

MASsoft Version 7 *Professional* Manual Addendum

**Hidden Analytical Limited
420 Europa Boulevard
Warrington
WA5 7UN
England**

**Tel: +44 (0)1925 445225
Fax: +44 (0)1925 416518**

**E-mail: info@hidden.co.uk
Web site: <http://www.HiddenAnalytical.com>**



Welcome

The purpose of this manual is to describe additional features in the MASsoft Version 7 *Professional* software not covered by the main manual.

This manual should be read in conjunction with the MASsoft *Professional* User Manual reference HA-085-067.

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In this Manual, a **Warning** is an instruction that draws the operator's attention to the risk of injury or death; a **Caution** is an instruction that draws attention to the risk of damage to the product or process.

Warnings and Cautions are placed immediately before the text to which they refer; they are headed by **WARNING** or **CAUTION** respectively. The associated explanatory text is in **bold**. If several Warnings or Cautions apply at one point in the text, they are numbered with the most important appearing first.

Technical assistance

Technical assistance can be obtained from the Hidden Analytical Limited Service Department which can be contacted on:

Email: service@hidden.co.uk

Tel: +44 (0)1925 445225

Fax: +44 (0)1925 416518

In the U.S.A. and Canada, technical assistance can be obtained from Hidden Analytical Inc.:

Email: service@hiddeninc.com

Tel: 603 924 5008

Fax: 603 924 5009

Toll-free phone: 1-888-96 HIDEN

Option 1 U.S.Sales Office

Option 2 U.S.A. & Canada Corporate Office & Service Department

Option 3 U.K. Manufacturing Facility

Amendment history

Issue: A Date: 20 October 2009.

Issue: B Date: 24 May 2011. M085-474.

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1 Introduction

This manual addendum has been written to accompany the MASsoft Version 7 *Professional* software application. It describes some new features of the software not covered in the main MASsoft *Professional* manual reference HA-085-067 Issue F.

MASsoft 7 *Professional* version 7.11 was released in the first quarter of 2010 and first appeared on the Hidden Software Suite CD version 7.11.

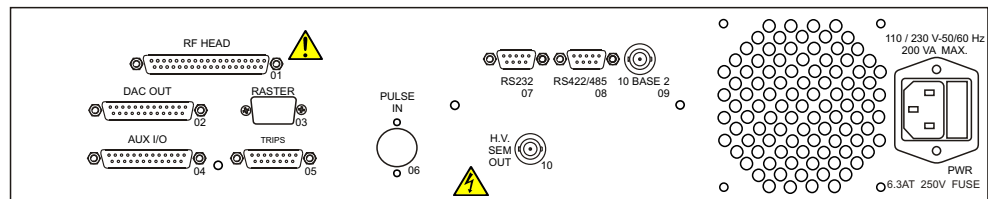
The software version number can be obtained by selecting **About** on the **Help** menu.

1.1 Compatibility

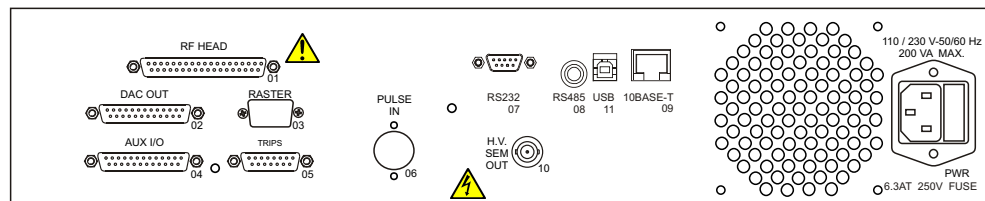
MASsoft Version 7 *Professional* has been designed to operate with the Windows 7, Windows Vista, Windows XP and Windows 2000 operating systems. It has been fully tested on the above four platforms.

It is not designed to operate with earlier versions of Windows and is not supported for use on such systems.

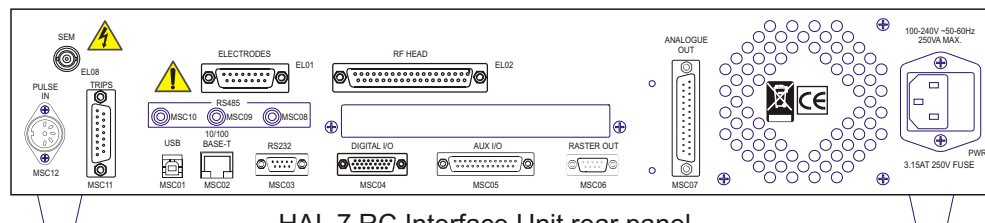
Users who are running earlier versions of the Windows operating system should contact Hidden Analytical Limited for advice.



HAL 4 RC Interface Unit rear panel



HAL 5 RC Interface Unit rear panel



HAL 7 RC Interface Unit rear panel

Figure 1 RC Interface unit rear panels

MASsoft Version 7 *Professional* is designed to operate with the full range of Hiden Analytical mass spectrometers. Two types of mass spectrometer control unit are used; the 2U high RC Interface unit and the 7U high Mass Spectrometer Interface Unit. There are three versions of Hiden microcomputer board fitted to the control units; HAL4, HAL5 and HAL7. MASsoft Version 7 *Professional* operates with all the above hardware but some features may not be available due to the type of control unit and/or microcomputer board. For this reason the user should be aware of which type of control unit is employed in the system.

The control unit type can easily be established from the rear panel connector layout. Please refer to Figures 1 and 2.

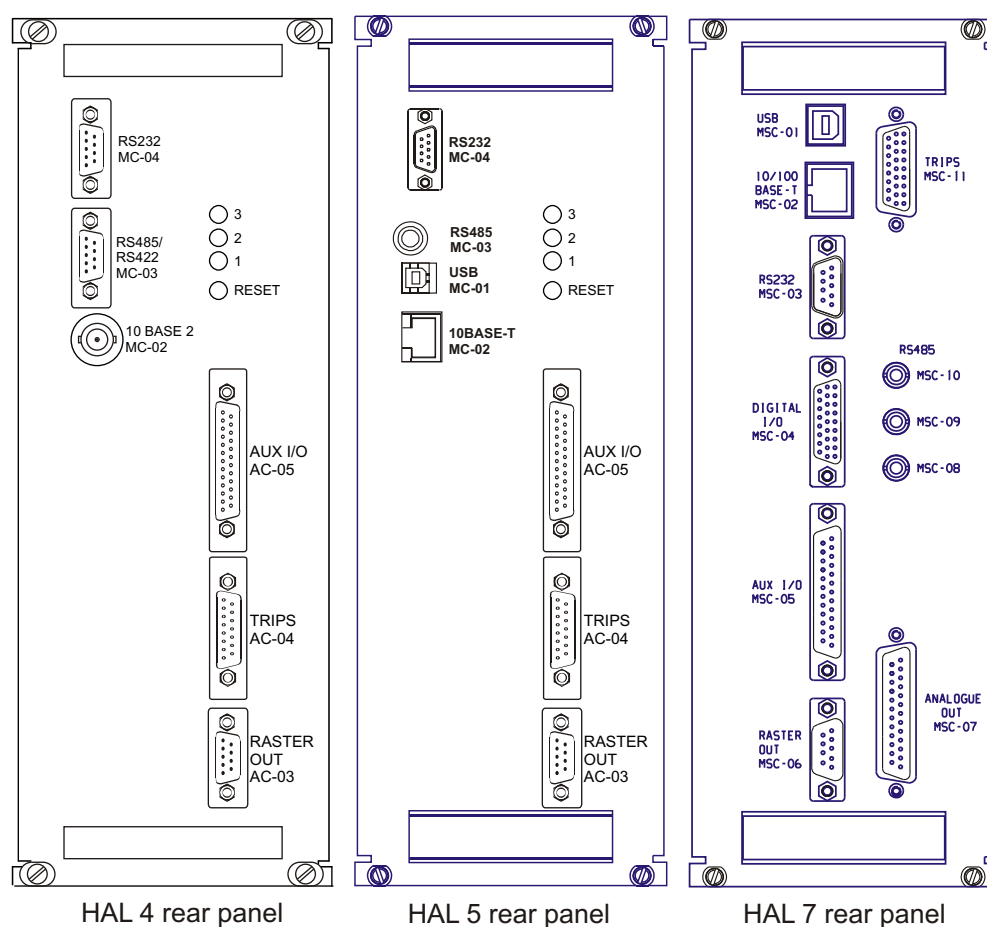


Figure 2 MSIU micro board rear panels

Note

The HAL 8 and HAL 9 units are identical to the HAL 7.

2 Icons

MASsoft Version 7 *Professional* features new toolbar icons in addition to the original icons used in previous releases of the MASsoft application. The new and original icons are described below.



New

Creates a new experiment file containing a basic scan tree.

The New button on the Shortcut tool bar has the same function as clicking **New** on the **File** menu.

This button is grayed out if no mass spectrometer is selected.



Open

Opens and displays an existing experiment file.

The Open button on the Shortcut tool bar has the same function as clicking **Open** on the **File** menu.

This button is grayed out if no mass spectrometer is selected.



Save

Saves the current scan tree information. The Save button on the Shortcut tool bar has the same function as clicking **Save** on the **File** menu.



Paste

Pastes the contents of the clipboard. May be used when editing Scans, Environments, Events and Trips and when using the File Explorer tab.

Performs the same function as selecting **Paste** on the **Edit** menu.



Copy

Copies the selected item(s) to the clipboard. May be used when editing Scans, Environments, Events and Trips and when using the File Explorer tab. The Copy button on the Shortcut tool bar has the same function as clicking **Copy** on the **Edit** menu.



















Cut

Cut the selected item(s) to the clipboard. May be used when editing Scans, Environments, Events and Trips and when using the File Explorer tab. Performs the same function as selecting **Cut** on the **Edit** menu.



Convert File

Converts files created by a different instrument to allow them to run on the current instrument. The Convert file button has the same function as clicking **Convert file** on the **File** menu.

