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# **ACQUITY QDa**

# **Automated Manufacturing Instrument Test Software (AMITS V4.1)**

## **Reference Manual**

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***For Internal Use Only***

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**1. PURPOSE**

The purpose of this Reference Manual is as a Quick Start reference in how to:

- Install AMITS QDa on a test bay Host PC.
- Create AMITS users.
- Use AMITS QDa to test an Acquity QDa.
- Use AMITS QDa to test an Acquity QDa Assemblies and Spares
- Use AMITS QDa to test an Acquity QDa that has previously failed a test, including “continue” test “Status Tool” functionality
- Use AMITS QDa to perform a Root Cause Analysis (RCA)
- Use AMITS QDa to generate DHR printouts
- Use AMITS QDa to generate DHR Summary printouts
- Use AMITS QDa to generate History log printout
- Use AMITS QDa History to trace an instruments test record
- Use AMITS QDa to access and view previously tested instrument manufacturing test data.
- Use AMITS QDa SigmaQuest data to create a dashboard to monitor production, produce reports, and perform trend analysis

To assist with these tasks, there is information on:

- How to use AMITS QDa Log and History Records to help diagnose a cause of failure
- When to use the RCA tools to confirm a fault has been fixed.
- When to ‘Restart’, or use one of the ‘Continue’ test options.

**2. SCOPE**

The scope of this Reference Manual is for:

- Manufacturing test of the Acquity QDa, using TSP – Acquity QDa – Automated Manufacturing Test Procedure ([46202](#)).
- Manufacturing test of the Acquity QDa Spares
- Any quadrupole testing of Acquity QDa Detector Housing Assembly (289009064).
- Any individual Quadrupole Rail Assembly (289009057) testing for production or spares

**2.1. Part Numbers**

Detector Housing Assembly (289009098) MEI 186006511

Quad Rail Assembly (289007658) - Category = Assembly

Detector Dynode Flange (289007991) - Category = Assembly

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Detector Housing Assembly (289009064) - Category = Assembly  
ESI Enclosure Assembly (700009612) - Category = Spare  
Pumping Block Assembly ( 700009678) - Category = Spare  
Ion Block Sub Assembly (700009595) - Category = Spare  
Control PCB – (700009594) - Category = Spare  
Segmented Quad Assembly (700009596) - Category = Spares.

**3. DEFINITIONS AND ABBREVIATIONS**

| Term | Definition / Abbreviation                       | Term    | Definition / Abbreviation  |
|------|-------------------------------------------------|---------|----------------------------|
| ACN  | Acetonitrile                                    | ISD     | Inter Scan Delay           |
| amu  | Atomic Mass Unit                                | LC      | Liquid Chromatography      |
| API  | Atmospheric Pressure Ionisation                 | Leu Enk | Leucine Enkephalin         |
| BPI  | Base Peak Intensity                             | LM      | Low Mass                   |
| Da   | Daltons                                         | MS      | Mass Spectrometer          |
| DHR  | Device History Record                           | m/z     | Mass to Charge             |
| ESI  | Electrospray Ionisation                         | NCR     | Non-Conformance Record     |
| FWHH | Full Width Half Height                          | NPO     | New Product Operations     |
| HM   | High Mass                                       | PAE     | Product Assurance Engineer |
| HV   | High Voltage                                    | PSU     | Power Supply Unit          |
| HPLC | High Performance Liquid Chromatography          | RF      | Radio Frequency            |
| H2O  | Water - refers to 18.2 Mohm.cm de-ionised water | RMS     | Root Mean Square           |
| ICD  | Inter Channel Delay                             | +ve     | Positive                   |
| ICT  | Ion Counting Threshold                          | -ve     | Negative                   |

**4. REFERENCES/RELATED DOCUMENTS**

| Doc No:               | Document Title                                             |
|-----------------------|------------------------------------------------------------|
| <a href="#">42304</a> | Windows 7 Network PC Setup Procedure                       |
| <a href="#">45760</a> | Acquity QDa Quadrupole Appendix Document                   |
| <a href="#">46202</a> | TSP – Acquity QDa – Automated Manufacturing Test Procedure |
| 730000677             | Waters Corporate IT Security Strategy                      |

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## 5. HEALTH & SAFETY

When the software runs, warning symbols are used to highlight potential health and safety hazards. It is the responsibility of the user to fully risk assess the hazards identified, and implement suitable controls to prevent/minimize the risk of injury or ill-health.

Where a symbol is used within the procedural text, a more detailed description of the specific hazard will be provided below.

Any concerns about the hazards identified and/or details of the possible controls required to mitigate the resultant risks, should be addressed with Waters before commencing the procedure.

|                                                                                     |                                                                                                                                                                                                  |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    | <p><b>WARNING!:</b></p> <p>Whenever using a liquid pump, there is a risk of solvents being squirted long distances whenever fittings are adjusted. Ensure proper eye protection is used.</p>     |
|   | <p><b>WARNING!</b></p> <p>Risk of exposure to high temperatures.</p>                                                                                                                             |
|  | <p><b>WARNING!</b></p> <p>Sharp point. The capillary tip is sharp and may scratch or puncture the skin surface. Wear gloves.</p>                                                                 |
|  | <p><b>WARNING!</b></p> <p>This procedure should only be performed by trained personnel. Risk of exposure to high voltages.</p>                                                                   |
|  | <p><b>WARNING!</b></p> <p>Risk of exposure to substances classified as harmful or irritant. Wear gloves whenever handling samples or parts that have been exposed to samples.</p>                |
|  | <p><b>WARNING!</b></p> <p>A general warning indicating a potential health and safety hazard, or risk of damaging the instrument. The hazard / risk is clarified within the test in question.</p> |

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**6. EQUIPMENT/SAMPLES REQUIRED**

**Samples:**

Acquity QDa Set Up Solution

**Engineer Dashboard.**

Latest validated issue can be found in SAP.

