. Use the download utility to load the application before re-trying."

"The application program failed to run in the Microvision Code: x . Use the download utility to load the application before re-trying".

where $x = 1$

Bad boot structure (Application not loaded or instrument not configured).

2 Corrupt application (CRC failed or application not loaded)

"The instrument responded initially as a Microvision but then failed to communicate to level 1 protocol commands."

If you get any of the above error messages use the Download facility to first un-load the Microvision code and then use the Download facility to re-load it. Then try to run RGA for Windows again.

If this does not work contact your local Spectra facility and report all the symptoms to the service engineer. He will advise you as to how to proceed.

9.5. Fatal Error 53

Error 53 just means that a file needed by RGA for Windows cannot be found.

Firstly, re-boot the entire system and use the RGA Reset icon to start.

If this does not work think about any changes you have made to the system, new software you may have installed or files you may have moved.

The file spectra.mdb file which is the database file used by the library in the bar chart mode is the most common one to cause problems. This file is in the Spectra directory.

In the RGA4Win.ini file there is a section called [Library]

There is a line which calls the database file. This line must agree with where the spectra.mdb file actually is.

If none of the about helps solve the problem you may need to re-install the software.

9.6. Miscellaneous Errors

9.6.1. System resources

Error messages:

"You have run out of Microsoft Windows system resources. Before you attempt to retry close as many other applications as possible."

Windows has a limited number of resources. If you are running multiple programmes or the multi-headed version of RGA for Windows you may run out of these resources. The only solution is to close down as many unnamed programmes as possible if you wish to continue. However, once Windows runs low on resources, strange effects will start to occur and it is generally recommended that you close Windows down before re-starting it.

9.6.2. Printing error

Error message:

"Error while printing. Check that the printer is switched on, connected to your PC, has paper loaded and is installed for Windows before trying to print again."

RGA for Windows has been unable to send a print-out to the printer after checking that the printer is switched on, has paper loaded and is plugged in

to your PC, try printing from another application (e.g. Note pad). If you cannot print from Note pad, the printer has probably not yet been configured for Windows, see the documentation supplied with the printer and/or Windows for details of how to configure.

9.6.3. Drive/path error

Error message:

"The drive or path does not exist."

When configuring disk store selecting a drive that cannot be read by DOS will cause this error, e.g., selecting a floppy disk with no disk inserted.

9.6.4. Incorrect disk

Error message:

"Incorrect disk inserted. Replace with original floppy disk and press Ok to continue."

During disk store operations, if a floppy disk that was read correctly during configuration can no longer be read, this error is generated.

9.6.5. Comment too long

Error message:

"The comment is longer than 32000 characters. Truncate to 32000 characters?"

When saving a comment it must be less than 32000 characters long. You have the option of truncating the comment or aborting.

9.7. Mass Spectrometer

9.7.1. Diagnostic failure

There are a number of faults which would cause a power supply to be reported as failed when the diagnostics are run. The failure could be due to a fault with the control unit, RF Head or with the analyser. To help track down the location of the fault you should perform the following tests in the order listed.

- Run the diagnostics with the RF head disconnected from the control unit. If the fault still occurs then the problem is with the control unit. You should consult your local agent for information about how to proceed. However if all the power supply tests now pass you should proceed with the next test.
- Run the diagnostics with the RF head connected to the control unit but disconnected from the analyser. If the fault occurs now then the problem is with the RF head. Again you should contact your local agent for further information. If it passes this test then the fault is with the analyser and you should proceed with the next test.
- If you have access to an ohm meter you can check for short circuits to ground within the analyser. To do this follow the instructions in the Analyser Maintenance section of the control unit manual.

9.7.2. Failed filaments

A filament is in a failed state when it has been selected but the emission current flowing is not the pre-set value (normally 1 mA). It is important to note that the supply to a failed filament may still be on if the **Filament | Protect Filaments | Filament Off when failed** option has not been selected, and that if the cause of failure is removed the filament will start working. There are many possible causes of filament failure. The most common, with suggested actions, are listed below:-

- The filament has blown, please refer to the analyser maintenance section of the control unit manual which will explain how to check this.
- The RF head is not connected to the control unit. Switch off the control unit and connect the RF head to the control unit using the 37 way "D" type connector. It is not recommended that this connection be made when the control unit is switched on.

CAUTION

A filament usually blows because it is being operated at high pressure. Before selecting another filament check that the pressure in your system is below that recommended.

- The RF head is not connected to the analyser. Switch off the control unit and carefully connect the RF head to the analyser.

- A short has occurred within the analyser. Run diagnostics. Depending on where the short is, a number of power supplies will no longer be working. To confirm a short, re-run diagnostics with the RF head unplugged from the analyser; all supplies should now pass.

The filament power supply in the control unit has failed. Run Diagnostics with the RF head disconnected for confirmation.

9.7.3. Loss of spectra when using multiplier

In dual detector systems it is possible for you to see spectra when you use the Faraday detector but for it to disappear when you use the Multiplier. There are a number of checks you can make to track down the cause of this problem.

If you are not currently using the Bar chart mode, select it and adjust the mass range so that stable spectra are displayed using the Faraday detector on a range greater than or equal to E-7. Try turning on the Multiplier and check that the range does not alter. If the magnitude of the partial pressures in the spectra change but do not disappear completely then you should calibrate the multiplier. See section Error! Reference source not found. for details about how to calibrate the multiplier and the effects that using the multiplier will cause. If all the peaks in the spectra disappear then check the following:-

- Check that the multiplier high voltage cable has been connected between the RF head and the control unit. Ensure that the control unit is switched off before connecting or disconnecting the high voltage cable.
- With a filament switched on, run the diagnostics and check that the SEM supply passes. If it fails you should contact your local agent for further advice.
- Run up RGA for Windows with a power up reset. This will reset all the system parameters to the factory default values. The default Multiplier voltage will be reset to give an approximate gain of x100. Use the Bar chart mode as before to see if the multiplier is now functioning.

Note that in Peak Jump and Trend modes the global multiplier in the icon bar must be on as well as the multiplier being *checked* in the Channel setting dialog box.

9.8. RF Tuning

This aspect of RGA for Windows is fairly complex and may only be of interest to a few users. Before you change any of the parameters associated with RF tuning or changing or adding RF Head/Analyser combinations, you should read this section and have a clear understanding of what you are trying to achieve.

CAUTION

Do not attempt to use this feature unless you are fully aware of the implications. Misuse will prevent the instrument from operating correctly.

9.8.1. Feature compatibility

The RF Tuning feature is available with all Microvision Plus, Microvision and Vac Check 100 instruments. With Windows Satellite instruments the feature is only available when a complete system comprising an analyser, RF head, Satellite and RGA for Windows software are purchased together. They are not available if you use an adapter box to connect an analyser and RF head supplied by another manufacturer. The RF Tuning feature is not available when using Vacscan Plus and Vacscan control units.