		Unlock	Unlocks a file containing data to allow editing. The Unlock button has the same function as clicking Unlock on the File menu.
		Print	Prints the currently selected view. The Print button on the Shortcut tool bar has the same function as clicking Print on the File menu
		Print Preview	Reviews data in print layout format before it is selected for printing. The Print Preview button on the Shortcut tool bar has the same function as clicking Print Preview on the File menu
		New Co-variant scan	The New co-variant scan button is used to add a new co-variant scan to a scan tree. The New Co-variant scan button performs the same function as clicking Insert new Co-variant on the Edit menu.
		New Multi-variant scan	The New multi-variant scan button is used to add a new multi-variant scan to a scan tree. The New Multi-variant scan button performs the same function as clicking Insert new Multi-variant on the Edit menu.
		New Scan	The New Scan button is used to add a new scan to a scan tree. The New Scan button performs the same function as clicking Insert new Sequence on the Edit menu
		Attach local environment	<p>The Attach local environment button is used to attach a local environment to a scan to allow the global environment values to be over-ridden for that scan, and enable it to be tuned individually. For example, where maximum sensitivity is required in several different mass MID scans, the ion transport environment may be optimised locally for each mass.</p> <p>This button performs the same function as clicking Set local environment on the Edit menu.</p>
		Delete	<p>The Delete button may be used to delete scans or local environments.</p> <p>To delete an environment or a scan, first select the object by clicking on it, and then click the Delete button.</p> <p>The Delete button performs the same function as clicking Delete on the Edit menu.</p>

**Attach view**

The **Attach view** button attaches a graphical view to a scan. An appropriate view for the type of scan is automatically created, a trend display if the scan has a single mass, or a graph if a variable scans over a range. More than one view may be attached to a scan, allowing the data to be displayed in several different ways.

The Attach view button performs the same function as clicking **New Graph View** on the **Views** menu.

**New MID Tabular View**

Adds a new MID tabular view.

Performs the same function as selecting **New MID Tabular View** on the **Views** menu.

**Shutdown**

The Shutdown button stops data acquisition (if running), and puts the system into the Shutdown state by loading the values in the **Shutdown environment** box into the mass spectrometer. These would normally be set to remove any high voltages from the system e.g. the detector High Tension (HT) and 1st-dynode supplies and turn the ion source filaments either off or to a low value, but leave the system ready for operation at short notice.

A **V** in the icon indicates when the system is in the shutdown state.

The Shutdown button performs the same function as clicking **Shutdown** on the **System** menu.

**Power Up**

The PowerUp button puts the mass spectrometer into a powered-up ('ready') state using the instrument mode information and variable values specified in the **Global** environment box at the top of the scan tree. If this is labelled **Global : RGA**, for example, the system is set to RGA mode.

A **V** in the icon indicates when the system is in the powered-up state.

This button does not start data acquisition.

The Power Up button performs the same function as clicking **Active** on the **System** menu.

**Start**

The Start button (green) starts data acquisition; the mass spectrometer will be powered-up if it is in the shutdown state. If any changes have been made to the scan tree since the last acquisition or scan set-up operation, the new values are downloaded to the mass spectrometer before acquisition starts.

**Stop scan**

The Stop button (amber) stops the scan at the end of the current cycle. When the end of the cycle is reached, this button is automatically deselected and the Abort button (red), is automatically selected.

**Abort scan**

The Abort button (red) stops the scan as quickly as possible without waiting for the end of the cycle. If the **Shutdown after scanning** check-box in the **Stop** box **Scan structure cycles** dialog box is selected, selecting this button is equivalent to using the Shutdown button.

**Degas**

The Degas button allows either filament to be switched on at a high electron energy for a certain time period; this heats the filaments and ion source cage which cleans them through forced degassing. Scanning cannot be performed whilst degassing.

2.1 Icon selection

The type of toolbar icons can be selected in the **Tool bar size** frame of the **Menu** tab in the **Preferences** dialog box selected on the **Views** menu. See Figure 3.

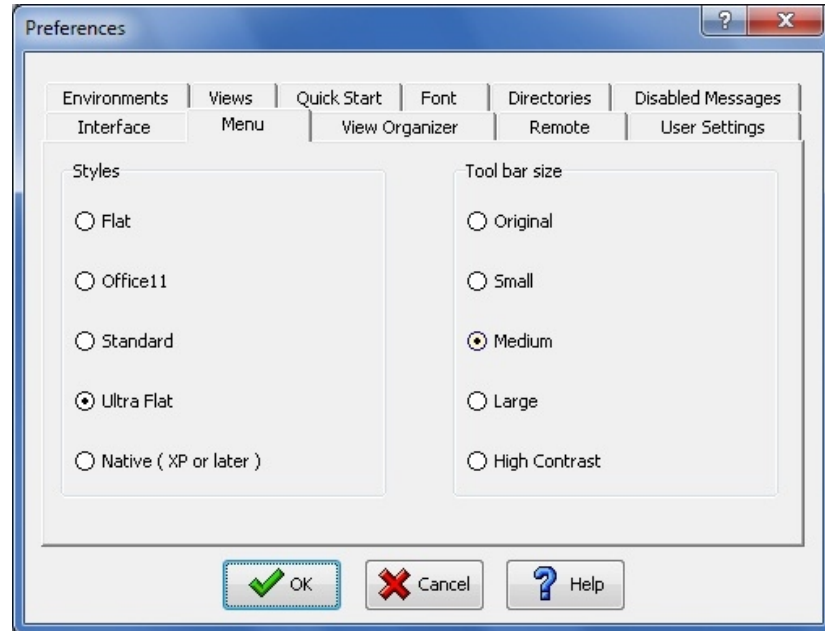


Figure 3 Preferences dialog box Menu tab

The different icons are selected by clicking on the relevant radio button. The change is implemented immediately so the user can see the effect straight away.

3 Preferences dialog box

The **Preferences** dialog box is opened by selecting **Preferences** on the **Edit** menu.
In MASsoft Version 7 two tabs have been added; **Directories** and **Disabled Messages**.
In later versions the **Export** tab has also been added.

3.1 Directories tab

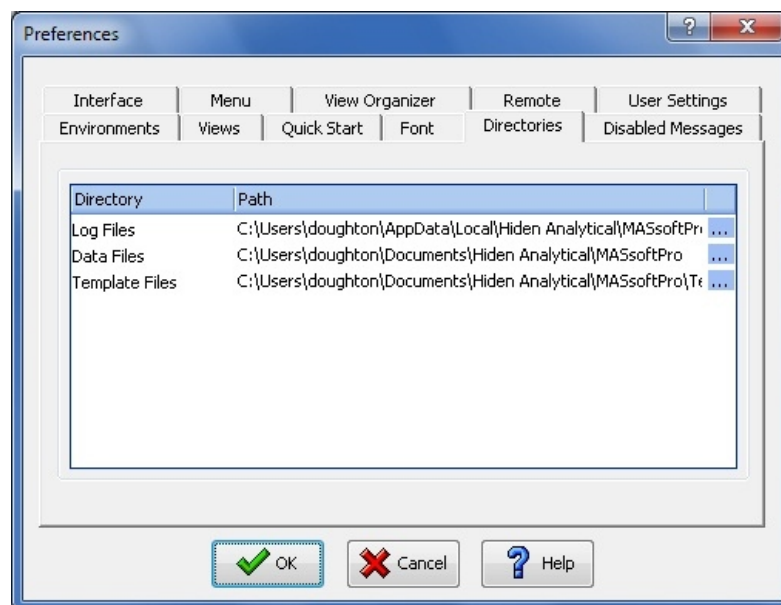


Figure 4 Preferences Directories tab

The Directories tab allows the location of log files, data files and template files to be specified.

Click on the  button to change the location.

3.2 Disabled Messages tab

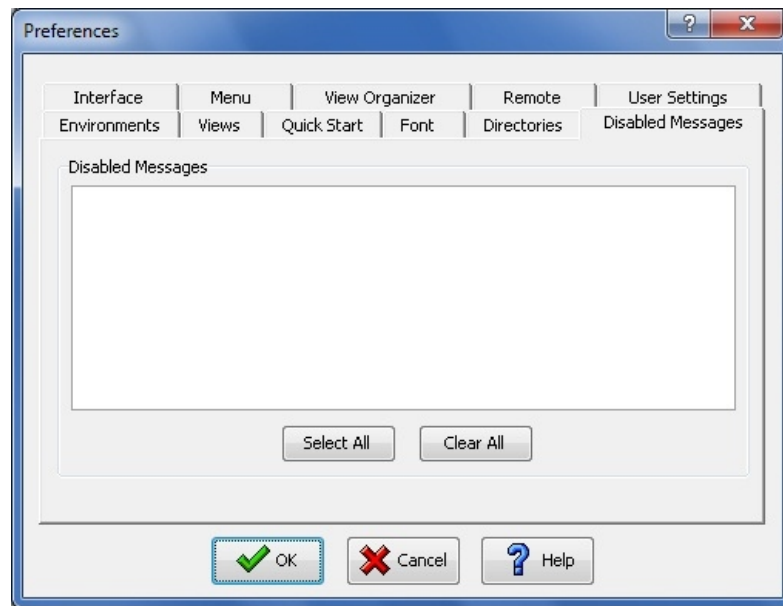


Figure 5 Preferences Disable Messages tab

The **Disabled Messages** tab allows the user to choose whether certain messages are displayed.

Some error message boxes have a "**Don't show this message again**" option. If this is selected the message box is added to the list displayed in this tab.

Note

The intention is to utilise the Disabled Messages tab further in future releases of MASsoft.

3.3 View Organiser tab

In MASsoft Version 7 the **View Organiser** tab has an additional **Active Tab Select** frame containing the two radio button described below.

Bring the file's tab to the top upon opening or creating files

If selected when a file is opened or a new file created a new tab is created with just that file's window. This new tab is made the current "top" tab.

The default setting is to have this option selected.

Bring the 'ALL' tab to the top upon opening or creating files

If selected when a file is opened or created the "ALL" tab is made the current "top" tab.

The default setting is to have this option deselected.