**Telnet EPC**

Telnet EPC can be entered through the run command in Windows

**Masslynx**

Masslynx for Acquity QDa – to access a tune page for further diagnostics.

**Chrome**

The current version of Chrome needs to be installed on the host PC. However, it **MUST NOT** be set as the default web browser, or used as a web browser.

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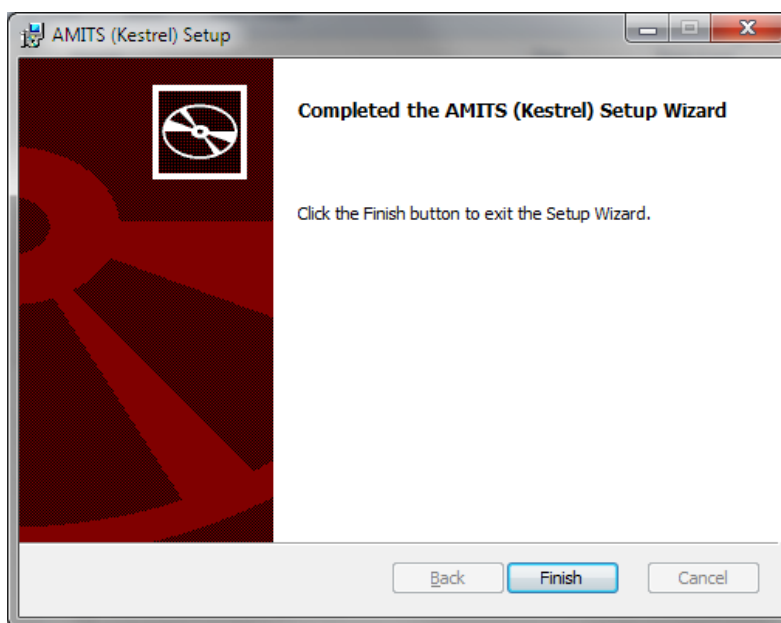
**7. INSTALLING ACQUITY QDa AMITS**

**7.1. Installing the Basic Acquity QDa AMITS Package on the Instrument Host PC**

**Prerequisites:** Chrome must be installed on the Local PC before starting AMITS. However, Chrome must NOT be set as the default browser. Chrome is only to be used as the platform upon which AMITS functions.

The host PC **must** have also been through the 42304 Windows 7 Network PC Setup Procedure to be present on the Waters CORP domain.

- (1) From the location disclosed within the change note release of AMITS, create a CD of the released installation package for Acquity QDa AMITS.
- (2) Install the CD onto the host PC.
- (3) Double click the icon for the installer package to start the installation process.
- (4) This will start the installation process. The process takes about 2 minutes.
- (5) Once the process has completed, the 'Completing Setup Wizard' window is displayed.
- (6) Click the 'Finish' button to complete the installation process.



- (7) AMITS can be started by using an icon that was installed onto the desktop
- (8) Double click the icon to start AMITS and open the 'Manufacturing Test Run Details' page.



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The screenshot shows a web application interface for 'Manufacturing Test Run Details'. At the top, there is a navigation bar with tabs: 'Test Run Details' (active), 'Dashboard', 'Test Log', 'Summary', 'DHR', 'Sigma Data', 'History', and 'Admin'. Below the navigation bar, the title 'Manufacturing Test Run Details' is centered. The form contains several input fields: 'Product Type' is a dropdown menu currently showing 'simulator'; 'Serial Number', 'Sample Batch Number', 'Sample Use By Date', 'Test Box Number', 'Test Rig Number', 'Procedure Document Version', and 'Production / Factory Order' are all text input fields, each with a corresponding label to its left.

- (9) The Acquity QDa AMITS is designed to be linked to a number of databases saved on the servers based in the installation site. Without these links the software will run, but in simulator mode. This is a demonstration / development mode that uses artificial data for the tests, and not data from the instrument.
- (10) AMITS has to be linked to the local servers by a user with administrative rights. The password will vary with build release to maintain security.

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**7.2. Linking Acquity QDa AMITS to the Manufacturing Test Databases**

- (1) Administrator: Click on the Admin tab to open the Administration window.

- (2) Administrator: Type the Admin Password for the build. Do not press enter after the text, if the password is correct, the Links Administration Page will open automatically.