There are a number of compatibility problems which you may encounter if you are using RF heads or Satellites which were purchased separately or as part of the DOS Black Box Multi-Quad system. The two symptoms you may find are:-

- If the Settings menu is not displayed in analogue mode then you do not have the software and/or hardware options fitted in your Satellite. If you did not purchase your Satellite and RF head as part of RGA for Windows package then your system will not need this feature and will operate correctly without it.
- If the Settings menu is displayed in analogue mode but the controls in the RF Tuning dialog box do not function correctly then you may be

using an incompatible RF head. This problem will occur if you try to use an RF head which was not purchased as part of an RGA for Windows system.

9.8.2. Why we need RF head settings

In order to produce a functioning sensor package (RF head and Analyser), the RF head must be tuned to compensate for slight variations in analyser characteristics. The tuning affects the mass alignment and the resolution of the analyser. RF heads and analysers should usually be treated as a matched pair. Under these circumstances it should not be necessary to tune the RF head.

The parameters which match the RF head to the analyser are stored in a data file which is part of the RGA for Windows environment. If you have more than one sensor package which you run from a single PC then the tuning parameters for each sensor package must be loaded into the data file. When you run RGA for Windows you will have to ensure that you select the correct "RF head/analyser pair" from the list provided.

In some applications one RF head is connected to several different analysers in turn. In these circumstances each RF head/analyser combination has to be treated as a separate "RF head/analyser pair".

Note: in Microvision, Microvision Plus and Vac Check 100 systems the RF head referred to above is part of the relevant control unit.

9.8.3. Factory default settings

Two sets of tuning parameters are associated with each "RF head/analyser pair". These are the default settings and the user settings. When RGA for Windows is installed the user setting and the default settings are identical and are set to the values determined during production for each of the sensor packages supplied.

When RGA for Windows is run the user settings are used to tune the RF head. If the tuning parameters are altered from the RF Tuning *dialog box* then the user settings are altered not the default settings. The default settings may be restored to the user settings at any time. To do this *click* the **Defaults** button in the RF Tuning *dialog box* and then *click* **Ok**.

9.8.4. Selecting the RF head/Analyser

If you only use one sensor package with the RGA for Windows it will not be necessary to select the RF head/Analyser pair. The only function that will be available is to add a new RF/analyser combination from the Current RF/Analyser pair list box in the RF Tuning *dialog box*.

If you use more than one sensor package the correct RF/Analyser pair must be selected before use. This is done from either the **Setting | RF Select** menu or from the RF tuning *dialog box*.

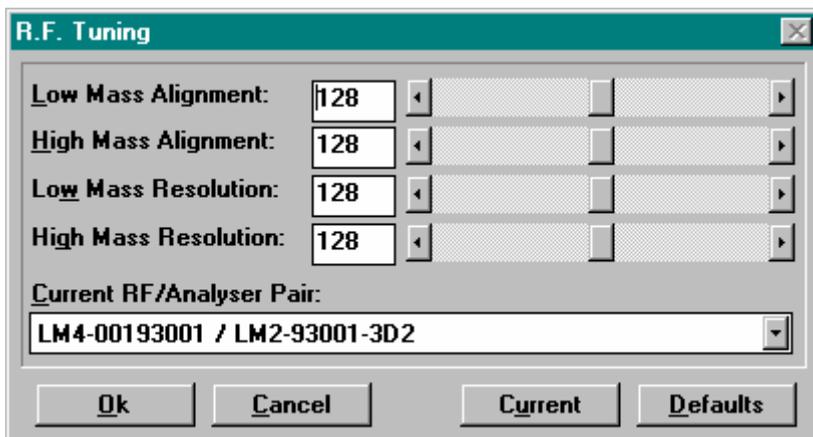
9.8.5. Adding RF head/Analyser combinations

The RF head/analyser combinations are given an arbitrary name consisting of two fields. Generally we recommend that the serial numbers of the RF head and analyser are used although any text string may be entered.

To add a new RF/Analyser combination open the RF Tuning *dialog box* from the Settings menu in the analogue mode. From the Current RF/Analyser pair list box select the "Add new RF/Analyser combination" entry. This will allow the name and default settings to be entered for the new RF head / analyser combination.

CAUTION

Once a new RF head/Analyser combination has been added it is not possible to change the default settings or delete the entry from within the RGA for Windows program. This has been done deliberately to prevent the accidental deletion of the default factory settings.



9.8.6. Adding RF head/Analyser combinations

The following table gives the default ion source settings for quadrupoles used with Microvision Plus, Vac-Check and Satellite instruments fitted with standard open and PVD ion sources. The table also gives the default settings for HPQ-2 in its three operating modes.

Please note that filament material does not affect the ion source settings.

Instrument & Mode	ION SOURCE PARAMETER			
	Emission	Electron Energy	Ion Energy	Extractor
Std Ion Source	1mA	70eV	5.5eV	-112V
PVD Ion Source	1mA	40eV	7.0eV	-20V
HPQ-2 RGA Mode	0.7mA	70eV	7.0eV	-110V
HPQ-2 HP Mode	0.1mA	35eV	5.0eV	-58V
HPQ-2 Leak Mode	1.0mA	88eV	10.0eV	-130V

9.8.7. RF head tuning

There are four parameters which need to be set in order to tune the RF head to a particular analyser. These four parameters adjust the mass alignment and resolution of the system. The four parameters are:-

- Low mass alignment.
- High mass alignment.
- Low mass resolution.
- High mass resolution.

RF head tuning in this instance refers to the adjustment of the mass alignment and resolution settings.

Under normal operating conditions you should not need to adjust these settings.

If the mass alignment and/or resolution appear to be incorrect you should first reset to the factory default settings for that analyser/RF head combination. To do this switch to the Analogue mode and select **Settings | RF Tuning . . .** from the *menu bar*, the RF Tuning *dialog box* will be displayed, *click* on the **Defaults** button.

If after resetting to the factory default settings the mass alignment and/or resolution still appear to be incorrect you could try re-tuning. Before doing so you need to appreciate the following points.

- Peak alignment is the position of the peak centre relative to the mass scale. The software will find the top of the peak if it is within 0.3 amu of a whole mass number.
- Resolution is a measure of the peak width. The normal resolution is when the peak width at 5% of the peak height is 1amu.
- Both the mass alignment and resolution have two controls, a high mass control and a low mass control. There is an interaction between them.
- The low mass control has an effect on peaks throughout the mass range and its effect tends to be the same on low masses and high masses.
- The high mass controls effect higher masses but do have a smaller effect

on low masses.

To tune the RF you will need to have at least three peaks in your vacuum system; a low mass peak (2 or 4 amu), an intermediate peak (12 to 28 amu) and a high mass peak (40 amu or above). In the following RF tuning example we use hydrogen (mass 2) as the low mass peak, water (mass 18) as the intermediate peak and carbon dioxide (mass 44) as the high mass peak.

1. Set the mass 2 alignment and resolution using the low mass alignment and low mass resolution controls.
2. Set the mass 18 alignment and resolution using the high mass alignment and high mass resolution controls.
3. Set the mass 2 alignment and resolution using the low mass alignment and low mass resolution controls.
4. Set the mass 44 alignment and resolution using the high mass alignment and high mass resolution controls.
5. Set the mass 18 alignment and resolution using the low mass alignment and low mass resolution controls.