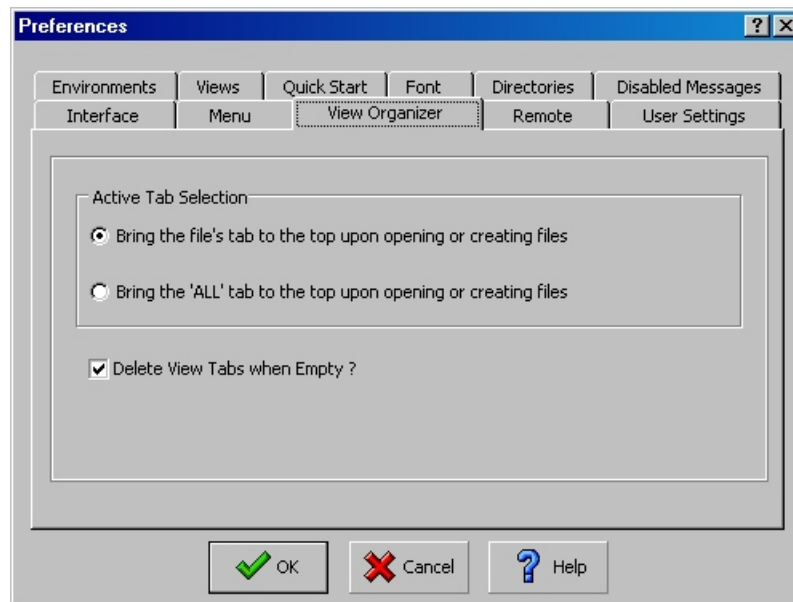


Figure 6 Preferences View Organiser tab

When files are created automatically as they are in End Point Detector systems they are shown in a new tab which will obscure the Event Log window which persists from run to run and is not present in the new tab. In such systems it is usual to have only one file open at a time, so having the ALL tab on top enables both the file window and the event log window to be seen.

3.4 User settings tab

Save scan to Flash Interval has been added to the **User Settings** tab in the **Preferences** dialog box opened by selecting **Preferences** on the **Edit** menu.

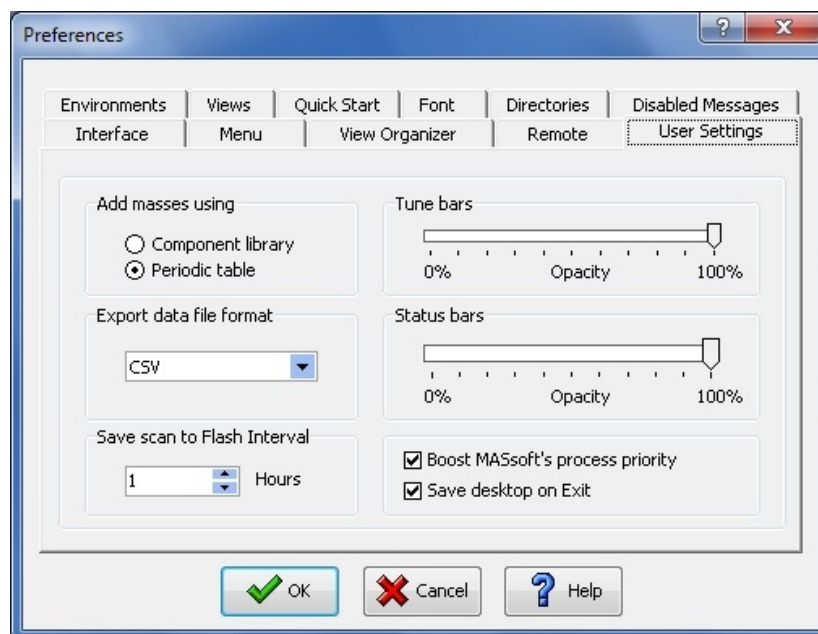


Figure 7 Preferences, User Settings dialog

Save scan to Flash Interval Sets the interval period for the saving of state variables, on the control unit, into flash memory. This is only available on HAL 7 control units.

The control unit retains the following settings when switched off:

- Scan and event sequences
- Instrument environment settings
- Parameters
- Multiplier usage count

HAL 4 and HAL 5 units automatically store these settings in battery backed memory.

With HAL 7 units they must be written to flash memory periodically, or after important changes have been made.

In later versions of MASsoft 7 where there is an **Export** tab on the **Preferences** dialog box the **Export data file format** frame will not appear on the **User Settings** tab.

3.5 Remote tab

This section supercedes Section 3.9.4 Remote tab in the MASsoft Manual reference HA-085-067 Issue G.

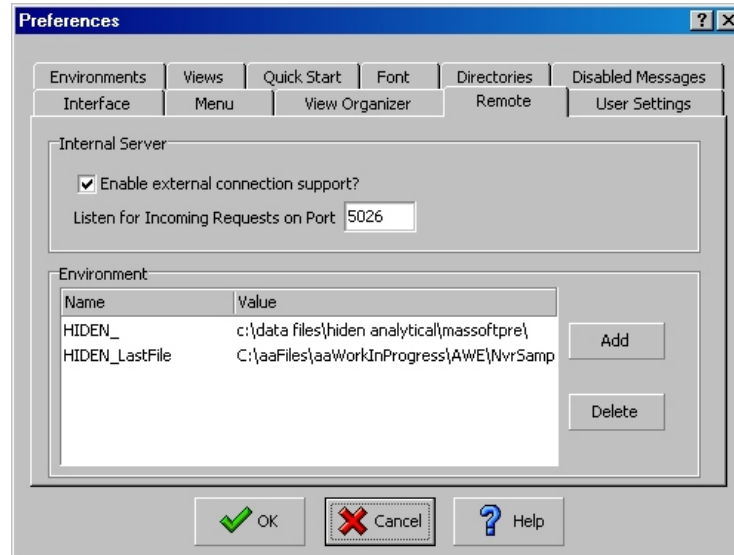


Figure 8 Preferences, Remote tab

Internal Server	This frame contains settings to allow external software applications to connect to MASsoft.
Enable external connection support?	If this is checked MASsoft will allow external software applications (clients) to connect to it on the specified port. Once a connection has been established, MASsoft will then be able to accept and operate on commands received from the connected client(s).
Listen for Incoming Requests on Port	<p>The port number that MASsoft will monitor for clients attempting to connect to MASsoft. This can be any valid port number but the user will need to ensure that no other software application is currently, or will be, using this port number.</p> <p>Changing the Port number whilst the Internal Server is already activated will result in the Internal Server being turned off; reassigned the new port number and then turned back on again. Any clients connected to the old port number will be disconnected and will have to reconnect via the new port number.</p>

Note

If clients are connected and the Internal Server is turned off the clients will be disconnected. MASsoft will display a warning message and the user may proceed or cancel.

The **Environment** variables are available in MASsoft Versions 6.15 onwards.

- Add button** Inserts a new Environment variable. It will be necessary to specify the name and value of the new environment variable. This variable can then be used by external applications when specifying filenames or on the command line when starting MASsoft Professional.
- Delete button** Deletes the selected environment variable.

Note

The environment variable `HIDEN_LastFile` is created by MASsoft Professional automatically each time a file is saved, opened or run.

3.6 Environments tab

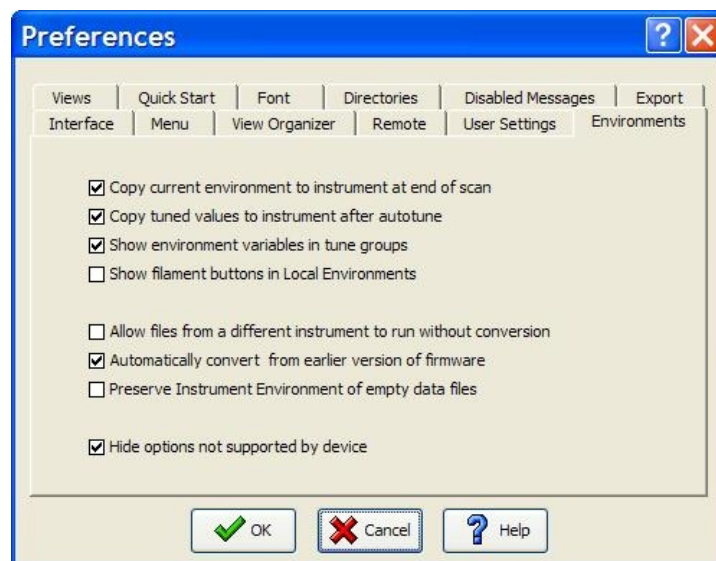


Figure 9 Preferences, Environments tab

The **Hide options not supported by device option** has been added to the Environments tab.

If a device does not support zeroing, calibration, auto-ranging and several other features then MASsoft will hide or disable these features in the **Scan Editor**, **Environment Editor** and **Input Device** selection dialog boxes.

Support for this feature was introduced in Interface Unit Firmware version 7.03. If your Interface Unit does not support this feature then all features will be displayed, even if the device does not support them.

If, due to a configuration error by Hiden, your firmware incorrectly hides a feature of a device then this option may be de-selected to reveal all features, both supported and unsupported.

3.7 Export tab

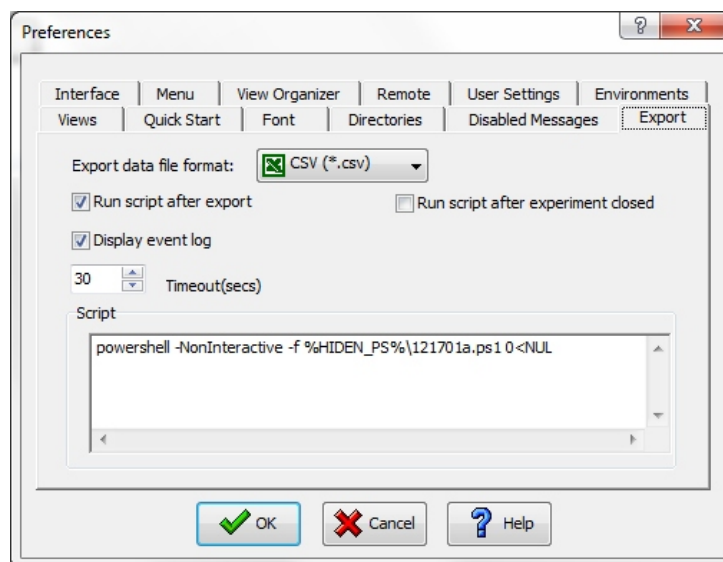


Figure 10 Preferences, Export tab

Note

*In versions of MASsoft 7 that do not have an **Export** tab **Export data file format** appears on the **User Settings** tab.*

The **Export** tab allows a Massoft experiment to be exported in a format that can be imported into another application. To enable exporting the **Export after scanning** option must be selected in the **Scan Structure Cycles** dialog box. Refer to the Repeating scans section of the main MASsoft manual for further information on the **Scan Structure Cycles** dialog box.