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Manufacturing Test x

localhost:8082/webserver/modules/manTest/console/client/views/start.html

Test Run Details Dashboard Test Log Summary DHR Sigma Data History Admin

### Administration

Tests Database: C:\Program Files (x86)\AMITS\release\AMITS\IMTestModules

Results Database: C:\Program Files (x86)\AMITS\release\data\_store\IMTestResults

Users Database: C:\Program Files (x86)\AMITS\release\data\_store\IMTestUsers

SigmaQuest Folder: C:\Program Files (x86)\AMITS\release\data\_store\SigmaQuest

Temp Folder: C:\Program Files (x86)\AMITS\release\data\_store\Temp

Station GUID: 62A3EAE4-8DEA-0F21-8634-482637673A32

Station Name: <No Station>

Location: Wilmslow Remove

Add Location: Add

Area: Clean Room Remove

Add Area: Add

Sigma Version: 6

Available Product Types:

- ☒ Acquity\_QDa
- ☒ Acquity\_QDaMKII
- ☒ Acquity\_QDaMKII\_Nostop
- ☒ Acquity\_QDa\_Nostop
- ☒ QDaMKII\_Detector\_Dynode
- ☒ QDaMKII\_Detector\_Dynode\_Nostop
- ☒ QDaMKII\_Detector\_Housing
- ☒ QDaMKII\_Detector\_Housing\_Nostop
- ☒ QDa\_Detector\_Dynode
- ☒ QDa\_Detector\_Dynode\_Nostop
- ☒ QDa\_Detector\_Housing
- ☒ QDa\_Detector\_Housing\_Nostop
- ☒ QDa\_Quad\_Rail
- ☒ QDa\_Quad\_Rail\_Nostop
- ☒ QDa\_RCA\_Charging
- ☒ QDa\_RCA\_Detector
- ☒ QDa\_RCA\_Fast\_Tuning
- ☒ QDa\_RCA\_Heater
- ☒ QDa\_RCA\_Internal\_Cal

- (3) In this configuration, AMITS will only run in standalone mode.
- (4) Administrator: Reconfigure the Database location to those of the installation site. The locations of these databases are contained within a separate document. For data security reasons, this document is not referenced within this document.

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**Tests Database** – This location contains the test methods. The methods are compiled and can not be altered by the user. However, for added security, AMITS will be directed to a server saved copy of the test methods..

**Results Database** – This location is where AMITS will store the equivalent of the MassLynx Project Folder for the instrument. . As this location is server based, there is no longer any risk of data loss.

**Users Database.** –The user list of engineers that have been approved to run AMITS will be stored and maintained on a server. The passwords associated with the user list are generated by the users themselves, and are encrypted.

**SigmaQuest Folder** – This location is where a program called SigmaProbe will automatically upload a completed set of key data to Sigma Quest in Milford, via a server in Manchester. The completed key data set is generated once an instrument completes AMITS testing. A record is also transmitted if the test sequence is completely restarted after a rework action.

**Temp Folder** – This is a temp folder stored within the results database. It stores a copy of the SigmaQuest xml file that is transmitted to Milford.

**Station GUID** – This is the code required by SigmaProbe to import the key data into the SigmaSure database stored in Milford.

**Station Name** – This should be changed to the PC name on which AMITS has been installed. This will allow production to track which instruments were tested using this test location.

- (5) Once the above amendments have been made, Chrome needs to be refreshed to log out of the Administration mode. Either click the recycle button or hit the function key F5. This will return AMITS to the Test Run Details Page.
- (6) At this point, AMITS is now fully installed.

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**8. UNINSTALLING AMITS**

As AMITS is run on a browser platform, it does not have the normal problems associated with uninstalling software. All of the software is stored in a single location.

- (1) Close Chrome.
- (2) Click the shutdown AMITS icon on the desktop to shutdown the software that drives AMITS.



- (3) Delete the AMITS icons from the desktop.
- (4) Open Windows explorer.
- (5) Open C:\Program Files (x86)
- (6) Rename or Delete the folder called AMITS.

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## 9. ACQUITY QDa AMITS USERS

At the time of writing this manual, the AMITS user list is controlled by Product Assurance, Wilmslow.

**Users Database.** – During the installation of Acquity QDa AMITS, the software is linked to a Users Database. This location contains the user list of engineers that have been approved to run AMITS. The passwords associated with the user list are generated by the users themselves, and are encrypted.

### 9.1. Adding New Acquity QDa AMITS Users

- (1) Double click the icon to start AMITS and open the 'Manufacturing Test Run Details' page.



- (2) Click on the Admin tab to open the Administration Page.

Test Run Details Dashboard Test Log Summary DHR Sigma Data History Admin

**Administration**

Software Version: Simulator AMITS V4.1 Build: 2

Admin Password:

Test Engineer:

New Engineer:

Old/Admin Password:

New Password:

New Password:

Create/Update User

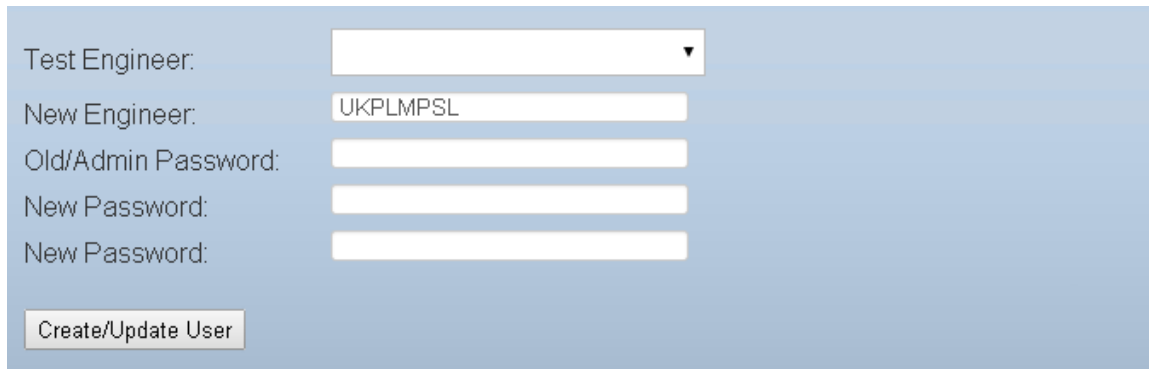
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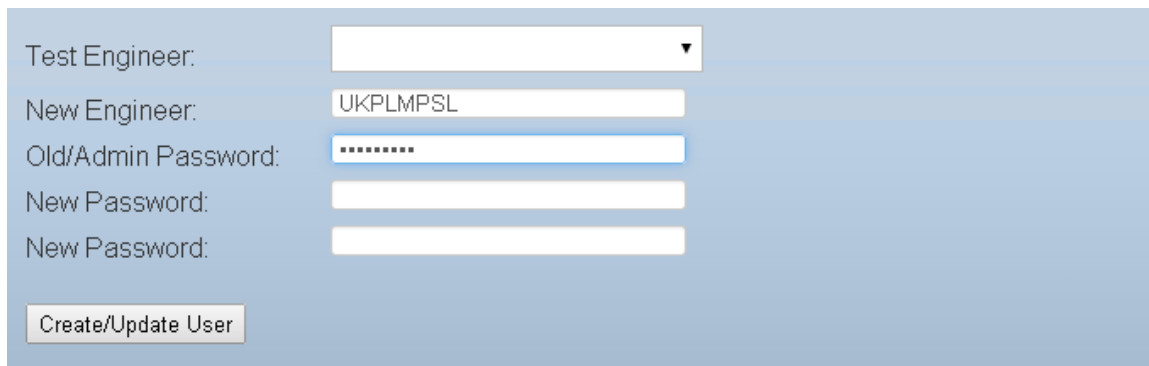
- (3) Administrator: Enter the new engineers SAP ID, for example: UKPLMPSL



The screenshot shows a web form with the following fields and values:

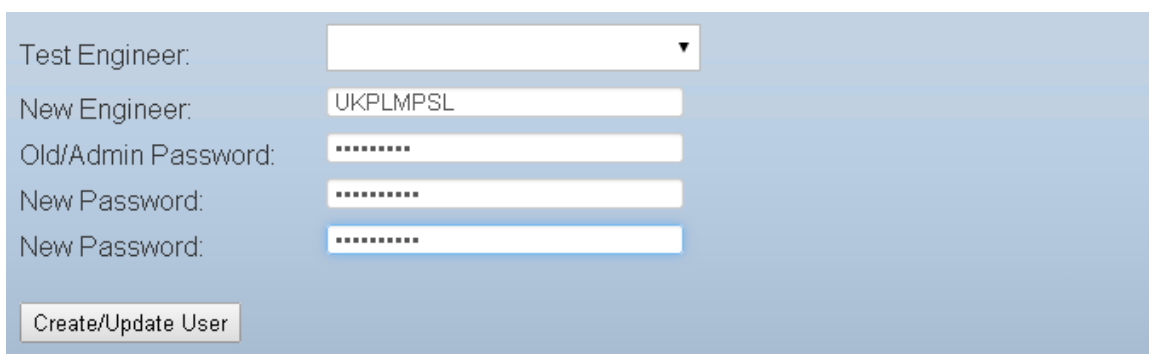
- Test Engineer: [Dropdown menu]
- New Engineer: UKPLMPSL
- Old/Admin Password: [Empty text box]
- New Password: [Empty text box]
- New Password: [Empty text box]
- Create/Update User: [Button]

- (4) Administrator: Enter the Admin Password for the released version of AMITS being used.



The screenshot shows the same web form as before, but with the 'Old/Admin Password' field now containing a series of asterisks (\*\*\*\*\*).

- (5) Administrator: Enter the same choice of temporary password within both New Password boxes



The screenshot shows the same web form, but now both the 'New Password' fields are populated with a series of asterisks (\*\*\*\*\*).

- (6) Administrator: Click the 'Create/Update User' button to create the new user account.
- (7) Administrator: Refresh AMITS by clicking the refresh button, or pressing F5. This will return AMITS to the Manufacturing Test Run Details page.

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- (8) Administrator: Open the Administration page and confirm the new user has been added to the User Database by clicking on the drop down list button beside 'Test Engineer'

The screenshot displays a web-based administration interface with a light blue background. On the left side, there are several labels for user management: 'Admin Password:', 'Test Engineer:', 'New Engineer:', 'Old/Admin Password:', 'New Password:', and another 'New Password:'. To the right of these labels are corresponding input fields. The 'Test Engineer:' field is a dropdown menu that is currently open, showing two options: 'micromass' and 'UKPLMPSL'. The 'micromass' option is highlighted with a blue background. Below the input fields, there is a button labeled 'Create/Update User'.

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**9.2. Changing an Acquity QDa AMITS Test Engineer Password**

Once a new engineer has been given an AMITS account it is highly recommended that they change the temporary password supplied by Product Assurance, to one known only to them selves.

This process will need to be repeated every 90 calendar days as per corporate policy. (730000677)

- (1) Double click the icon to start AMITS and open the 'Manufacturing Test Run Details' page.



- (2) Click on the Admin tab to open the Administration Page.