Then repeat the procedure and keep repeating until a satisfactory set-up has been achieved. Do not expect to get the set-up perfect but aim to minimise errors throughout the mass range. Aim to get the mass alignment within 0.3 amu and the peak width at 5% of the peak height between 0.8 and 1.2 amu.

9.8.8. Removing RGA for Windows

Use the Uninstall program provided to remove RGA for Windows from your PC. To run Uninstall you will need the original RGA for Windows distribution disks.

9.8.9. Getting help

If you require any further help or advice about RGA for Windows please contact your local agent. To assist us in dealing with your enquiry promptly, please quote the serial numbers of the RF head, analyser and control unit along with the information listed in the "About" *dialog box* accessed from the **Help | About** menu.

If you have a question or problem which seems to relate to the mass

spectrometer hardware, you may be asked to send printouts of the diagnostics screen and analogue mass spectra. These printouts can provide us with valuable information which will enable us to respond promptly to your enquiry.

If your enquiry relates to the software and how it functions on your PC you should provide as much of the following information as possible:-

Make and model of your PC.

Make and model of your graphics card.

The amount of memory fitted in your PC.

The amount of free disk space on your hard disk(s)

Printouts of the following files:-

AUTOEXEC.BAT

CONFIG.SYS

WIN.INI

SYSTEM.INI

RGA4WIN.ini

9.8.10. Resetting After Maintenance

Some maintenance procedures carried out on analysers will result in changes to the mass alignment and resolution settings. Since these settings are stored on the PC, which almost certainly will not have been returned for repair, it will be necessary to reset the resolution and alignment settings. The settings are written on the Shipment Report Checklist, which will have been sent with the equipment, in the Technical Information section.

To check/alter the settings:

Connect up the instrument as usual then start RGA for Windows using a Power Up Reset, see Reset .

Select the analogue mode, check the pressure is low enough to operate the quadrupole then switch a filament on.

Select the correct RF Head and Analyser combination then select RF Tuning. Check that the four parameters on the screen match those on the Shipment Report. Adjust the parameters to match the shipment report as necessary.

Repeat this for all RF / Analyser combinations.

Finally, you can check the performance of the quadrupole by operating in the analogue mode and comparing the spectra you obtain with those on the printouts attached to the Shipment Report. Run the instrument for two hours before making any changes.

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Appendix A.

Glossary

Atomic mass unit (AMU)

Exactly one twelfth the mass of a neutral atom of the most abundant isotope of carbon, ^{12}C . 1 amu. = 1.660×10^{-27} kg.

Abundance sensitivity (Partial pressure analyser)

The smallest concentration of one gas that can be detected in the presence of another gas with a partial pressure analyser of a given design.

Active gas

A gas which reacts readily with some substances to form chemical compounds.

Background spectrum (Partial pressure analyser)

A mass spectrum of residual gas species in a system. It is usually obtained before a sample of interest is introduced and analysed in order to deduce by subtraction of spectra the true mass spectrum of the sample.

Backstreaming

The movement of gases or vapours under molecular flow conditions in the opposite direction to the gas flow or pumping.

Bakeout

The term used to describe the process of heating a vacuum system to reduce or eliminate condensable gaseous contaminants.

Base peak

The largest peak in the spectrum of a pure compound.

Cold trap

A vacuum vessel containing an inner vessel which may be filled with liquid nitrogen. Vapours in the vacuum system are condensed onto the cold surfaces reducing contamination. They also prevent backstreaming of diffusion pump oil into the vacuum system. Well designed cold traps will serve as an optical baffle to oil vapours so that liquid nitrogen is not required except to achieve very low temperatures.

Cracking pattern

Tabulation of the peaks in the mass spectrum of a pure compound. Usually the heights are related to the height of the base peak which is assigned a value of 100 (or 1000). For a particular type of mass spectrometer operated under a fixed set of conditions, the cracking pattern remains more or less constant.

Cryopump

Method for pumping of common permanent gases by freezing out onto cold surfaces below 30K. This is a similar principle to that used for the pumping of water vapour on a liquid nitrogen trap at 77K.

Detector

A device which produces an output signal, usually an electrical signal, in response to an input signal.

Electron multiplier

A detector which consists of cascaded stages, each intensifying the current from the preceding stage. Electrons released from the first electrode, cascade through the device to provide a charge or a current amplification. Electrons are released from the first electrode by the impingement of photons and/or by sufficiently high velocity heavier particles, charged or neutral.

Electron emission (From Surfaces)

The release of electrons from a solid or liquid surface as a result of:-

- i) atom and/or molecule impact (secondary electron emission)
- ii) electron impact (secondary electron emission)
- iii) electric fields (field emission)
- iv) photon impact (photoelectric emission)
- v) previous mechanical and/or radiative chemical disturbance of the surface (exoemission)
- vi) thermal energy (thermionic emission)

Note: Thermionic emission is the method used to generate electrons in the source which in turn create ions.

Faraday cage

A charged particle detector consisting of a metal electrode, cup shaped, for the collection and detection of charged particles. This geometry is used to prevent reduction of signal by suppression of secondary emission current.

Fingerprint spectrum

A mass spectrum characteristic of a vacuum system, associated leak or processing environment.

Foreline trap

A vessel filled with molecular sieve (or activated alumina) to trap backstreaming oil vapours. It is normally fitted between the high vacuum pump and rotary pump to prevent oil vapour backstreaming into the vacuum system.

Inert gas

A gas which does not normally react chemically with other substances.

Ion

Any atom or molecule which has resultant electric charge due to loss or gain of valence electrons.

Ion current

The rate of ion flow.

Ion repeller

The electrode in an ion source to which a potential is applied to provide an electric field which contributes to the initial acceleration of newly formed ions (See ion source).

Ion source

A combination of electrodes to which potentials are applied to generate ions and to accelerate them as a beam.

Isotope

One of a set of chemically identical species of atom which have the same atomic number but different mass numbers.

Leak rate

Designated as the quantity of gas passing through a leak in a given time, divided by that time. Leak-rate is a general concept whereas rate of pressure change is specific to the vacuum system volume. Leak-rate has therefore the advantage that component, or part leak-rates, can be added together to find an overall figure for a complete plant. A unit for leak-rate is the Millibar Litre per Second.

Mass range (Mass Spectrometer)

The interval between the smallest and largest masses which can be detected with a mass spectrometer.

Mass analyser

That portion of a mass spectrometer which separates the ion beam into its various mass to charge ratio components.

Mass spectrum

i) A recording of the ion current amplitude as a function of mass number obtained by scanning through all or part of the mass range.

ii) A tabulation or chart of peak ion current as a function of mass number.

Mass to charge ratio

The ratio of the mass to the charge of an ionised particle. (See Ion).

Millibar

Unit of pressure which approximates to 1/1000 of an atmosphere. The most widely used unit of pressure measurement in Europe.

Minimum detectable partial pressure

The smallest partial pressure the mass spectrometer can detect.