The **Export** tab is one of a number of tabs contained within the **Preferences** dialog box.

The **Export** tab allows the user to select the required export format and to perform a series of DOS commands after the exporting has been completed.

Export data file format

This control lists all the available formats.

Run script after export	Select this control to run the script after the experiment has been converted to the select format.
Run script after experiment closed	Select this control to run the script after the experiment has been closed.
Display event log	Brings the event log to the front.
Timeout (secs)	The script timeout value.
Script	This control lists a series of DOS commands to be run after the exporting has been completed.

Example

The following script will run a Massoft experiment and on completion will generate an ASC formatted file. This file will then be renamed and copied into the c:\temp directory. Finally the contents of the directory will be listed in the Event log.

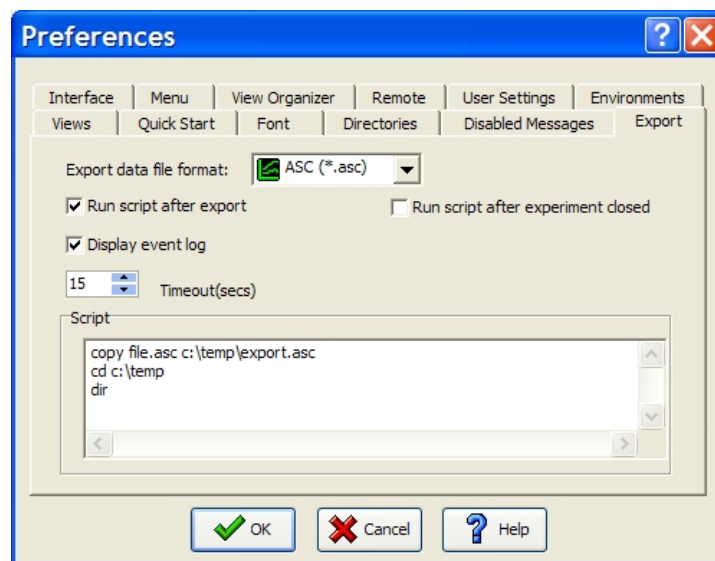
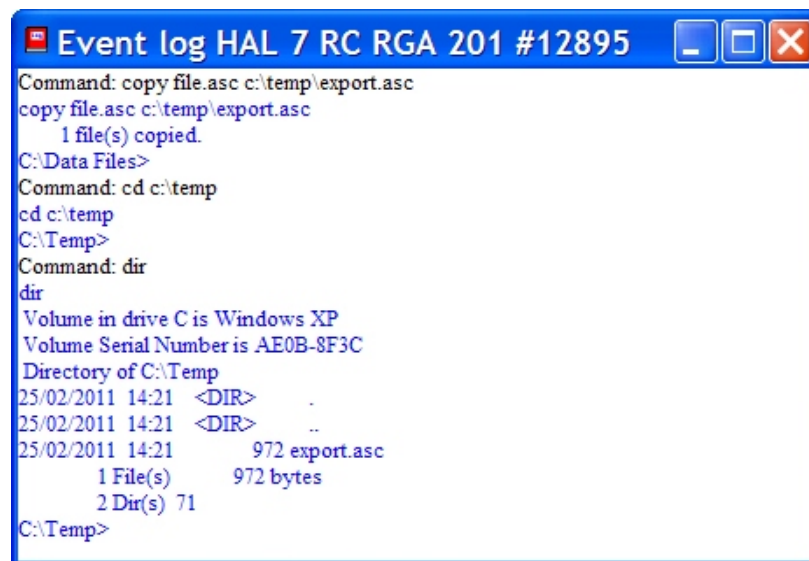


Figure 11 Export tab example



```
Event log HAL 7 RC RGA 201 #12895
Command: copy file.asc c:\temp\export.asc
copy file.asc c:\temp\export.asc
1 file(s) copied.
C:\Data Files>
Command: cd c:\temp
cd c:\temp
C:\Temp>
Command: dir
dir
Volume in drive C is Windows XP
Volume Serial Number is AE0B-8F3C
Directory of C:\Temp
25/02/2011 14:21 <DIR> .
25/02/2011 14:21 <DIR> ..
25/02/2011 14:21          972 export.asc
1 File(s)          972 bytes
2 Dir(s)  71
C:\Temp>
```

Figure 12 Export example Event log

4 Creating a MID scan

In MASsoft *Professional* version 6.15 and above the **Trend View Setup** up dialog box has changed.

To create an MID scan follow steps 1. to 23. described in section 2.5.1 **Creating a MID scan** of the MASsoft *Professional* manual reference HA-085-067 Issue F then follow the steps 24. to 28. below.

24. Click **Trend view setup...** on the **Views** menu.

The **Trend View Setup** dialog box is displayed as shown in Figure 13.

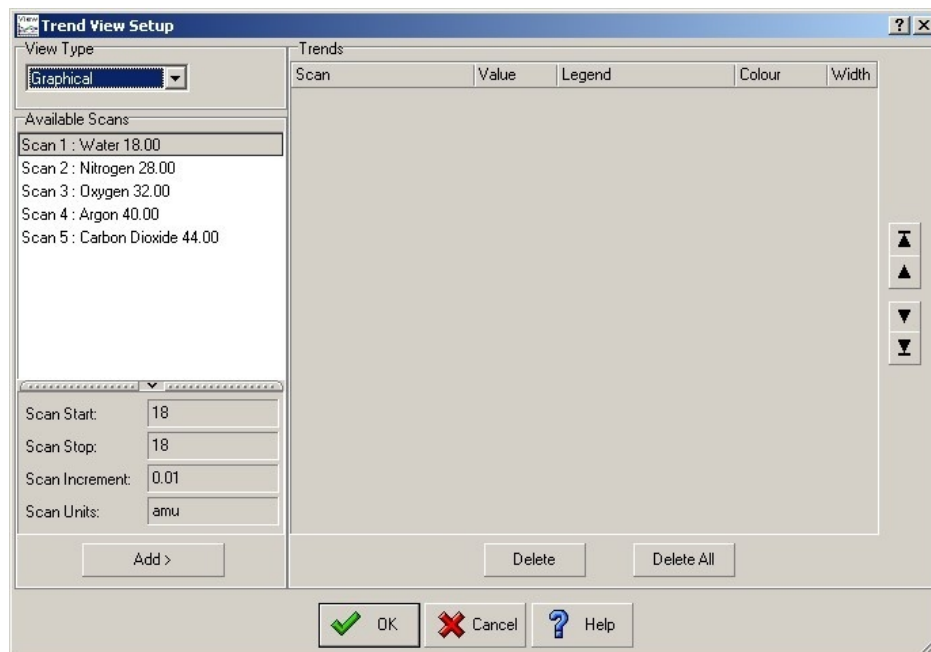


Figure 13 Trend View Setup dialog box

Note

*Any scans selected in the scan tree will automatically be added to the **Trends** list.*

25. Select **Tabular** in the **View Type** drop-down list box.

See Figure 14.

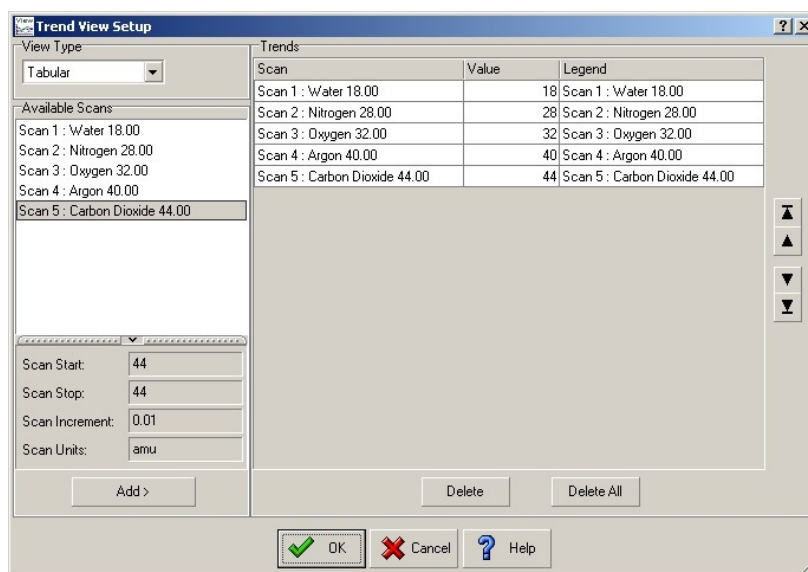


Figure 14 Completed Trend view setup dialog

26. Click **Scan 1** in the Available Scans list then click the **Add** button. The Scan is added to the **Trends** list.

Note

*New trends can also be created by double clicking on a scan in the **Available Scans** list or by dragging and dropping a scan into the **Trends** list.*

27. Repeat step 26 for the other four scans.

28. Click the **OK** button.

The **Trend View Setup** dialog box will be closed and a Tabular view will be displayed. See Figure 2.27 in the MASsoft *Professional* manual reference HA-085-067.

5 Views functions

In MASsoft *Professional* version 6.15 the **Trend View Setup** dialog box has been re-designed.

5.1 Trend View Setup dialog box

This section replaces section 7.3.1 **Trend view setup dialog box** in the MASsoft *Professional* manual reference HA-085-067 Issue F.

The **Trend View Setup** dialog box (see Figure 15) is used when creating new MID trend graphical and tabular views; it is opened by clicking the **Trend view setup...** item in the **Views** menu. It can be used to view data from **MID**, **BAR** and **PROFILE** scans.

If an existing MID view is selected before opening the **Trend View Setup** dialog box it can be used to change the view.