A screenshot of the AMITS software interface. At the top, there is a navigation bar with tabs: 'Test Run Details', 'Dashboard', 'Test Log', 'Summary', 'DHR', 'Sigma Data', 'History', and 'Admin'. The 'Admin' tab is selected. Below the navigation bar, the page title is 'Administration'. The main content area shows the following information: 'Software Version: Simulator AMITS V4.1 Build: 2'. Below this are several input fields: 'Admin Password:' followed by a text box, 'Test Engineer:' followed by a dropdown menu, 'New Engineer:' followed by a text box, 'Old/Admin Password:' followed by a text box, 'New Password:' followed by a text box, and another 'New Password:' followed by a text box. At the bottom left of the form area is a button labeled 'Create/Update User'.

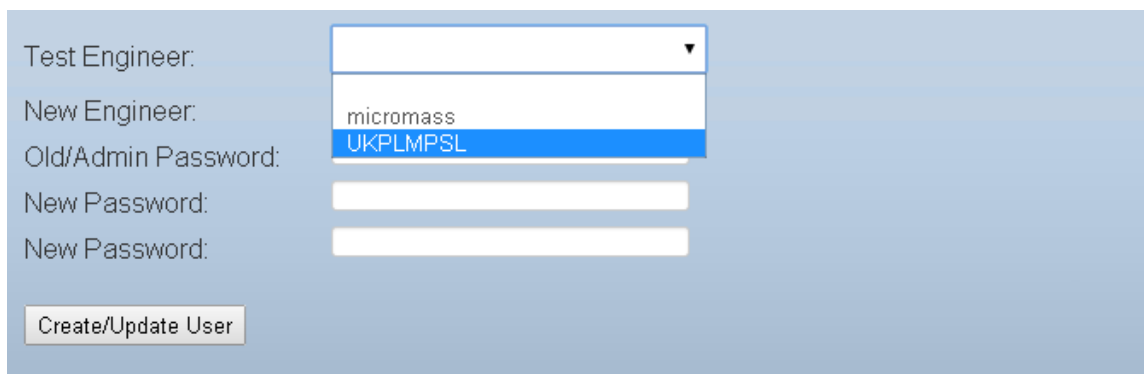
- (3) Test Engineer: Select your name from the Test Engineer drop down list.

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Test Engineer:

New Engineer:

Old/Admin Password:

New Password:

New Password:

- (4) Test Engineer: Enter the current password into the 'Old / Admin Password' field. Note, if the password has been forgotten, an Administrator can use their password and generate a new Test Engineer password using this tool.
- (5) Test Engineer: Enter the new password into the two 'New Password' fields.



Test Engineer:

New Engineer:

Old/Admin Password:

New Password:

New Password:

- (6) Test Engineer: Click the 'Create/Update User' button to change the old password to the new password. If successful, the Administration page will be blank.

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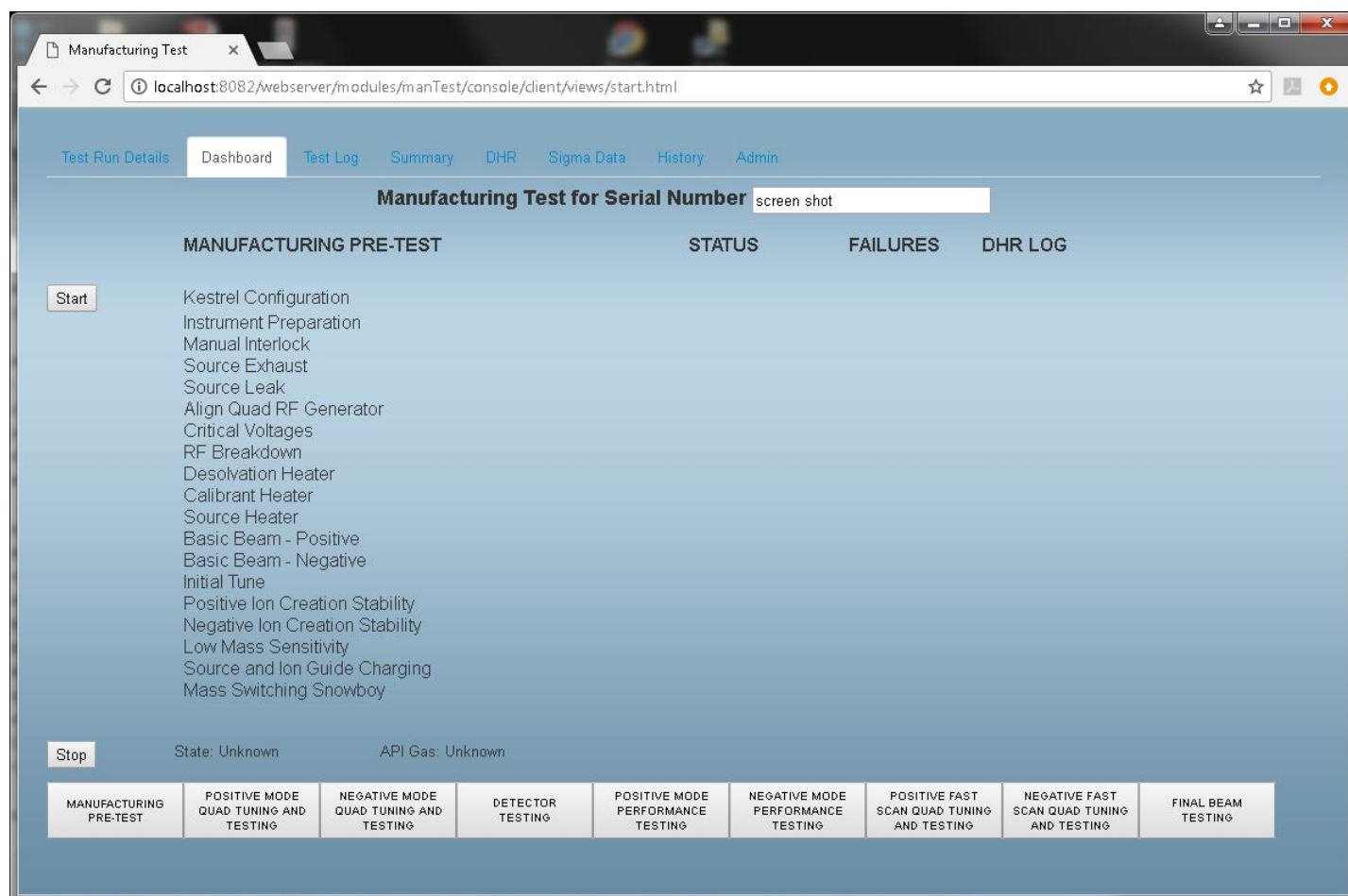
**10. NAVIGATING AROUND AMITS - THE DASHBOARD**