Molecular flow

The state of gas flow where the mean free path of the molecule is greater than the dimensions of the vacuum vessel so that molecules collide with the vessel wall rather than with other molecules. Typically occurs below 7.5×10^{-5} torr.

Partial pressure

The contribution that a gas component makes towards the total pressure.

Pressure (gas)

The average normal force per unit area exerted by gas molecules impacting on a surface.

Real leak

Ingress of gas (usually air) into the vacuum system from the atmosphere outside the vacuum system.

Relative sensitivity

The relative height of the base peak of a component compared to nitrogen measured at the same partial pressure. This difference is due to differences in ionisation efficiency for different gases. The indicated partial pressure on a mass spectrometer should be divided by the relative sensitivity factor to obtain the true partial pressure.

Resolving power

The ability of a mass spectrometer to separate adjacent mass peaks.

Torr

Unit of pressure. 760 torr equals one atmosphere.

Total pressure

The sum of all the partial pressures present within the vacuum chamber.

Transition or knudsen flow

The flow of low pressure gas through a tube several mean free paths wide. The flow is neither viscous nor molecular. Under these conditions, the microscopic concept of viscosity needs to be modified since the resistance to motion is due primarily to molecular collisions with the passage walls.

Vacuum

"A space entirely devoid of matter"

In reality this cannot be achieved, hence one normally talks in terms of the degree of vacuum attained within the following pressure ranges.

Rough vacuum	1000 - 1.3 mbar.
Medium vacuum	1.3 - 1.3×10^{-3} mbar.
High vacuum	1.3×10^{-3} - 1.3×10^{-8} mbar.
Ultra-high vacuum	1.3×10^{-8} and higher vacuum

Vacuum leak

Any fault on a vacuum chamber wall through which material can pass from higher to lower pressure regions.

Virtual leak

The effect caused by the outgassing of contaminants relating to the contents within an otherwise leak-tight vacuum chamber.

Viscous flow

The state of gas flow where the mean free path is less than the dimensions of the vacuum vessel so that molecules collide with other molecules rather than

with the vessel walls. Typically occurs above 1×10^{-2} mbar. There exists a region between 1×10^{-2} and 1×10^{-4} mbar where a mixture of viscous and molecular flow occurs.

Appendix B.

Mass Spectral Interpretation

Introduction

When the mass spectrum of a vacuum system has been taken, the first question is probably "What do all those peaks mean?" Although at first sight they may appear complex, interpretation in fact is a relatively simple matter.

Major peaks

The first task is to identify the mass numbers of the major peaks in the spectrum (ignore all the smaller ones to start with). Search through a reference library for spectra with the same major peak.

Secondary peaks

At some mass numbers there is the possibility of more than one component being present when using the base peak reference method of identification. With the exception of mass 28, identification is usually possible with the knowledge of which gases have been introduced into the vacuum system. For example, at mass 43 unless acetone or n-butane have been used in the system or the cleaning of vacuum components, it is unlikely that a peak at mass 43 is due to these compounds.

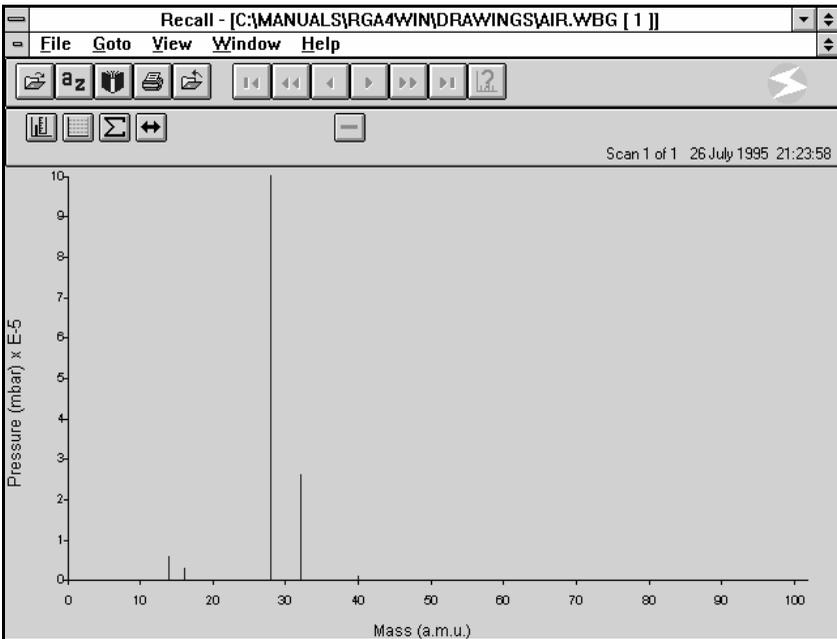
Comparing the secondary peaks from the reference library confirms the match and would show that the peak had most likely originated from rotary pump oil which can be confirmed by checking the presence of other peaks typical of this oil.

At mass 28, unless ethylene or ethane have been used in the vacuum system, the most likely source will be nitrogen or carbon monoxide, or a mixture of the two. Nitrogen is identified by checking mass 14, which is approximately 5% of the base peak intensity. The mass 28 contribution due to nitrogen can therefore be calculated. The remainder of mass 28 will be due to carbon monoxide, confirmed by the presence of a mass 12 peak of approximate intensity of 5% of the base peak. In practice, mass 28 is always present as it originates from chemical reactions of oxygen and carbon containing materials at the filaments of mass spectrometers, ion gauges, etc.

Typical fingerprint spectra

The fingerprint spectrum is a mass spectrum which is characteristic of the vacuum system from which it is taken. The term is extended to include spectra which are characteristic of problems or faults commonly encountered in vacuum systems. The following fingerprints typify some of these problems and it should be remembered that a vacuum system could show a combination of two or more of these fingerprints.

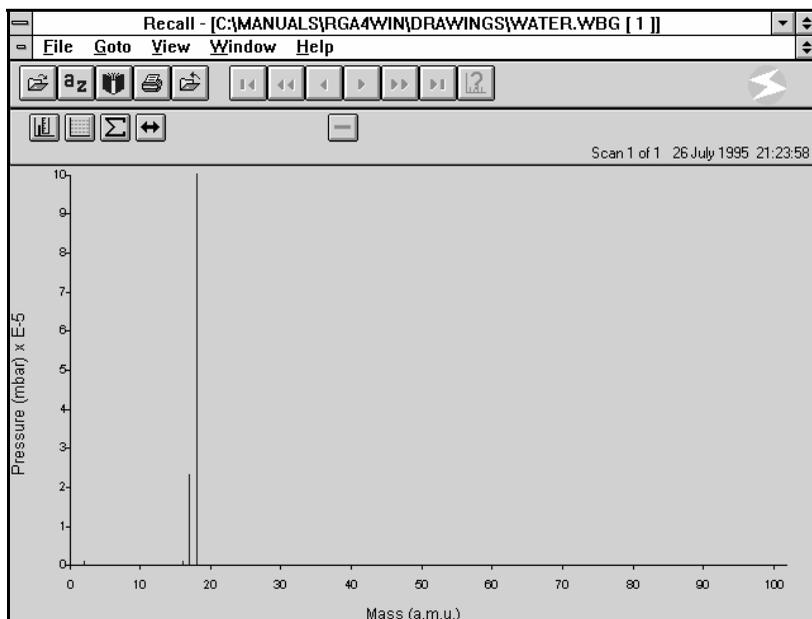
Air leak



Characteristic spectrum of an air leak, masses 28 and 14 from nitrogen, 32 and 16 from oxygen, 40 from argon.