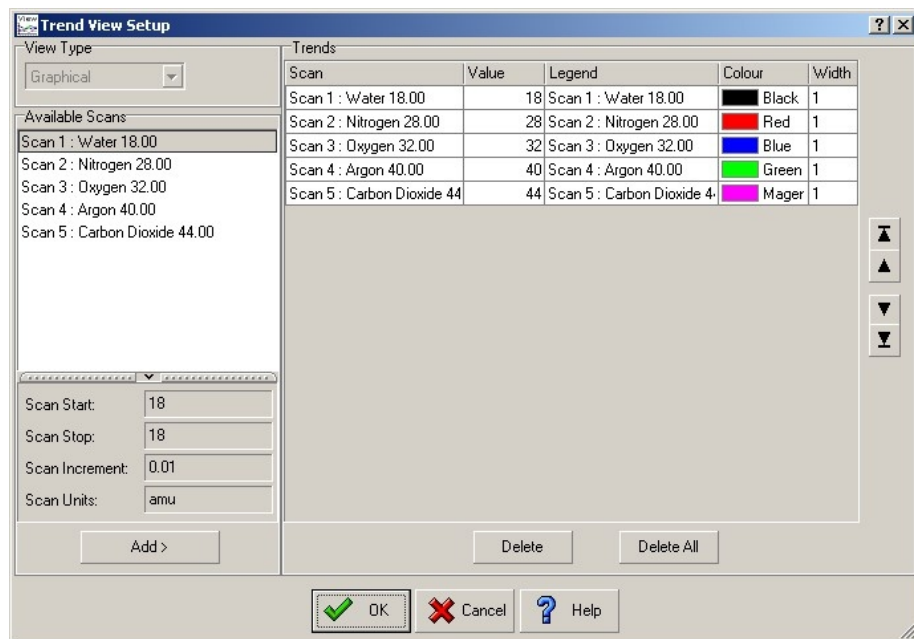


Figure 15 Trend View Setup dialog box

View Type list box Selects the type of trend view that is produced when the **OK** button is clicked. The options are:

Graphical Produces a graphical trend view; this is the default **View Type** option.

Tabular	Produces a table of the trend view data.
One of each	Produces a graphical trend view and a table of the trend view data.

Note

This option is disabled if an existing MID view was selected before opening the Trend View Setup dialog.

Available Scans	This box lists the scans that are available in the scan tree. Each scan can be selected by clicking on it.
Scan Start	Shows the existing Start value for the selected scan.
Scan Stop	Shows the existing Stop value for the selected scan.
Scan Increment	Shows the existing Increment value for the selected scan.
Scan Units	Shows the units for the selected scan.

Note

*It is possible to show/hide the panel containing the scan parameters, **Start Scan**, **Stop Scan**, **Scan Increment** and **Scan Units** by clicking on the splitter bar with the arrow on it.*

Trends	This box contains the list of trends derived from the Available Scans list. Trends are added to the bottom of the list by clicking the Add button, double clicking a scan or by dragging a scan from the Available Scans list and dropping it into the Trends list. A selected trend is removed from the list by clicking the Delete button. All trends can be removed by clicking the Delete All button.
Scan	Shows the scan from which the trend is taken.
Value	Shows the device value from which the trend is taken.
Legend	Shows the legend assigned to the trend.
Colour	Shows the line colour used to display the trend. When a new trend is added to the list the next available colour/width combination will be selected automatically.
Width	Shows the line thickness used to display the trend. When a new trend is added to the list the next available colour/width combination will be selected automatically. The higher the number, the thicker the line. The line width defaults to 1.

Note

The Colour and Width columns are not displayed when the View Type is set to Tabular.

5.2 Creating a graphical MID trend view

This section replaces section **7.4.2 Creating a graphical MID trend view** in the MASsoft *Professional* manual reference HA-085-067 Issue F.

A trend view displays trends against time derived from **BAR** and **PROFILE** data, i.e. it effectively gives a **MID** display.

To create a new graphical trend view:

1. Select the mass spectrometer control window.
2. Click **Trend view setup...** item on the **Views** menu.

The **Trend View Setup** dialog box is opened, see Figure 15. When first opened, the **Trends** box in the **Trend View Setup** dialog box will contain entries for all scans selected in the scan tree. If no scans are selected then the list of trends is empty.
3. Select the **Graphical** option in the **View type** list box.

If a tabular view is also required, select the **One of each** option in the **View type** list box.
4. Select one of the scans in the **Available Scans** list by clicking on it.
5. Click the **Add** button.

The trend is added to the **Trends** box. Alternatively, double-click the scan or drag and drop the scan from the **Available Scans** to the **Trends** list.
6. For a non-**MID** scan, enter a value in the **Value** column for the new trend.

This must be between the scan's start and stop values.
7. If required, enter a **Legend**.

A legend is automatically assigned to a new trend.
8. If required, select a **Line colour**.

A colour is automatically assigned to a new trend.
9. If required, select a **Line Width**.

10. Steps 4. to 9. can be repeated for other values and other scans in the **Available scans** list, as required.
11. Click the **OK** button. The view(s) are created.

5.3 Editing a MID trend view

This section replaces section **7.4.3 Editing a MID trend view** in the MASsoft *Professional* manual reference HA-085-067 Issue F.

The **Trend View Setup** dialog box (Figure 7.20) allows trends to be added to, or removed from, an existing graphical view and the line colour and width to be edited. This dialog box is similar to that used when creating MID trend and tabular views, see Section 5.1.

To add trends to a graphical view:

1. Select the view.
2. Click **Trend view setup...** on the **Views** menu.
3. Select the required scan in the **Available Scans** list by clicking on it.
4. Click the **Add** button.
5. For a non-MID scan, enter a value in the **value** column for the new trend.
6. If required, enter a **Legend**.
7. If required, select a **Line colour**.

The **Trend View Setup** dialog box is opened. This dialog box is identical to that opened when creating a new trend view (see Figure 15), except that the **View type** list box is disabled.

The trend is added to the **Trends** box. Alternatively, double-click the scan or drag and drop the scan from the **Available Scans** to the **Trends** list.

This must be between the scan's start and stop values.

A legend is automatically assigned to a new trend.

A colour is automatically assigned to a new trend.

- | | |
|--|--|
| 8. If required, select a Line Width . | Steps 4. to 9. can be repeated for other values and other scans in the Available Scans list, as required. |
| 9. Click the OK button. | The trends are added to the view. |

To remove trends from a graphical view:

- | | |
|--|--|
| 1. Select the view. | |
| 2. Click Trend view setup... item on the Views menu. | The Trend View Setup dialog box is opened. This dialog box is identical to that opened when creating a new trend view (see Figure 15), except that the View type list box is disabled. |
| 3. Select the trend to be removed in the Trends box by clicking on it. | |
| 4. Click the Delete button. The selected trend is removed from the Trends box. | |
| 5. Steps 3. and 4. can be repeated for other scans in the Trends box, as required. | |
| 6. Click the OK button. The trends are removed from the view. | |

5.4 Editing a tabular view

This section replaces "To remove trends from a tabular view" in section **7.6.4 Editing a tabular view** in the MASsoft *Professional* manual reference HA-085-067 Issue F.

To remove trends from a tabular view:

- | | |
|---|--|
| 1. Select the view. | |
| 2. Click View trend setup... item on the Views menu. | The Trend View Setup dialog box is opened, see Figure 15. |
| 3. Select the trend to be removed in the Trends box by clicking on it. | |

4. Click the **Delete** button. The selected trend is removed from the **Trends** box.
5. Steps 3. and 4. can be repeated for other scans in the **Trends** box, as required.
6. Click the **OK** button. The trends are removed from the view.

6 Scan structure cycles

The **Scan structure cycles** dialog box is opened by double clicking the Stop box in a Scan Tree.

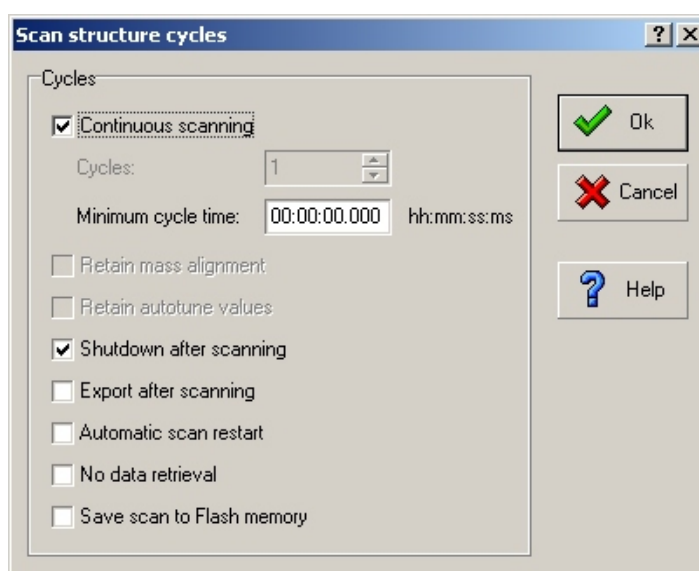


Figure 16 Scan structure cycles dialog

Save scan to Flash memory This option causes MASsoft to instruct the control unit to save its state information into flash memory when the experiment file has stopped running. This option is greyed out if the control unit does not support it. The default setting is OFF.

7 Raster dialog box

The MASsoft Version 7 *Professional* Raster dialog box is shown in Figure 17. The dialog



box is displayed as a result of clicking the Raster button in the **Environment Editor** dialog box for instruments fitted with the Rastering option.

Rastering is described in the Rastering section of the MASsoft *Professional* User Manual reference HA-085-067.

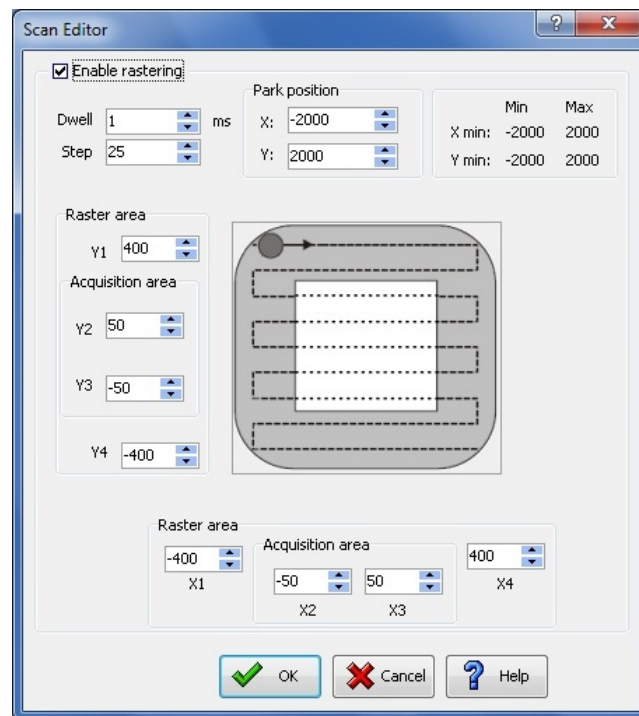


Figure 17 Raster dialog box

In MASsoft Version 7 *Professional* Rastering always begins at the top left corner.

