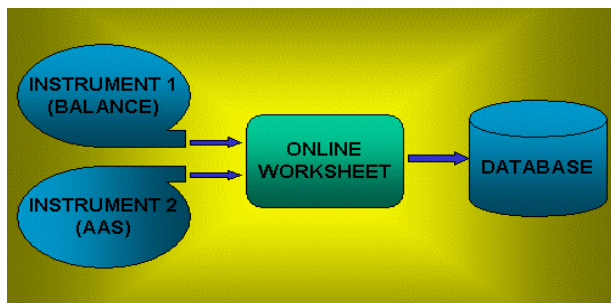




## Overview

The Online Worksheet (OnWSH = WSH) module is an advanced interface between one or more instruments and the LIMS database. It was designed with the same flexibility of a spreadsheet. It records all analytical data from lab instruments, performs calculations, exports data to any commercial LIMS relational database and it is integrated with an advanced QA/QC system.



### WSH file naming convention

Worksheet files are stored in the corresponding month folder under a main Work folder. Worksheet files have a predefined file name and have the *WSH* file extension. *AAS1234-JAN02.WSH*, where *AAS* is the service group, *1234* is a number between 1 and 9999 for each month and *JAN02* is the month and year. Worksheet templates are stored in the service group root folder and can have any name with the *WSH* extension.



### WSH database setup

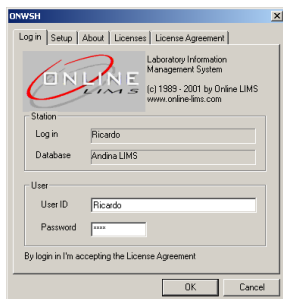
Even if WSH data is stored on a file (\*.WSH) system (like Excel) all-relevant header data is stored in a database to allow fast queries. The database interface used is ODBC32 (Open Database Connectivity) and needs to be configured for the first time it is used.

From the Control Panel select Data Sources (ODBC) and make sure to have the following selection (everything else is default):

1. At *System DSN* add "Online LIMS" for SQL Server
2. At *SQL Server Configuration on Data Source Name* add "Online LIMS" and the local server on which resides.
3. Check "With Windows NT authentication using network login ID"
4. Change to the default database to "Online LIMS" or ask the system administrator for the correct name.

### User's Login

In order to have access to the LIMS database a user must be a valid domain user and have the required access privileges. Every WSH user gets a *username/password* assigned to them.



WSH users are also assigned an access level in order to restrict them to the appropriate areas within the WSH modules.

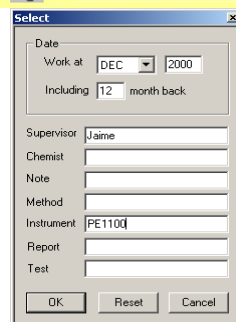
To change or set the password switch to the <Setup> tab and select <Change Password>

## Browser

The WSH browser is a menu window that allows a user to quickly and easily navigate through the selected list of WSHs. The browser is linked only to the database, so it has to be synchronized with the WSH files (\*.WSH) in order to have them visible. Its main functions include: WSH Creation, Editing, Removing, Template Management, Filtering and Querying for information.



### <S> Select filter



The *SELECT* filter allows a custom grouping of WSHs, depending on the data entered on the Select dialog.

Worksheets can be grouped by months, up to 12 months at a time.

Any string entered is not case sensitive, and can be part of the search string (Jim Morrison is selected as 'Jim' or 'Mor').

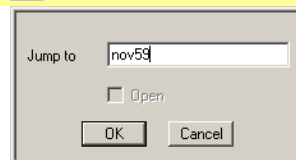
### Service Group filter



It is the browser's main filter. Service Groups represent distinct work or instrument groups and they must be configured in the *OnSetup* module. Matching Folders for each Service Group must exist under *LIMS\WORK* folder in the WSH file structure. The Browser only displays worksheets for one Service Group.



### <J> Jump to goes directly to a wanted worksheet



Moves the cursor directly to a wanted WSH. It accepts different formats, like '59', 'nov59', 'NV0059', etc. It is not case sensitive.



### <T> Templates

Templates are pre-designed worksheets used for routine work where analyses and/or Samples ID are always the same. Templates are created from a WSH and then saved as a template in the workgroup folder root directory.

1. Select the WSH from which to create a template.
2. Select Create Template from the File menu.
3. Type a descriptive name in the pop-up window.
4. Select Template from the File menu to modify it.



### Worksheet File Format changes the browser file format



**SQL select command** used to write a custom filter (ie: *SGroup='IMS' OR SGroup='ICP'* selects 2 service groups) **Remove a worksheet.** Removed WSH are renamed using the file extension *'BAK'* and a log file is generated. To restore change the file extension manually back to *'WSH'* and open it with the <T> function to include it on the browser pane again.