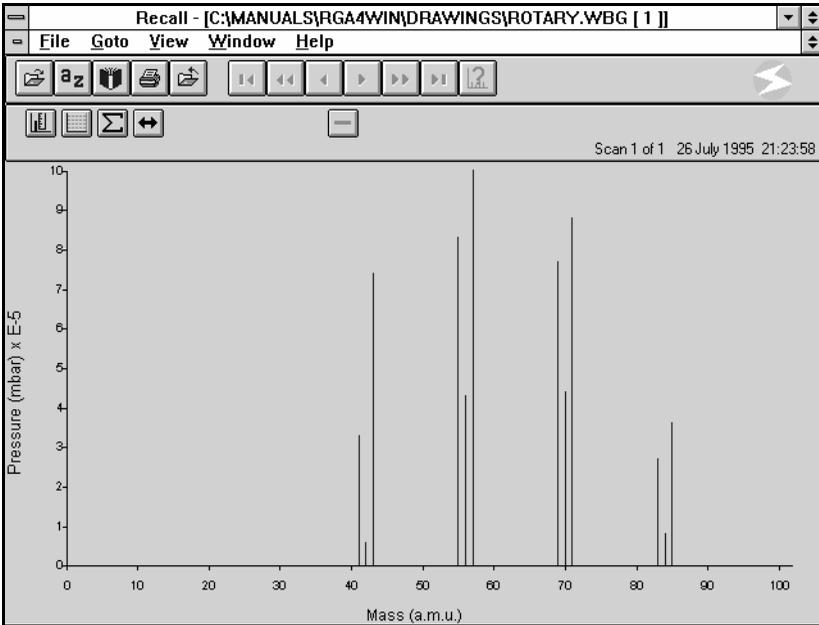
To locate the leak, tune the quadrupole to mass 4 (helium) and probe all joints, welds and feedthroughs etc., with helium. An increase in the helium peak on the mass spectrometer indicates the source of the leak. It is usually worth checking freshly made joints or newly added components first as these are the more likely sources of leaks on a previously leak-tight vacuum system.

Water vapour



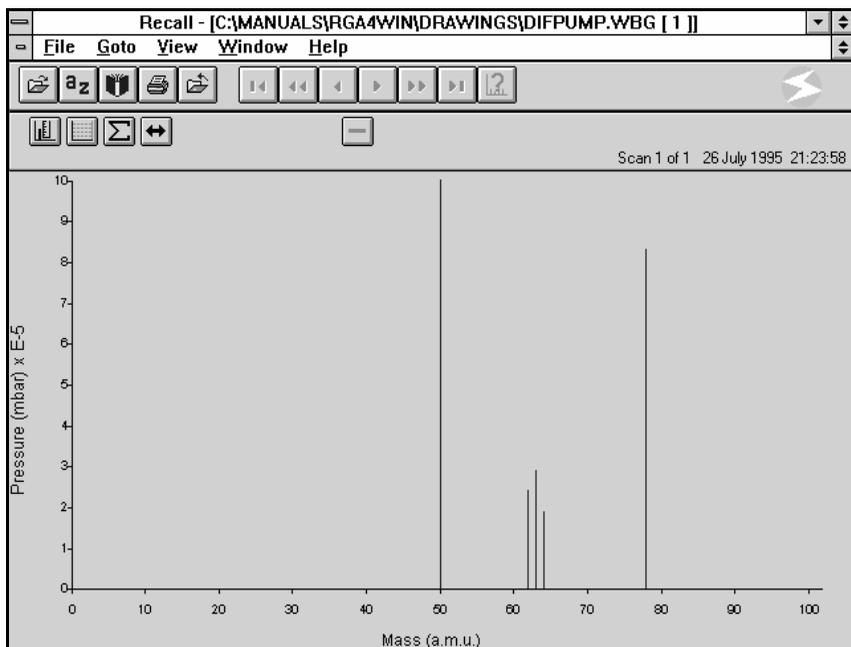
Characteristic spectrum of water vapour in the vacuum system. The problem is solved by baking the system to 250 deg. C for some hours, preferably with an oven to ensure a uniform baking temperature. Remember to avoid sudden large temperature changes on ceramic and glass components to prevent damage.

Rotary pump oil



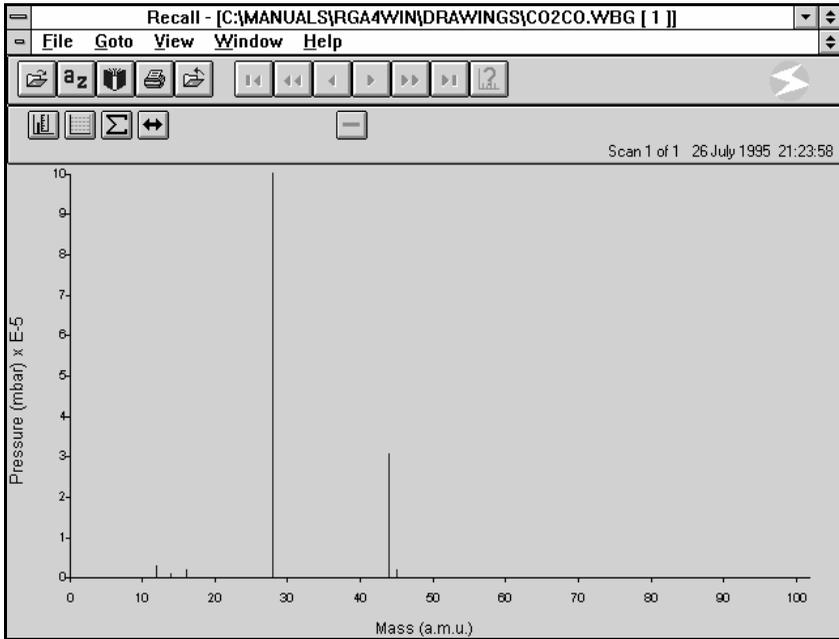
Characteristic spectrum of rotary pump oil contamination, due to foreline trap not fitted or in need of reactivation. Solve by fitting or reactivating trap as appropriate and bake vacuum system.