8 Settle and dwell times

Tables 1 to 3 show the settle and dwell times used with control units fitted with the HAL 7 micro board.

In the tables the double line indicates the change from the low gain amplifier to the high gain amplifier.

The switching times between the Faraday and Electron Multiplier detectors are reduced for the HAL 7 micro board.

Low gain SEM to high gain Faraday 9.4s

High gain SEM to high gain Faraday 6.4s

These times were 16.4s and 13.4s for previous versions of micro board.

Mode	MID & BAR		Profile		
Range (Torr)	Settle (ms)	Dwell (ms)	Settle (ms)	Step (ms)	Dwell (ms)
10^{-5}	5	25	5	4	10
10^{-6}	5	16	5	4	10
10^{-7}	150	10	150	40	10
10^{-8}	250	160	250	80	40
10^{-9}	300	640	300	40	160
10^{-10}	400	2750	400	10	640

Table 1 Faraday detector settle and dwell times

Mode	MID & BAR		Profile		
Range (Torr)	Settle (ms)	Dwell (ms)	Settle (ms)	Step (ms)	Dwell (ms)
10^{-7}	5	10	5	4	10
10^{-8}	5	25	5	4	10
10^{-9}	5	16	5	4	10
10^{-10}	150	160	150	10	40
10^{-11}	250	1600	250	10	400
10^{-12}	300	1600	300	10	400
10^{-13}	400	2750	400	10	800

Table 2 SCEM detector settle and dwell times

Mode	MID & BAR		Profile		
Range (Torr)	Settle (ms)	Dwell (ms)	Settle (ms)	Step (ms)	Dwell (ms)
10^{-7}	5	25	5	4	10
10^{-8}	5	16	5	4	10
10^{-9}	150	16	150	40	10
10^{-10}	250	160	250	10	40
10^{-11}	300	1600	300	10	400
10^{-12}	400	2750	400	10	800

Table 3 Channel plate detector settle and dwell times

9 Input selection dialog box

The **Input Selection** dialog box, shown in Figures 20 and 21 can be opened from the scan tree or graphical view.

To open the **Input Selection** dialog box from the scan tree double click on the Input device box. In Figure 18 this is the box labelled **Faraday**.

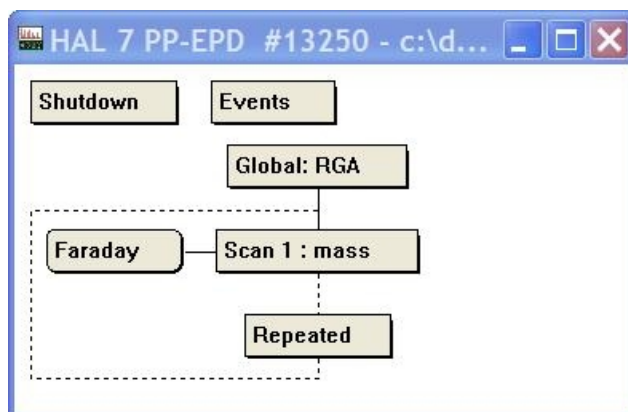


Figure 18 Input selection, scan tree

To open the **Input Selection** dialog box from a graphical view double click on the Y-axis title. In Figure 19 the Y-axis title is the box labelled **Faraday : torr**.

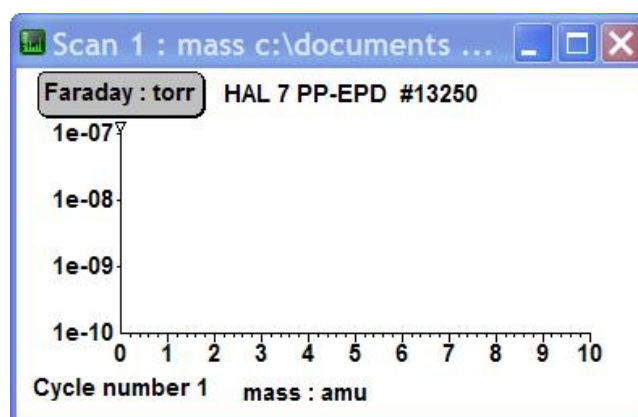


Figure 19 Input selection, graphical view

The **Input Selection** dialog box can only be opened from the graphical view if the view is not a MID view. The Y-axis title will be displayed as a rounded rectangle if the **Input Selection** dialog box can be opened.

9.1 The Available Inputs

The **Input Selection** dialog box supports range-switched input devices and allows the user to specify upper and lower auto-range limits to prevent auto-ranging to slower, high-gain ranges when very small peaks are not of interest, or to low-gain ranges which would suppress very small peaks.

The high dynamic range option allows data to be collected over a larger dynamic range by combining data from scans on two or three ranges as if they were a single scan. This allows measurements to cover a range of two, four, six or even eight decades.

The data values in the **Acquisition Range** and **High Dynamic range** tabs are independent, modifying the **Start** value in one tab will not modify the value in the other tab. The value from the selected tab will be used when the dialog box is closed.

Available Inputs This control contains a list of the input devices available on the instrument. The input device may be selected by clicking on the required name or by typing the name in the control. The devices available on pulse-counting and analogue analysers are shown in Table 4.

Input Device	Pulse counting analyser	Analogue analyser	Units
SEM	Yes	Yes (option)	c/s (Pulse counting) Torr (Analogue)
raw-counts	Yes		Counts
Faraday	Yes (option)	Yes	Torr (Analogue) c/s (Pulse counting)
Total	No	Yes	Torr
auxiliary 1	Yes	Yes	Volts*
auxiliary 2	Yes	Yes	Volts*
f(x)	Yes	Yes	
f(<unit>)	Yes	Yes	<unit>
none	Yes	Yes	
vacuum	Yes (option)	Yes (option)	Torr

Table 4 Available devices

SEM	<p>Secondary electron multiplier; the gain of the SEM is controlled by the multiplier voltage setting in the scan's environment and the 1st dynode voltage, if fitted.</p> <p>This detector is standard on pulse-counting instruments and optional on analogue instruments.</p>
raw-counts	<p>This is an alternative to the SEM on pulse-counting instruments; it reports the intensity as counts instead of counts/second.</p>
Faraday	<p>Faraday cup detector.</p> <p>This detector is standard on analogue instruments and optional on pulse counting instruments.</p>
Total	<p>The total pressure input device configures the analyser to pass ions of all masses, thus giving an approximation of the total pressure in the system. The ions are collected by the Faraday detector. The mass selected is irrelevant when this input device is used.</p> <p>This detector is standard on analogue instruments.</p>
auxiliary1 auxiliary2	<p>These are analogue inputs which can be read as a scan's input; each input has user-selectable ± 10 V and ± 1 V ranges.</p> <p>The ranges are to the power of 10, i.e., range 0 represents a x1 gain (10×10^0 full scale, ± 10 V) and range -1 represents a x10 gain (10×10^{-1} full scale, ± 1 V).</p> <p>These detectors are standard on all instruments.</p> <p>Note</p> <p><i>The names and ranges of auxiliary1 and auxiliary2 may be configured in the Status tab.</i></p>
f(x)	<p>This input device allows an input value to be calculated as a function of data previously acquired, or of another data value.</p> <p>Please contact Hiden Analytical Limited if further information is required.</p> <p>This detector is standard on all instruments.</p>
f(<unit>)	<p>The f(v), f(Torr), f(%), f(mbar), f(ppm), f(c/s) and f(Pa) devices are identical to the f(x) device except for the units used by the device.</p>
vacuum	<p>Reports the total pressure as read by the TIC (Edwards Turbo Interface Controller).</p>

9.1.1 The Acquisition Range Tab

The units displayed in the **Acquisition Range** depend on the input selected.

Figure 20 Acquisition range tab

Start x10E

This control contains the range used at the start of a scan. The value entered is a power of ten. If **-7** is selected, the range is set to 10^{-7} .

For instruments with a pulse counting detector this value specifies the maximum number of counts. It should normally be left set to **7**, (10^7 counts). If it is set to a lower value the instrument will measure how long it takes to acquire the specified count and calculate the c/s from the time. The time will not exceed the dwell time.

Auto Range

When selected, this allows the analyser to automatically change the range and follow changes in the input signal.

Highest x10E	<p>This control contains the highest range to which the input device may auto-range. The value entered is a power of ten. This value should be set to the expected maximum intensity.</p> <p>This control is not applicable to pulse-counting instruments.</p> <p>The Highest x10E value should be set to the expected maximum intensity, i.e. the pressure in the vacuum system as indicated by the vacuum gauge.</p>
Lowest x10E	<p>This control contains the lowest range to which the input device may auto-range. The value entered is a power of ten.</p> <p>This control is not applicable to pulse-counting instruments.</p>
Dwell Time	<p>Defines the time used to acquire a single point in the scan. A value may be typed directly into the text box.</p> <p>If the mS radio button is selected, the value in the text box will be specified as milliseconds. Note that if the instrument changes range the dwell time will be used on the new range and this may affect the signal to noise ratio.</p> <p>If the % radio button is selected, the value will be interpreted as a percentage of the default dwell time for that range. The default dwell time for a given system and range is contained within look-up tables in the Interface Unit; it is selected to give a good signal-to-noise ratio for the selected range.</p> <p>Dwell times are given in the tables in Section 8 of this manual.</p>
Settle Time	<p>Defines the time to allow the instrument to settle before the scan is started. A value may be typed directly into the text box.</p> <p>If the mS radio button is selected, the value in the text box will be specified as milliseconds.</p> <p>If the % radio button is selected, the value will be interpreted as a percentage of the default settle time for that range. The default settle time for a given system and range is contained within look-up tables in the Interface Unit; it is selected to allow adequate settling on the selected range.</p> <p>When the scan has started, a “point time” is applied between each measurement; this time cannot be defined by the user. There are also other delays which contribute to the overall scan time.</p> <p>Settle times are given in the tables in Section 8 of this manual.</p>

For the SEM input on pulse-counting instruments, the **Auto zero** and **Auto range**, (and hence **Highest x10E** and **Lowest x10E**), entries are not applicable. Acquisition range, **Start** sets the maximum expected count rate which affects the **Settle time** and **Dwell time** when they use the percentage mode.