The Dashboard is the main user interface page.

- (1) Double click the icon to start AMITS and open the 'Manufacturing Test Run Details' page.



- (2) Click on the Dashboard tab to open the Dashboard Page.



Example of an untested instrument Dashboard window.

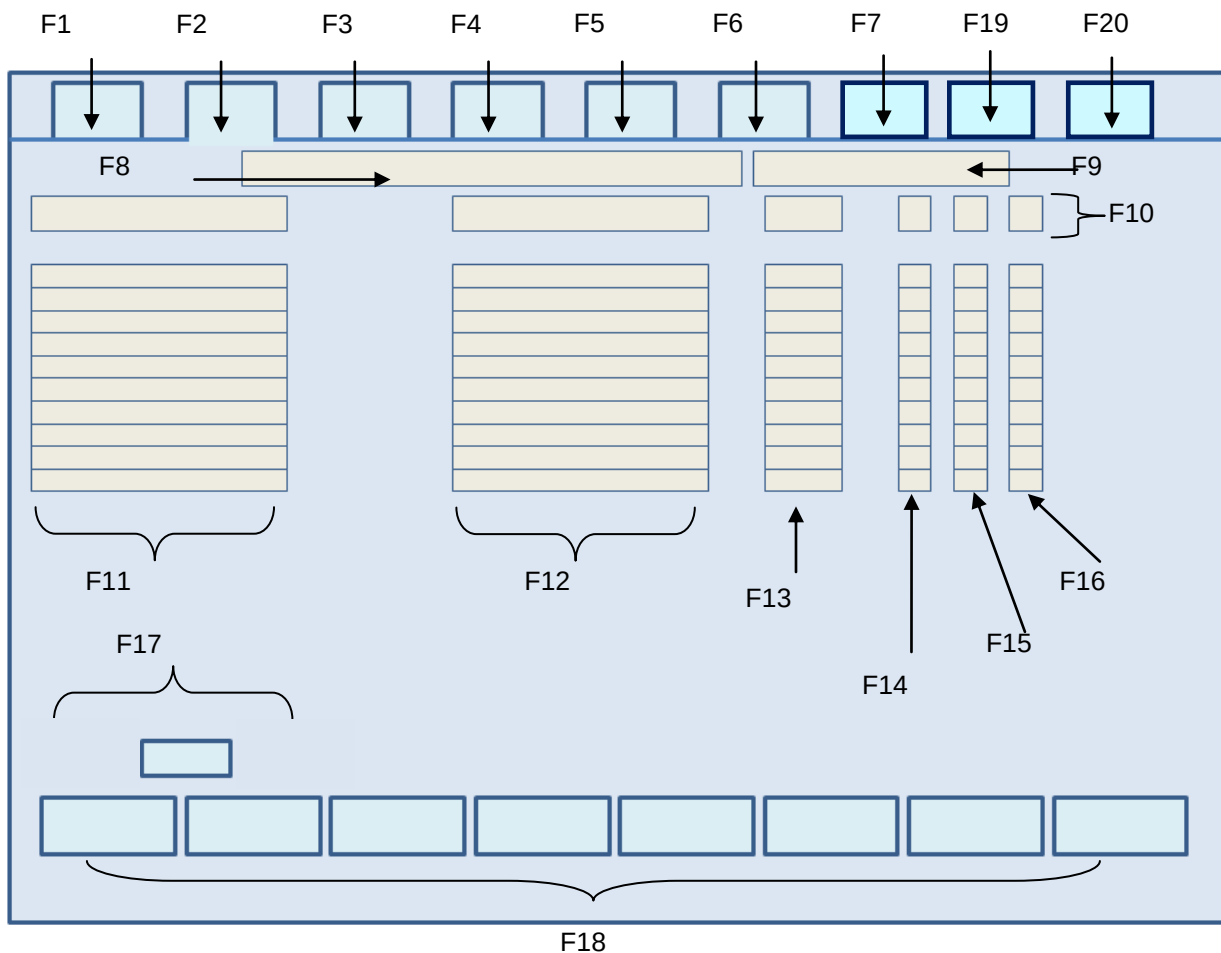
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**10.1. Dashboard Layout**