Polyphenylether diffusion pump oil



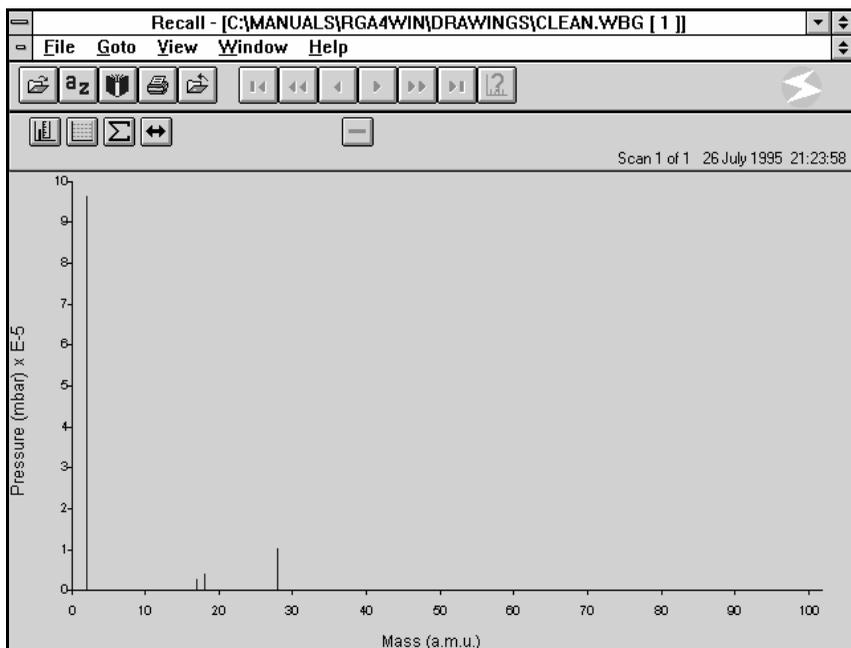
Characteristic of spectrum of polyphenylether diffusion pump oil. Solve by fitting efficient baffle or cold trap and bake.

Carbon monoxide and carbon dioxide



Characteristic spectrum of carbon monoxide and carbon dioxide outgassed by filaments and ion source. Solve by switching quadrupole into degas remembering to degas filaments of other equipment such as ion gauges.

Clean high vacuum



Characteristic spectrum of a clean high vacuum. Note the relatively high level of hydrogen which is desorbed from the metal walls of the vacuum system. Mass 28 due to carbon monoxide will always be present, the extent depending on how many filaments, and their types, are in operation.

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Appendix C.

Cracking Pattern Table

The following table lists some of the more common gases encountered in residual gas analysis along with their cracking patterns. The minor peaks are shown with their approximate intensity (Height) relative to the base peak that it is assumed equals 100.

COMPONENT	Base Peak	MINOR PEAKS (Height)		
		1	2	3
Hydrogen	2	1 (3)	-	-
Helium	4	-	-	-
Methane	16	15 (86)	14 (16)	13 (9)
Ammonia	17	16 (80)	15 (7)	14 (2)
Water	18	17 (21)	16 (1)	-
Neon	20	22 (10)	-	-
Ethylene	28	27 (64)	26 (63)	25 (12)
Carbon Monoxide	28	12 (5)	16 (2)	29 (1)
Nitrogen	28	14 (5)	29 (1)	-
Ethane	28	27 (34)	30 (24)	26 (23)
Methanol	31	32 (67)	29 (65)	28 (6)
Ethanol	31	45 (34)	27 (24)	29 (23)
Oxygen	32	16 (11)	-	-
Hydrogen Chloride	36	38 (32)	35 (17)	-
Argon	40	20 (13)	-	-
N-Butane	43	29 (38)	27 (28)	41 (28)
Acetone	43	58 (27)	27 (8)	42 (7)
Carbon Dioxide	44	16 (9)	28 (8)	12 (7)
Iso-Propyl Alcohol	45	43 (17)	27 (16)	29 (10)
Diffusion Pump Oil	45	59 (94)	43 (68)	41 (39)
Rotary Pump Oil	57	43 (73)	55 (73)	41 (33)
Sulphur Dioxide	64	48 (49)	32 (10)	16 (5)
Benzene	78	52 (19)	51 (19)	50 (16)
Trichloroethylene	95	130 (90)	32 (85)	60 (65)
Polyphenylether	446	77 (79)	51 (28)	39 (10)
Diffusion Pump Oil				

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Appendix D.

Relative Ionisation Sensitivity

Substance	Formula	Relative Ionisation Sensitivity
Acetone	(CH ₂) ₂ CO	3.6
Air		1.0
Ammonia	NH ₃	1.3
Argon	Ar	1.2
Benzene	C ₆ H ₆	5.9
Benzonic Acid	C ₄ H ₅ COOH	5.5
Bromine	Br	3.6
Butane	C ₄ H ₁₀	4.8
Carbon Dioxide	CO ₂	1.4
Carbon Monoxide	CO	1.06
Carbon Tetrachloride	CCl ₄	6.0
Chlorobenzene	C ₆ H ₅ Cl	7.0
Chloroethane	C ₂ H ₅ Cl	4.0
Chloroform	CHCl ₃	4.8
Chloromethane	CH ₃ Cl	3.1
Cyclohexylene	C ₆ H ₁₂	6.4
Deuterium	D ₂	0.35
Dichlorodifluoromethane	CCl ₂ F ₂	2.7
Dichloromethane	CH ₂ Cl ₂	3.7
Dinitrobenzene	C ₆ H ₄ (NO ₂) ₂	7.8
Ethane	C ₂ H ₆	2.6
Ethanol	C ₂ H ₅ OH	3.6
Ethylene Oxide	(CH ₃) ₂ O	2.5
Helium	He	0.14
Hexane	C ₆ H ₁₄	6.6
Hydrogen	H ₂	0.44
Hydrogen Chloride	HCl	1.6
Hydrogen Fluoride	HF	1.4
Hydrogen Iodide	HI	3.1
Hydrogen Sulphide	H ₂ S	2.2
Krypton	Kr	1.7
Lithium	Li	1.9
Methane	CH ₄	1.6
Methanol	CH ₃ OH	1.8
Neon	Ne	.23
Nitrogen	N ₂	1.0

Nitric Oxide	NO	1.2
Nitrous Oxide	N ₂ O	1.7
Oxygen	O ₂	1.0
n-Pentane	C ₅ H ₁₂	6.0
Phenol	C ₆ H ₅ OH	6.2
Phosphine	PH ₃	2.6
Propane	C ₃ H ₈	3.7
Silver Perchlorate	AgClO ₄	3.6
Tin Iodide	SnI ₄	6.7
Sulphur Dioxide	SO ₂	2.1
Sulphur Hexofluride	SF ₆	2.3
Toluene	C ₆ H ₅ CH ₃	6.8
Trinitrobenzene	C ₆ H ₃ (NO ₂) ₃	9.0
Water	H ₂ O	1.0
Xenon	Xe	3.0
Xylene	C ₆ H ₄ (CH ₃) ₂	7.8

Appendix E.