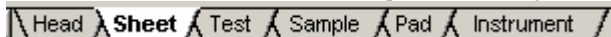
**<F> Find a sample** in a WSH. Accept any close match.





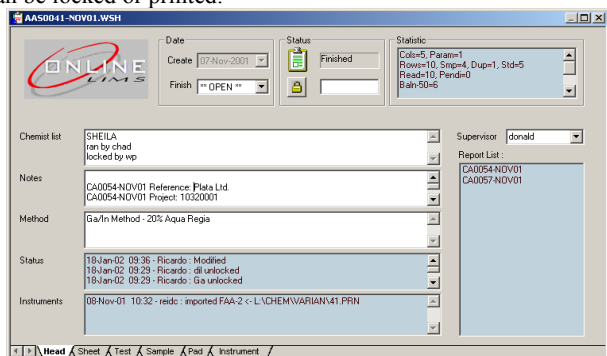
## WSH - Worksheet

The WSH module is a advanced spreadsheet for chemistry and is divided in 4 main sections (Test & Sample are to configure Sheet):



### 1) Header Tab

In the header tab is stored all significant worksheet header data. The first thing after creating a WSH is to enter all general data related to the WSH, like: chemist, technicians, methods used, and notes related to the job. In addition, from the header tab the WSH can be locked or printed.



### 2) Sheet Tab

This is the WSH main working area. Its main functions are reading data from instruments, processing and validation of data with QC and exporting data to the LIMS. In this grid, the information in the row and column headers comes from the respective tabs *Sample* and *Test*.

Sample ID	A weight g	B volume ml	C read@GaA Apulp	D Ga mg/L	E dil cr
1 APR01.721	1.0016	100	26018.07	27.9971	10
2 APR01.722	0.9979	100	25584.92	27.4293	10
3 APR01.730	0.9983	100	154415.55	33.1227	50
4 APR01.722	1.0012	100	25821.33	27.7743	10
5 APR01.723	0.9965	100	17807.38	19.0643	10
6 Gallium Arsenide	0.5166	100	479996.23	26.6401	100
7 blank	1	100	21.72	0.2102	1.11
8 AAS inst blk	1	1	-0.01	-0.0150	1
9 QCS-19 & QCS-7	1	1	100.75	50.3771	2
10 QCS-19 & QCS-7	1	1	101.68	50.8410	2

### Test Tab

This tab is used to configure the **column header (=analysis)** of the Sheet tab. Each analysis can have several parameters and the relationship between them is given by the WSH formula.

### Sample Tab

The sample tab stores all sample related data. It is used to configure the **Row Header** of the Sheet tab. All Sample Id information, duplicates and QC samples are configured in the Sample Tab.

### 3) Pad Tab

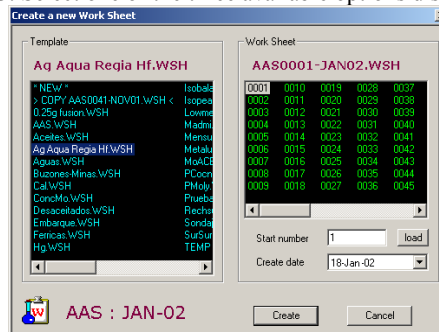
The pad tab serves as a text editor (like WordPad) that includes an object container to store additional information like bitmaps, etc.

### 4) Instrument Tab

It displays all instrument information including calibration data, which is recorded in the WSH log file. For traceability, the log file data is a view only and can't be modified.

## WSH Creation & Configuration

1. Make sure to be on the right *service group* before starting.
2. Select *New* from the browser *File* menu.
3. Select one of the three available options displayed:



**New**  
creates an empty new WSH

>**Copy XXXX**<  
makes a copy of the selected WSH.

**Template**  
creates a WSH from a template.

4. Select a *WSH Number* from the numbers list.
5. Press <Create> button. (If it is necessary, change the *Create date* before pressing the <Create> button)

### Sample Login

The second step is to login samples on the *Sample* tab. *Sample ID* is typed directly or loaded automatically if a link exist with the LIMS (*R.Num* & *R.Tag*) or a *QC file*.

*	Sample ID	R.Num	R.Tag	Sequence	Type	Qc File	Note	Preparation
1	E005-4.1				STD	E005-4.1	LIMS QC test	
2	dr99 011113 0001	DR99		dr99 011113 000	SMP			pulv
3	dr99 011113 0002	DR99		dr99 011113 000	SMP			pulv
4	dr99 011113 0003	DR99		dr99 011113 000	SMP			pulv

*R.Num* & *R.Tag* is used to link the WSH sample with the LIMS sample. A valid Report or sample template should exist.

*Sequence* is used when importing data from instruments and is used to link the WSH and the instrument file.

*QC File* links the WSH with the QC database. Use <ctrl+enter> to call the *QC pickup list*.