**Dashboard Function Table**

| ID | Function         | Description                                                                                                 |
|----|------------------|-------------------------------------------------------------------------------------------------------------|
| F1 | Test Run Details | Button to Select Test, and access test run details page                                                     |
| F2 | Dashboard        | Button to open Dashboard page                                                                               |
| F3 | Test Log         | Button to open the <b>Current</b> Test Log page in a “live” format.                                         |
| F4 | Summary          | Button to open DHR Summary for Printing                                                                     |
| F5 | DHR              | Button to open All DHRs in preparation for printing. Will only complete if the test sequence has completed. |
| F6 | SigmaData        | Button to open a representation of the SigmaQuest Data export.                                              |
| F7 | History          | Button to open History Log                                                                                  |

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| ID  | Function                             | Description                                                                                                                                                                                 |
|-----|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| F19 | Admin                                | Button to open Admin Page                                                                                                                                                                   |
| F20 | Configuration                        | Button to open Configuration Tables (visible in PAE Admin mode only)                                                                                                                        |
| F8  | Title Text                           | Description Text                                                                                                                                                                            |
| F9  | Serial Number                        | Text Box displaying instrument serial number. To review old data, enter here the serial number to review the data.                                                                          |
| F10 | Column Titles                        | Descriptive text, that alters with Test Section                                                                                                                                             |
| F11 | Test Module List                     | Test Modules allocated with the Test Section                                                                                                                                                |
| F12 | Test Module Status                   | Status (PASS, FAIL, RUNNING, PENDING, or blank) and if running, a scrolling colour bar indicating the position within the test                                                              |
| F13 | Test Module Failure Count            | Failure count. (failures that stop AMITS)                                                                                                                                                   |
| F14 | Test Module Config link              | Link to access Test Module config table (visible in PAE Admin mode only)                                                                                                                    |
| F15 | Test Module DHR link                 | Button to open only the selected Test Module's DHR report                                                                                                                                   |
| F16 | Test Module Test Log Link            | Button to open only the selected Test Module's Log report                                                                                                                                   |
| F17 | Control Button                       | Stop button – This will stop AMITS by cancelling the current run.                                                                                                                           |
| F18 | Test Section Access Buttons / Status | Test Sections allocated to the manufacturing test. Click these titles to open the Test Section. Includes a colour scheme to indicate current status within the manufacturing test sequence. |

The Dashboard primary functions are:

### Controlling Runs

- To allow all users to start test runs, stop test runs, restart testing from the beginning of the manufacturing test sequence, continue testing from a point of failure. (Refer to section 11, section 13, and section 19)

### Current Test Status

- To allow all users to quickly see where the instrument is within the manufacturing test sequence. (Refer to section 10.2, Colour Codes, PASS, FAIL, RUNNING, and PENDING.)
- To indicate if any tests have failed and if so, how many times. (Refer to section 10.2)

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**Current Test Information**

- To allow all users to access additional information about individual tests. (Refer to sections 15 - DHR, 16 - LOG, 17 – DHR Summary, and 20 Rework History)

**Navigating through Test Sections and Tests**

- To allow users to navigate between each of the main test stages, and review the test information within each sections.

**Review Previously Acquired Test Information**

- To view previously created test projects. (Refer to section 10.5)

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**10.2. Current Test Status - Colour Codes, PASS, FAIL, RUNNING and PENDING.**

The Dashboard is the main user interface page. Its primary function is to allow the user to quickly see where the instrument is within the manufacturing test. It does this by using colour codes.