Default Settings

Leak check

Multiplier	0 = off
Accuracy	3 = standard
Probe Gas	4 = Helium
Mass Offset	16 = Zero Peak Offset
Range	5 = E-05
Auto Range	0 = Off
High Alarm	0 = Off
Low Alarm	0 = Off
Audio	1 = On

Bar Chart

Multiplier	0 = Off
Total Pressure	1 = On
Accuracy	3 = Standard
First Mass	1 = First Mass
Mass Span	50 = Mass Span
Range	5 = E-05
Auto Range	0 = Off

Peak Jump

Multiplier	0 = Off
Total Pressure	1 = On
Accuracy	3 = Standard

Multi Trend

Multiplier	0 = Off
Total pressure	1 = On
Accuracy	3 = Standard
Scan Interval	5 = 1 second

Analogue

Multiplier	0 = Off
Total Pressure	1 = On
Accuracy	3 = Standard

First Mass 14 = Mass 14
 Mass Span 16 = 16 amu
 Range 5 = E-05
 Auto Range 0 = Off

Channel Parameters

Channel	1	2	3	4	5	6	7	8	9	10	11	12
Multiplier	Off											
On/Off	On	On	On	On	On	On	Off	Off	Off	Off	Off	Off
Mass	2	4	12	14	15	16	17	18	28	32	44	55
Range	E-5											
Auto	Off											
Range												
High	Off											
Alarm												
Low	Off											
Alarm												

Appendix F.

INI File Structure

This help topic was previously released as the document:
RGA for Windows INI File Structure
LP210007
Rev 1.00 1 Oct 1999

This document is provided as a reference for Spectra personnel. Whilst we are quite happy for customers to read it, they make changes to INI files at their own peril. Please only change INI file settings if instructed to do so by a Spectra engineer.

These are the ini file sections:

“CONFIGURATION”
“SYSTEM”
“RVC”
“DISK STORE”
“USER DISK HEADER”
“PRINTER”
“LIBRARY”
“ANALOGUE”
“BAR CHART”
“LEAK CHECK”
“MULTI TREND”
“PEAK JUMP”
“CHANNEL”
“DEGAS”
“MULTIPLIER CALIBRATE”
“VACUUM SCAN”
“VALVE CONTROLLER”
“RF TUNING”
“PORTS”
“SIGNALS”
“ANALOGUE OUTPUT CONFIGURATION”

Each INI file section is detailed below. The sections are listed in alphabetical order not in the order in which they appear in the INI file. The first column is the item text and the second is the default value. The third column

contains explanatory comments.

[ANALOGUE] Section

Erangle	0	List index string starting at 0
Auto Range	0	0 or 14
Accuracy	3	
Total On	1	
Mass Zoom	1	Listindex staring at 0
First Mass	1 or 14	1 if mass range = 20 else 14

[ANALOGUE OUTPUT CONFIGURATION] Section

PC Analogue Output Fitted	0	
Channel n	300;0;10	300hex 0-10V

[ANALOGUE OUTPUT SETTINGS] Section

Channel n	0;10;2;0;1E-4;0;0
-----------	-------------------

where parameters are:

S.MinDesiredOutputV;

S.MaxDesiredOutputV;

S.ScaleType;

S.MinValue;

s.MaxValue;

D.DataType;

D.DataIndex

[BAR CHART] Section

In Log	0	
High Range	8	from 5 up (applies to Log scales)
Low Range	5	as above
Erangle	0	applies to linear scale – values 0 to 6
Auto Range	0	
Accuracy	3	
Total On	1	
First Mass	1	
Mass Zoom	1 or 2	List index number 1 for maxmass=20

[CHANNEL] Section

In Log	0	
High Range	8	for log scales
Low Range	5	as above
Accuracy	3	

Total On	1	
Detector Gain	0;0;0;0;0;0;0;0;0;0;0	0, 2 or 3
Erange	0;0;0;0;0;0;0;0;0;0;0	0 to 6
Auto Range	0;0;0;0;0;0;0;0;0;0;0	
Enabled	1;1;1;1;1;1;1;1;1;1;1	
HiAlarm Enabled	0;0;0;0;0;0;0;0;0;0;0	
LoAlarm Enabled	0;0;0;0;0;0;0;0;0;0;0	
HiAlarm Mantissa	900;900;900;900;900;900;900;900;900;900;900	
LoAlarm Mantissa	100;100;100;100;100;100;100;100;100;100;100	
HiAlarm Exponent	5;5;5;5;5;5;5;5;5;5;5	
LoAlarm Exponent	5;5;5;5;5;5;5;5;5;5;5	
Dwell	6;6;6;6;6;6;6;6;6;6;6	
Settle	100;100;100;100;100;100;100;100;100;100;100	
Mass Offset	16;16;16;16;16;16;16;16;16;16;16;	
Mass	2;4;12;14;15;16;17;18;28;32;44;55	(if mass > 50)
Mass	1;2;4;12;14;15;16;17;18;28;32;44	(if mass > 20)
Mass	1;2;3;4;7;8;12;14;15;16;17;18	(otherwise)
PC Alarm Signal	depends on head #	
Ratio Channels	0;0;0;0;0;0;0;0;0;0;0	

[CONFIGURATION] Section

Alarm Sound	a .wav file	
Background Colour	&H0C0C0C0&	
Alert Bar Colour	&HFF	
Help Bar Colour	&H80FFFF&	
Disk Status Bar Colour	&H80FFFF&	
Sem Protect On	1	
Production Features Available	0	
Pressure Y-Label	Pressure (Torr)	
Library Y-Label	Peak Height	
Mass Label	Mass (a.m.u.)	
Ignore CTS	0	
Key Repeat Delay	600	
Key Repeat Interval	5	
Up Down Repeat Interval	180	
Normal Text	&H0&	
Highlight Text	&HFF&	
Standard Font	10	
Sequence Available (default ON)	1	Sequence available override
Ramped Degas	1	

SEM Gain Setting	MinSemRange	
EM EE Adjust On	0	
PC Digital I/O Fitted	0	
Do Events In Key Repeat	1	
Icon Bitmap File	ICONCLIP.BMP	
Setting Bitmap File	SETCLIP.BMP	
Sat Debug Info	0	
Manual Colours	0	use default colours
Current Trip Available	0	
Current Trip Info	0	
Comm Port	-1	-1 forces the user to
Configure		
Baud Rate	9600	
RF Protect On	1	
Mass Range	300	
Max Sem Range	3	FOR x1000
[DEGAS] Section		
Start Power	15	
Power Step	1	
Time	300	
[DISK STORE] Section		
Timed Store	0	
Store Interval	30	
Number of scans	10	
Store at end of scan	0	
Store Hundredths	1	
[LEAK CHECK] Section		
Erange	0	
Auto Range	0	
Accuracy	3	
Prode Mass	4	
Offset	16	
Audio On	1	
[LIBRARY] Section		
Select mass	28	
Select enabled	0	
Select base	0	

Filename	Spectra.mdb
Library On	0
Background On	0
Subtract On	0

[MULTIPLIER CALIBRATE] Section

Mass1	28
Mass2	14
Mass3	12
Mass4	18
Mass5	44
Manual Mass	28
Manual Erange	inSemRange
Manual Offset	16
Manual SEM Gain	MinSemRange

[MULTI TREND] Section

Color Trend	0
Time Relative	1
Verticle Time Label	0
Label Trace	0
Interval	1000

[PEAK JUMP] Section

Peak Surround	1
---------------	---

[PORTS Section] (all in DIGIO.INI)