*Note* & *Preparation* fields are only for user reference.

Use **[D]** to keep the date as a constant in the Sample ID.

After finishing the sample login use 'Check and Validate sample'.

### Increment fill – Sample editing macro

This tool is used to program a increment sequence. The increment sequence is included in front to the increment sting in brackets {2}

Drill 1	Drill 1	Drill 2	Drill 3
Drill {5}1	Drill 1	Drill 6	Drill 11
Drill {5}1-1{2}10	Drill 1 10	Drill 6 12	Drill 11 14

### Test Login

The third step is to login all Analysis information on the **Test Tab**.

*	Column ID	Unit	Technician	Note	Source	Dec	DetLim
1 A	LIM@Ni	%			3	4	no
2 B	Ni	%			PHMT-7	---	---
3 C	LIM@Mo	ppm			3	4	no
4 D	Mo	ppm			PHMT-7	---	---

1. Type the TestId on the *ColumnID* header. A valid *LIMS link* is identified with an @. The string after the @ has to match with the LIMS Analysis destination (ie: LIM@Mo, Mo is the link with the LIMS)
2. Type the formula for a valid link (pink row). Should be usually 'a'. Enter the **Dec=Decimals** & **DetLim=detection Limit** values.
3. To add one or more result columns for the same element for re-analysis or duplicate enter the test Id using the format: @Test Id (e.g. @Mo)



## Formulas

The worksheet allows *CELL* formulas like in Excel. To simplify calculations for columns, a *WSH formula* has only column references and can be typed on the Test tab (source column) or directly when performing calculation.

### WSH formula calculation

WSH formulas are used only on the Test Tab (Source column) and on the column calculation dialog. This formula has only Column References (A, B, .. AA, AB, ...) without row numbers. When calculating, the LIMS formula will be replaced for the *CELL* formula on each cell.

Column References typed in lowercase are relative to the calculation column (XYZ@TestID). Uppercase Column references are absolute. If the calculation column is 'C' the LIMS converts to:

<b>Calculate selected cells</b>	a/10000+A
Formula: a/10000	=C/10000+A
Decimals: 4 use [-n] for precision	SUM( a:c)
Det Limit: 0.01	=SUM(C:E)
OK Cancel	AVG( A..C)+a*b
	=AVG(A:C)+C*D

### Cell formulas (Sheet tab)

Formulas calculate values in a specific order. A formula in a Cell always begins with an equal sign (=). The equal sign tells WSH that the succeeding characters constitute a formula. Following the equal sign are the elements to be calculated (the operands), which are separated by calculation operators.

In the example below, the parentheses around the first part of the formula force WSH to calculate B4+25 first and then divide the result by the sum of the values in cells D5, E5, and F5.

$$=(B4+25)/SUM(D5:F5)$$

### Conditional formula: =IF(X, TRUE, FALSE)

This function returns the value of TRUE if X evaluates to non-zero, or FALSE if X evaluates to zero. Example:

$$=IF(A1, 7, 9) = 7, \text{ where } A1 = 1$$

$$=IF(B17=0, 0, "non-zero") = "non-zero", \text{ where } B17 = 1$$

### Decimal rounding

The system is able to round significant figures when calculations are performed. In addition, each cell can be adjusted by the rounding function.

When calculating selected cells and a negative value is entered as 'decimals', then the rounding is performed as a precision rounding.

## Instrument Interface

The OWH handles two type of instrument interfaces: Online Reading and File importing (= file parsing). The method used will depend on the instrument's data exporting capability.

### On-line reading

This connection is called On-Line because as soon as the instruments sends data it is parsed and written directly into the currently selected cell in the worksheet. The OnLINK application should be active on the taskbar for On-line reading.

1. Select *Instrument->Setup for on-line* from the sheet tab.
2. Select the Instrument driver and the Inst ID from the list.
3. On <Read> check 'Read using Barcode labels' if a bar code reader is available. After BC scanning, this will move the cursor to the right Sample ID.
4. Select the Instrument log file path. This file will store all data received from the instrument as a backup. The default maximal of the file size is 64 KByte and can be changed.

When on-line reading is selected, the current cell cursor turns RED.

### Import Reading

The import reading will parse linked reading from an instrument generated file. Be sure to have the correct instrument driver, instrument ID and Inst. File path selected.

**Insert Sequence ID** will add rows and fill the Sequence ID on the Sample tab.

**Insert Test ID** will add columns and fill the TestID

**Remove source after importing** will rename (hide) the Inst. File to \*.T01, \*.T02..

**Remove read status** will remove any reading status (Only PE WinMass)

### How to link an instrument file with the WSH

To link the worksheet with the Inst. file and have the readings go to the proper cells (Insert Sequence ID and Insert Test ID must be disabled) follow two simple rules: **1)** The **TestID** on the Inst. file has to match with the TestID on the WSH Column Header (Test Tab). **2)** The **SampleID** on the Inst. file has to match with the SequenceID (Sample Tab).