9.1.2 High Dynamic range tab

The units displayed in the **High Dynamic range** depend on the input selected.

Start x10E	The range maximum at the start of the scan. The value entered is a power of ten. If -7 is entered, the range is set to 10^{-7} .
Decades	The number of decades to be displayed. The possible options are 2, 4, 6 and 8. However, not all the options may be available, they are dependent on the input device and start value.
Dwell Time	The time used to acquire a single point in the scan as a percentage of the default dwell time for the range. Normal is 100%, while Low Noise is 400%.



Figure 21 High Dynamic range tab

9.1.3 Common controls

Some controls are common to both the **Acquisition Range** tab and **High Dynamic range** tab.

- | | |
|-------------------------|---|
| Auto Zero | When selected, this forces the analyser to perform an automatic zeroing function at the start of each scan. This corrects any errors due to amplifier offsets and leakage currents. |
| Defer Auto Range | <p>When selected, the scan is completed before any data is displayed. If out of range values are detected, the scan will be restarted with different range settings.</p> <p>When not selected data are displayed immediately. If out of range values are detected the range is changed before the next cycle.</p> |

9.2 Control Visibility

If a device does not support a particular capability the associated control will be hidden.

This can be overridden by deselecting the **Hide options not supported by device** option in the **Environments** tab of the **Preferences** dialog box. This option is selected by default.

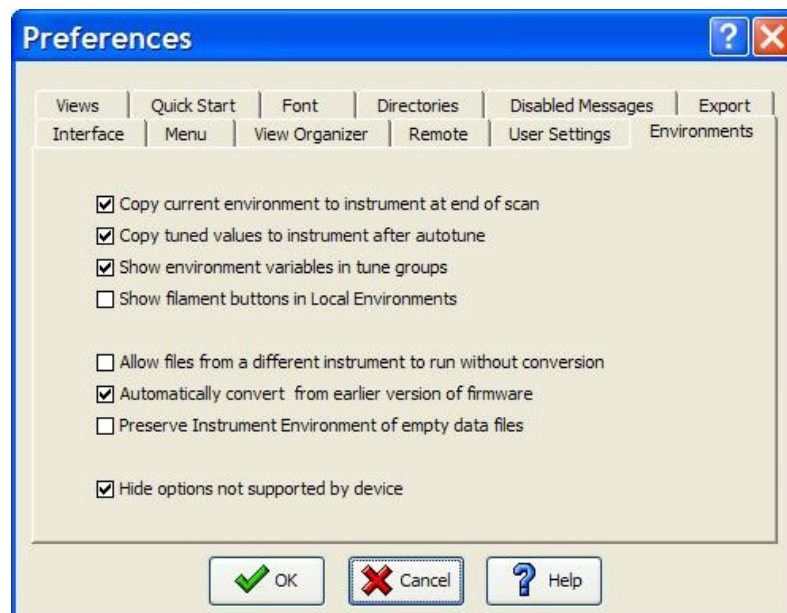


Figure 22 Environments tab

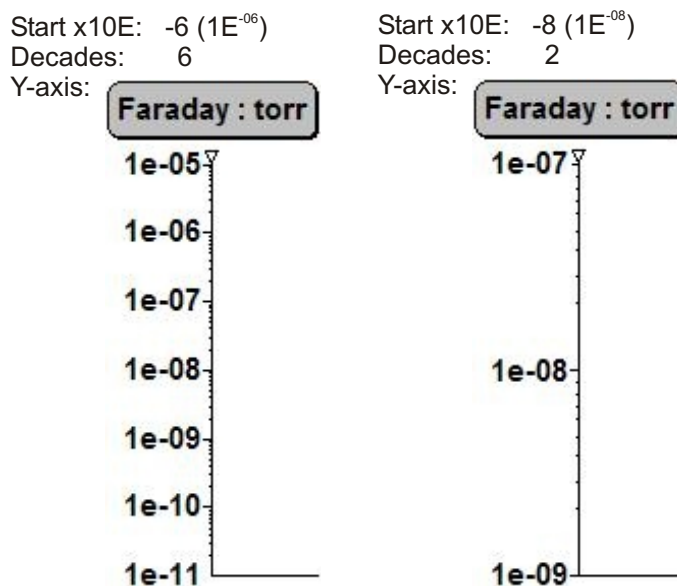
9.3 Immediate Update

On instruments that support the high dynamic range option it is possible to change the range while scanning.

The **Input Selection** dialog box should be opened from the graphical view. The **Start x10E**, **Decades**, and **Dwell Time** controls can then be modified. Closing the dialog box by clicking the **OK** button will result in the modifications being sent immediately to the Interface Unit.

The user will not be able to change the input device.

The Y-axis range will be changed to match the new settings. The Y-axis will be changed to a log axis with a maximum value set to the **Start x10E** value and the number of displayed decades matching the **Decades** value.



On the -6 range full scale is 10×10^{-6}
equivalent to 1×10^{-5} .

Figure 23 Y-axes

The Y-axis minimum value will never be set to less than the input device resolution. If the **Start x10E** value was set to -7 and the **Decades** was set to 6 the Y-axis minimum would still be **1e-11**, (Faraday detection limit), and not **1e-13**.

9.4 Decades

The high dynamic range option allows data to be collected over a larger dynamic range by combining data from scans on two or three ranges as if they were a single scan. This allows measurements to cover a range of 2, 4, 6 or even 8 decades.

Decade	Meaning
2	Will perform one scan covering two decades.
4	Will perform two scans with each covering two decades.
6	Will perform two scans with each covering three decades.
8	Will perform three scans, covering eight decades.

Table 5 Scans and decades

10 Error messages

This section lists the common error messages encountered during the general operation of MASsoft.

Error: No reply from the M.S., check connections

Communications between MASsoft and the Interface Unit (IU) have failed. MASsoft has transmitted a message to the IU and received no reply within the time-out period of eight seconds. Use the MSIU Test application to establish whether the IU is responding correctly. Also ensure that the IU and PC are connected to the same mains supply and that the system is properly earthed.

Data corrupted

MASsoft has received an unexpected character from the IU during acquisition. Probable causes are that IU has been reset or there is interference on the RS232 communications link. Also ensure that the IU and PC are connected to the same mains supply and that the system is properly earthed.

Error: Acquisition stopped, no data available, please check over-pressure and external trips

The IU has stopped acquisition immediately after starting and MASsoft did not manage to acquire any data. Probable causes are over pressure or external trips, or the scan has been terminated by a user event sequence. Also see IU error numbers 111 and 112.

Error: Error writing file: <Filename>

This is normally due to insufficient disk space. Acquisition will be stopped. Data saving can be switched off on individual files if it is not required for later review.

10.1 Network communications errors

This network error message occurs if the connection to the IU fails, caused by IU being powered-off, or a problem with the network. The network protocol will automatically make several attempts to re-establish a link but, if these continue to fail, the error message displayed.

If the scan is aborted, by selecting Abort, acquisition will stop and any further attempt to use the IU may result in “**No reply from MS**” errors. If further attempts are made to use the IU, this message will be repeated until a connection is established. Choosing Ignore is not recommended as MASsoft is frequently unable to terminate acquisition.

Network errors can be caused by congestion on the Local Area Network (LAN) due to heavy network traffic.

See the appropriate section in the Hardware Manual and the TCP/IP Implementation manual, for further information.

10.2 IU error messages

Error messages generated by the IU normally appear in red on the status line of the MASsoft window, however, they may appear in a message box displaying the time and date.

The errors which may be encountered are given below.

Error number 7 “Message 7 Mass Table full”

Each time a different mass is used for alignment, it is added to the mass table. This error will occur if there are already eight other masses in the mass table. Select **System, Maintenance, Clear mass table** to empty the mass table.

Error number 10 “Message 10 Logical device value scaled out of range”

This error only occurs when an output device is calibrated, or if the mass alignment is very poor. It indicates that the output value requested (i.e. the product of the requested value and the calibration factors) is outside the range supported by the hardware.

Try clearing the mass table using the **System, Maintenance, Clear mass table** command. If this fails to cure the problem, re-interrogate the IU. Re-interrogation is described in the Installation Guide.

Error number 24 “Message 24 Insufficient scan workspace memory”

The scan tree is too complex or nested too deeply.

Error number 25 “Message 25 Insufficient data storage memory”

The data storage buffer is full. This error is usually caused by a slow PC that cannot keep up with the rate at which the IU generates data, or by executing scans with a very short Dwell time and Settle time when connected by RS232. Data read back from the IU pauses while the PC updates its display, which can cause data to build up in the IU's buffers. The data displayed on the screen will lag a long way behind the acquired data.

Error number 26 “Command error 26 Scan not initialised”

This error may occur if the IU crashes while MASsoft is downloading the scan.

Error number 27 “Message 27 Device in use”

This error may occur if the PC or MASsoft crashes. The IU may still be scanning and buffering data when the PC has been re-booted and MASsoft reconnects to the IU. If MASsoft then starts to download a new scan this error will occur. Exit MASsoft and switch the IU off.

Error number 62 “Message 62 Environment field: environment space full”

There are too many local environments.

Error number 111 “Message 111 External trip”

The external trip, connected to the “inhibit” input on the trip connector, has been activated and the scan stopped to protect the system from damage. The external trip is active when open circuit. The error will occur if the pressure gauge or turbo pump controller has operated its trip output at the set point used to protect the Mass Spectrometer.

MASsoft may read an error, relating to an historical event, from the error buffer if the pressure was high before the start of the scan. In this case scanning continues and the error message may be ignored.