Number Of 8255	0
8255n Base	0
8255n PortA	0
8255n PortB	0
8255n PortCH	0
8255n PortCL	0

[PRINTER] Section

Logo On	1
Company Name	Leda Mass
Company Font	Arial
Portrait Size	20
Landscape Size	32
Print Peak Colour	&HFF0000

Logo Colour &HFFFF00

[QUAD CALIBRATION] Section

Total Calibration Factor 1.0

[RF TUNING] Section

Entries 1

Current 1

<N> RF analyser/Head followed by tuning parameters

[RVC] Section

Rotary Pump 1

Turbo Pump 2

Maintenance Text 3

Gate Valve 4

Hi Valve 5

Hi Valve Text 6

Lo Valve 7

Lo Valve Text 8

Var Valve 9

Var Valve Text 10

Atmos Pump 11

Atmos Text 12

Atmos Valve 13

Filament Text 14

Main Pump Text 15

Hi Interlock 16

Lo Interlock 17

Window Size left, top, width, height

Windows StateWindow On Top 1

Manual Valve 0

Pump Timeout Time 300

Background Colour &HFFFFFF&

Schematic RVCSCHEM.DAT

Title Remote Vacuum Controller

[SIGNALS] Section (in DIGIO.INI)

No Of Signals 0

Port Address n 0

Bit Mask n 0

[SYSTEM] Section

Save Settings	1	
Plot One Decimal Place	0	
Show Icon Bar	1	
Show Setting Bar	1	
Show Help Bar	1	
Continuous Trace	1	
Grid	0	
Cursor	0	
Password	In SPECTRA.DDM	
Locked	In SPECTRA.DDM	
Y-Label On	1	
Multiplier Warning	1	
Monitor Comm Noise	1	
Disconnect Satellite	0	
Last Scanning Mode	RGA	
Partial Trip On	0	
Total Trip On	0	
Total Trip Erange	0	
Trip Filament On	1	
Application Title	RGA for Windows	
Satellite Analogue Output Enabled	0	
PC Analogue Output Enabled	0	
Satellite Alarm Output Enabled	1	
PC Alarm Output Enabled	0/1	Default to 1 if DigIO Card fitted
Audio Alarm Enabled	0	
Windows State	0	determines window layout
Window Size		left, top width, height

[USER DISK HEADER] Section

Number Of Entries	0
Save Settings	0
EntryNLabel	Default Label N
EntryNDefault	
EntryNType	Text

[VALVE CONTROLLER] Section

Title	Valve Controller Window Caption
-------	---------------------------------

Valve Mode	0	0 = manual, 1 = auto
Window On Top	1	
Store Complete Scan	1	
Purge Valve Number	0	

Example of a Typical RGA4Win.ini file

[CONFIGURATION]

Pressure Y-Label=Pressure (mbar)
Mass Range=200
Detector=Dual
Sem Supply=1.5Kv
Ramped Degas=-1
Baud Rate=9600
Comm Port=1
Pressure Units=1

[RF TUNING]

Current=1
Entries=1
1=LM4-00193001;LM2-93001-2D2;128;128;128;128;100;134;103;120

[SYSTEM]

Last Scanning Mode= 2
SaveSettings=0
Save Settings=1
Show Icon Bar= 1
Show Setting Bar= 1
Show Help Bar= 1
Windows State= 2
Continuous Trace= 1
Grid= 0
Cursor= 0
Satellite Analogue Output Enabled= 0
PC Analogue Output Enabled= 0
Satellite Alarm Output Enabled= 1
PC Alarm Output Enabled= 0
Audio Alarm Enabled= 0
Y-Label On= 1
Multiplier Warning= 1

Monitor Comm Noise= 1
Disconnect Satellite= 0
Partial Trip On= 0
Total Trip On= 1
Total Trip ERange= 2
Trip Filament On= 1
Plot One Decimal Place= 0

[DISK STORE]

Timed Store= 0
Store Interval= 30
Number of scans= 10
Store at end of scan= 0
Store Hundredths= 0

[LIBRARY]

Select mass= 28
Select enabled= 0
Select base= 0
Filename=C:\SPECTRA\Spectra.mdb
Library On= 0
Background On= 0
Subtract On= 0

[Microvision Plus]

Total Pressure Input= 255
External TP Linear Full Scale= .0001
External TP Log 5V= .00001
External TP Log 1V= 1E-09
External TP Analog Input= 1
External TP Scale Mode= 0

[QUAD CALIBRATION]

Total Calibration Factor= 1

[ANALOGUE]

ERange= 4
Auto Range= 0
Accuracy= 3
First Mass= 8

Mass Zoom= 1
Total On= 1

[BAR CHART]

In Log= 0
High Range= 8
Low Range= 5
ERange= 4
Auto Range= 0
Accuracy= 3
First Mass= 1
Mass Zoom= 2
Total On= 1

[LEAK CHECK]

ERange= 0
Auto Range= 0
Accuracy= 3
Probe Mass= 4
Offset= 16
Audio On= 1

[MULTI TREND]

Colour Trend= 0
Time Relative= 1
Vertical Time Label= 0
Interval= 1000
Label Trace= 0

[PEAK JUMP]

Peak Surround= 1

[CHANNEL]

In Log= 0
High Range= 8
Low Range= 5
Accuracy= 3
Total On= 1
Detector Gain=0;0;0;0;0;0;0;0;0;0;0
ERange=0;0;0;0;0;0;0;0;0;0;0

Auto Range=0;0;0;0;0;0;0;0;0;0;0
Mass=2;4;12;14;15;16;17;18;28;32;44;55
Enabled=1;1;1;1;1;0;0;0;0;0
HiAlarm Enabled=0;0;0;0;0;0;0;0;0;0
LoAlarm Enabled=0;0;0;0;0;0;0;0;0;0
HiAlarm Mantissa=900;900;900;900;900;900;900;900;900;900
LoAlarm Mantissa=100;100;100;100;100;100;100;100;100;100
HiAlarm Exponent=5;5;5;5;5;5;5;5;5;5
LoAlarm Exponent=5;5;5;5;5;5;5;5;5;5
Dwell=6;6;6;6;6;6;6;6;6;6
Settle=100;100;100;100;100;100;100;100;100;100
Mass Offset=16;16;16;16;16;16;16;16;16;16
Ratio Channels=0;0;0;0;0;0;0;0;0;0

[VACUUM SCAN]

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Appendix G.

Document Data

Title: RGA for Windows Help Manual
Reference: LP105010
Source: DellIt D:\HelpMans\RGA4Win
Original: Revision 1.00
Current: Revision 2.20 14 June 2000

Original Based On: RGA for Windows Manual, LP101005 Rev 2.40

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Rev 2.20 14 June 2000

LP101005 Rev 2.47 included. LP210007 Rev 1.00 included, LP210004 Rev 1.10 included.

Rev 2.10 22 May 2000

Fatal Error 53 Topic added.

Rev 2.01 19 May 2000

Cracking pattern table and rel. ion. Sens. Re-formatted.

Rev 2.00 22 Feb 2000

Complete re-write into new format.

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