Seq. ID	Cu	Mo=Mo	Au	Fe
Drill 1				
<b>Drill12=Drill 2</b>		<b>12.34</b>		
Drill 3				



## QC & data validation

### QC Sample types

QC samples are classified in 4 main groups (1 for precision):

<b>Duplicates</b>	For precision control, duplicates/replicates
<b>Standards</b>	Accuracy control, reference materials
<b>Blank</b>	Accuracy control mainly for bias control
<b>Control</b>	In house standards or control (calibration) samples

The WSH flags all sample in 6 groups: the 4 QC sample types, normal 'live' samples and no defined samples (date, comment row)

<b>SMP</b> - sample	<b>DUP</b> - duplicate	<b>STD</b> - standard
<b>NOS</b> - no sample	<b>BLK</b> - blank	<b>CTL</b> - control

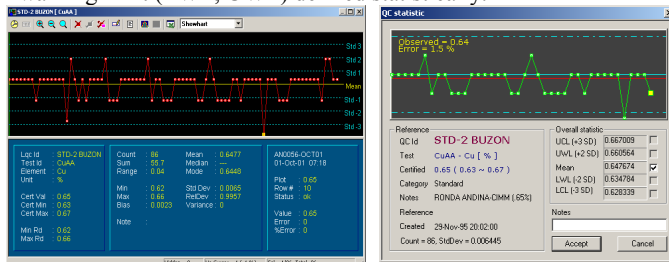
### QC Definition

**Precision** is used to describe the reproducibility of results. It can be defined as the agreement between the results of repetitive measurements made in an identical fashion. *Keyword: precision -> replicates, duplicates.*

**Accuracy** is used to denote the nearness of a result to the true or most probable value, and is expressed in terms of error. *Keyword: accuracy -> standards (reference material), blank, control.*

### QC Validation chart

When locking a column (WSH data validation) and a QC value is found to be outside the certified range then the *QC validation chart* is displayed. If an out of spec value is accepted as valid, it will be highlighted in red to indicate the QC error. There are 2 out of spec categories: 1) Out of the certified value limit and 2) out of the warning limit (LWL, UWL) defined statistically.



Only the last 40 values are displayed in the *QC validation chart*. To view the whole population, use the OnLQC module. However, the statistics shown are for the whole population, including the last point as 'live data'. If <accept> is pressed, the data point and the note, if any, are sent to the QC database.

### Data validation / Column locking

Data is validated when a column is locked. A locked column turns the column header GREEN and can not be modified, unless unlocked with the same key (password). The password is equivalent to the signature when the technician approves or releases data. If a locking is done on a result column (**XYZ@TestId**) then validation is done against the QC database.

## Exporting – data reporting

### WSH to LIMS interface

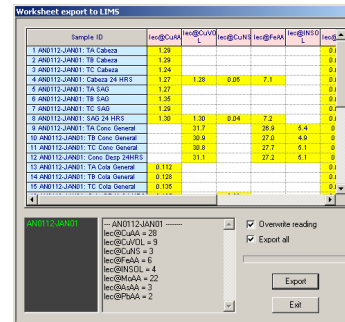
Before sending data to the LIMS It is very important to tell the WSH what is the target LIMS. There are many LIMS interfaces build-in on the WSH. Select 'File->Setup' and from the list select the correct LIMS interface.



Check the current LIMS link on the WSH title bar.

### Exporting to LIMS

Only locked (approved) columns are exported (=reported) to the LIMS. The exporting menu will display only the data that is ready to be exported. A green header means that the WSH verified a link with the LIMS (only with an on-line system).



**Overwrite reading** tells the WSH to replace LIMS data with the current one (only by online link)

**Export all** means all data is exported. If *Export all* is not checked then the cells to be exported has to be highlighted on the grid by clicking over it or on the column / row header.

### WSH / LIMS link considerations

Sample ID's and Test ID's in the WSH have to match exactly with the ID's in the LIMS in order to have a correct link.

LIMS ID	WSH location	WSH ID
TestId	Column ID, Test tab	XYZ@TestId
SampleId	Sample tab	SampleId

Example: If on the LIMS we have a Sample ID 'Drill 123' and a TestID 'MoAA' then on the worksheet the Sample ID should be the same 'Drill 123' and the Test ID should be 'AAS@MoAA', where AAS is not relevant and symbolizes the test was done by the service group AAS. But 'MoAA' has to match exactly and only ONE 'AAS@MoAA' and only ONE 'Drill 123' can be defined on the WSH.

### Log status

The WSH logs all important tasks and changes on the status field (header tab). This information is used to track changes on the WSH. This read only status can not be modified by the user.