If the system pressure is correct, check that the trip connector is connected, the cable is not faulty and that the set points are correct.

This error may also be caused by extreme electrical interference, faulty earthing (grounding), etc.

Error number 112 “Message 112 Over pressure trip”

The Hiden Analogue RF Head contains circuitry to monitor the pressure in the source. If the pressure is too high the scan is stopped to protect the system from damage and this error is generated.

If the pressure is correct, check that the RF Head is properly connected.

This error may also be caused by the source being in line-of-sight of an ion gauge, cold cathode gauge or other source of electrons. Try switching each gauge off in turn to see if the error is cured (but see error number 111, above, if the gauge trip protects the mass spectrometer). If this cures the problem then reconfigure the vacuum system so that the gauge and quad analyser are no longer in line-of-sight by using another port on the vacuum chamber or placing an elbow on the gauge or analyser ports.

As in error number 111, this error may also be caused by extreme electrical interference, faulty earthing (grounding), etc.

Error number 115 “Message 115 Advise checking Amp. Zero”

This error message is produced by the auto zero routine. If the **Auto Zero** check box is selected in the **Input Selection** dialog box, the mass spectrometer takes a reading with the beam turned off before each measurement is taken. This reading is used to automatically zero any baseline offsets. If the offset is larger than expected, or if the reading has to be repeated due to noise or drift then the Message 115 is displayed.

If the error message occurs on the first scan only it can certainly be ignored; it is due to the zero being measured while the system is settling down. The error message will remain on the status line; it can be cleared from the drop down menu.

The system error log can be checked if the message occurs on each scan.

Electrical pick-up can cause Message 115 - is there noise on the baseline? Check the electrical environment: Is it very noisy? Are the earth connections secure?

Check the Amp Zero by examining a Profile scan on the pressure range on which the error occurred; if the baseline in the valleys is close to zero then the Amp Zero is correct. Also check that large peaks are not being clipped.

If problems are still encountered after the above checks e-mail Hiden Analytical Limited with a Profile scan on each range. If possible, the scan should include a full scale peak and some baseline.

10.3 Complete list of IU error codes

These are the message numbers for Firmware revision 7.02. Message numbers may vary if you have a different revision. The IU command *eid\$* is used by Hidden applications to obtain the error message corresponding to an error number.

Messages are divided in to the following categories in order of severity:

System error	Indicates an error in the software itself or in the configuration. e.g. System error 153 "Invalid device command" indicates that the unit has been programmed with a command that is invalid for a remote device.
Fatal error	Indicates that an unrecoverable problem has occurred. e.g. Fatal error 34 "Stack error".
Message	Indicates a problem with the operation of the instrument. e.g. Message 7 "Mass Table full" indicates that the mass table used for mass scale alignment is full.
Warning	Indicates a situation that does not prevent the system operating e.g. Warning 11 "Reading out of range" indicates that the value read outside the device's minimum and maximum limits.
Advisory message	Indicates the lowest level of severity. Advisory messages can usually be ignored if they do not occur frequently. e.g. Advisory message 115 "Advise checking amp. zero" may occur the first time a range is zeroed.
Command error	Indicates that an illegal command was sent to the IU. This type of error is unlikely to occur except when sending commands directly to the IU or when using Event Sequence Command events. E.g. Command error 8 "Unknown logical device" could occur if you ran an unconverted file from another instrument.

Error number 0 "System error 0"

Error number 1 "Unknown command"

Error number 2 "Syntax error"

Error number 3 "Command truncated"

Error number 6 "Bad configuration - Device missing"

Error number 7 "Mass Table full"

Error number 8 "Unknown logical device"

Error number 9 "Logical device value out of range"

Error number 10 "Logical device value scaled out of range"

Error number 11 "Reading out of range"

Error number 12 "Pressure too high for SEM"

Error number 13 "Unknown parameter"

Error number 14 "Read-only parameter, can't use pset or pini"

Error number 15 "Parameter value out of range"
Error number 16 "Can't set ALL parameters"
Error number 17 "Unknown field"
Error number 18 "Unknown scan"
Error number 19 "Scan table row out of range"
Error number 20 "Current Fail"
Error number 21 "Emission Fail"
Error number 22 "Scan in progress"
Error number 23 "Not scanning "
Error number 24 "Insufficient scan workspace memory"
Error number 25 "Insufficient data storage memory"
Error number 26 "Scan not initialised"
Error number 27 "Device in use"
Error number 28 "Unknown I/O device"
Error number 30 "No free task"
Error number 31 "Task number out of range"
Error number 32 "Job not running"
Error number 33 "Save to Flash memory failed"
Error number 34 "Stack error"
Scan errors
Error number 40 "Illegal command with ALL"
Error number 41 "Scan field out of range"
Error number 42 "Row field out of range"
Error number 43 "Output device field out of range"
Error number 44 "Start field out of range"
Error number 45 "Stop field out of range"
Error number 46 "Step field out of range"
Error number 47 "Input device field out of range"
Error number 48 "Range device field out of range"
Error number 49 "Low range field out of range"
Error number 50 "High range field out of range"
Error number 51 "Current range field out of range"
Error number 52 "Dwell time field out of range"
Error number 53 "Settle time field out of range"
Error number 54 "Mode field out of range"
Error number 55 "Report field out of range"
Error number 56 "Option not recognised"
Error number 57 "Return value type not recognised"

Error number 58 "Zero field out of range"

Error number 59 "Type field: scan type not recognised"

Error number 60 "Environment field: invalid logical device"

Error number 61 "Environment field: value out of range"

Error number 62 "Environment field: environment space full"

Error number 63 "Environment field: list not changed"

Error number 64 "Environment field: can't link; scan has no list"

Error number 65 "Environment field: can't link; no such scan-row"

Error number 66 "Environment field: not in list"

Error number 67 "Cycles field out of range"

Error number 68 "Interval field out of range"

Error number 69 "State field: state not recognised"

Trip and Event Sequence errors

Error number 70 "Unknown trip"

Error number 71 "Trip table full"

Error number 72 "Trip name already exists"

Error number 73 "Invalid trip name"

Trip and event run-time errors

Error number 74 "Illegal trip type. Programme stopped."

Error number 75 "Can't get data from co/multi-varient scan."

Error number 76 "value in a field incompatible with this type of trip"

Error number 79 "Trips: invalid destination"

Error number 80 "Trips: input field, invalid logical device"

Error number 81 "Trips: output field, invalid logical device"

Error number 82 "Trips: from field out of range"

Error number 83 "Trips: to field out of range"

Error number 84 "Trips: <limit field out of range"

Error number 85 "Trips: >limit field out of range"

Error number 86 "Trips: action field out of range"

Error number 87 "Trips: activate field out of range"

Error number 88 "Trips: deactivate field out of range"

Error number 89 "Trips: row field out of range"

Error number 90 "Trips: row field illegal, not scan input"

Error number 91 "Trips: output field illegal with scan as input"

Error number 92 "Trips: type field unrecognized"

Error number 93 "Trips: logic field unrecognized"

Error number 94 "Trips: activate field illegal with trip as action"

Error number 95 "Trips: deactivate field illegal with trip as action"

Error number 96 "Trips: enable field out of range"
Error number 97 "Trips: field illegal with this type of trip"
Error number 98 "Trips: next trip created automatically"
Error number 99 "Trips: text too short or too long"
Error number 100 "Trips: invalid operator in expression"
Error number 101 "Trips: invalid source"
Error number 102 "Trips: invalid expression"
Error number 103 "Trips: format-as field out of range"
Error number 104 "Trips: scan field out of range"
Error number 105 "Trips: index field out of range"
Error number 106 "Trips: cycle field out of range"
Error number 107 "Trips: on-error trip created automatically"
Error number 108 "Trips: stream field out of range"
Error number 109 "Trips: priority field out of range"
Error number 110 "No data"
Error number 111 "External trip"
Error number 112 "Over pressure trip"
Error number 113 "Filament failure"
Error number 114 "Emission failure"
Error number 115 "Advise checking amp. zero"
Error number 120 "Trips: Cycle field specifies wrong type of event"
Error number 121 "Trips: Option not recognised"
Error number 122 "Trips: average field out of range"
A scan error
Error number 123 "RS field out of range"
Z-motion error messages
Error number 130 "z-motion busy"
Error number 131 "z-motion error"
Error number 132 "z-motion failure"
Error number 133 "z-motion comms error"
Error number 134 "z-motion comms error"
Error number 135 "z-motion comms error"
Error number 136 "z-motion timeout"
Error number 137 "z-motion has not been homed"
ESPion Error messages
Error number 140 "ESP FIFO is full"
Error number 141 "ESP run failed - error flag set"
Error number 142 "ESP run failed - current over-range"

Error number 143 "ESP FIFO read error - not quiescent"

Error number 144 "ESP FIFO read error - no end tag"

Remote device errors

(Remote devices are devices connected to the IU by RS485 or Modbus. On the HAL7 these are the MSC08 MSC09 and MSC10 connectors or the Local RS232 pins on MSC04)

Error number 150 "Device busy"

Error number 151 "Device error"

Error number 152 "Device failure"

Error number 153 "Invalid device command"

Error number 154 "Invalid device response"

Error number 155 "Unterminated device response"

Error number 156 "Device not responding"

Error number 157 "Device comms error"

Error number 158 "Device returned an error code"

Error number 159 "Device response truncated"

Errors for penning and pirani gauges etc

Error number 160 "No output: Fault or device off"

Error number 161 "Device (or filament) failed"

Error number 162 "Device underrange"

Error number 163 "Device overrange"

Error number 168 "Invalid scan address"

Error number 169 "Scan failed consistency check"

Error number 170 "Gating not enabled"

Error number 171 "Measurement timed out"

Additional remote device errors

Error number 180 "Device access aborted"

Error number 181 "Device response contains an illegal address"

Error number 182 "Device response is not for the command sent"

Error number 183 "RS485: Tx collision"

Error number 184 "Error in converting value returned from remote device"

Error number 185 "Illegal character(s) in device format string"

Error number 186 "Retrying remote device command"

A block of 10 error numbers beyond the last specified error is reserved for error codes returned by remote devices. These error codes will be device dependant. Currently these are assigned error numbers 190 – 199

Error number 190-199 "Remote device error"