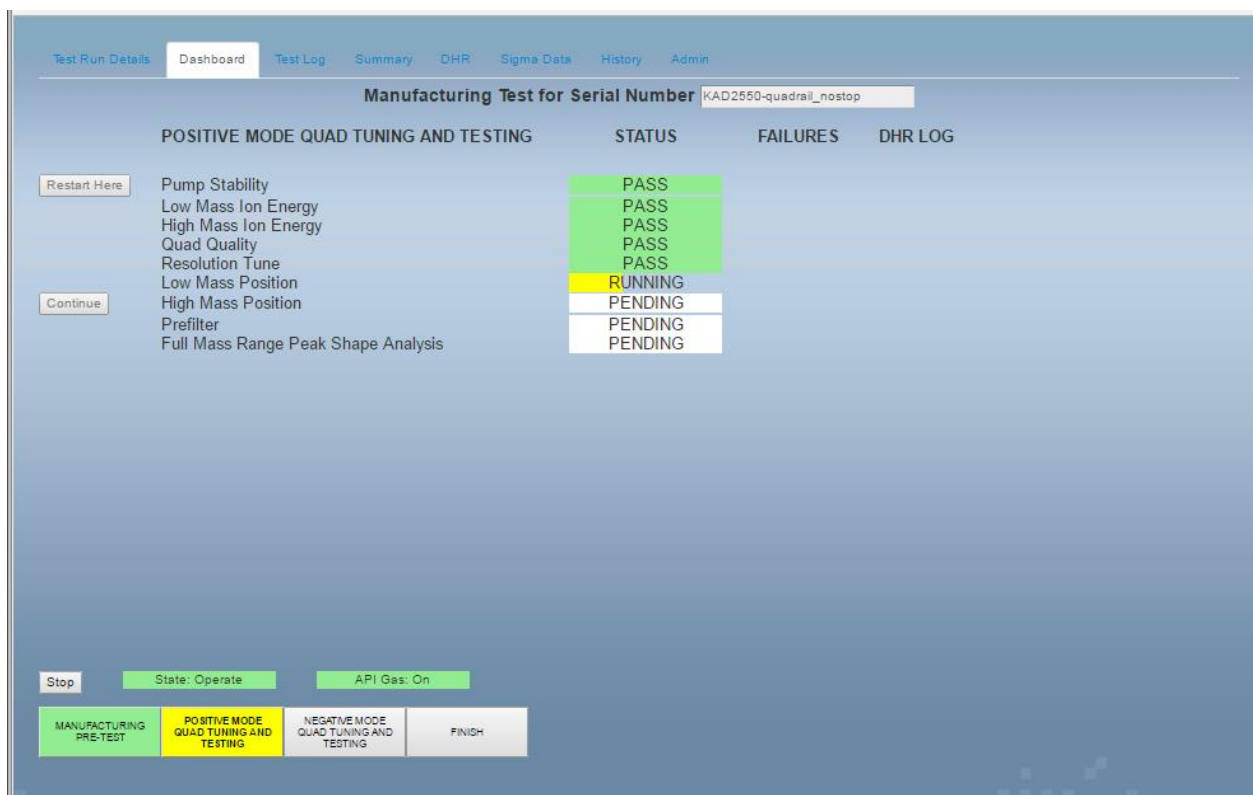
| Background Colour | Text    | Meaning                                                                                                                                                                                                                                                              |
|-------------------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Green             | PASS    | <p>The test has been run and it has passed.</p> <p>The test may be repeated during a tuning cycle. Therefore the PASS may only be temporary until the instrument completes the test section.</p> <p>This colour logic is also used for the test section buttons.</p> |
| Red               | FAIL    | <p>The test has been run and it failed.</p> <p>This stops AMITS. Only a rework action will allow AMITS to be restarted or continued from the point of failure.</p> <p>(Refer to section 13)</p> <p>This colour logic is also used for the test section buttons</p>   |
| Yellow            | RUNNING | <p>The test is currently running.</p> <p>This colour logic is also used for the test section buttons</p>                                                                                                                                                             |
| White             | PENDING | <p>This means this test is dependant on other tests being completed before allocating a PASS or FAIL.</p> <p>This colour scheme is only used on the test modules, NOT on the test sections.</p>                                                                      |
| White             | PASS    | <p>RCA Mode. In RCA mode all the tests will run regardless of the test passing the test specifications. If a test in RCA mode did fail a specification, its status will be PASS with a white background.</p>                                                         |
| Blank             |         | <p>The test has not yet been run</p>                                                                                                                                                                                                                                 |

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**Example of a test sequence, including PASS, RUNNING and PENDING statuses.**

This example shows the Quad rail test sequence, in RCA “No Stop” mode. This test sequence is designed to run through all the Positive Mode Quad Tuning and Testing steps in DC positive mode, and then run through all the tests in DC negative mode. In this way, the DC polarity with the best performance can be selected.

Normally, on a good quad, once all the DC positive test have been run, All the tests will have a PASS status, and the Full Mass Range Peak Shape Analysis result will be PENDING. The tests will then cycle through RUNNING in DC negative mode until the Full Mass Range Peak Shape Analysis test is reached again.

In the example above, DC positive failed the peak shape analysis, and DC neg is being tried. As the test sequence failed in DC positive, all the tests have a pending result.

The High Mass position and Low Mass position are set using a tuning loop, where the effect of one on the other is assessed and tuned until neither improved by any further tuning. This is why Low Mass position can be seen as running, while High Mass Resolution is PENDING.

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**Manufacturing Test for Serial Number** KAD2550-build46

|                              | POSITIVE MODE QUAD TUNING AND TESTING | STATUS | FAILURES | DHR LOG |
|------------------------------|---------------------------------------|--------|----------|---------|
| <a href="#">Restart Here</a> | Pump Stability                        | PASS   |          |         |
|                              | Low Mass Ion Energy                   | PASS   |          |         |
|                              | High Mass Ion Energy                  | PASS   |          |         |
|                              | Quad Quality                          | PASS   |          |         |
|                              | Resolution Tune                       | PASS   |          |         |
|                              | Low Mass Position                     | PASS   |          |         |
|                              | High Mass Position                    | PASS   |          |         |
|                              | Prefilter                             | PASS   |          |         |
| <a href="#">Continue</a>     | Full Mass Range Peak Shape Analysis   | FAIL   | 2        |         |

Stop      State: Unknown      API Gas: Unknown

|                        |                                       |                                       |                  |                                   |                                   |                                            |                                            |                    |
|------------------------|---------------------------------------|---------------------------------------|------------------|-----------------------------------|-----------------------------------|--------------------------------------------|--------------------------------------------|--------------------|
| MANUFACTURING PRE-TEST | POSITIVE MODE QUAD TUNING AND TESTING | NEGATIVE MODE QUAD TUNING AND TESTING | DETECTOR TESTING | POSITIVE MODE PERFORMANCE TESTING | NEGATIVE MODE PERFORMANCE TESTING | POSITIVE FAST SCAN QUAD TUNING AND TESTING | NEGATIVE FAST SCAN QUAD TUNING AND TESTING | FINAL BEAM TESTING |
|------------------------|---------------------------------------|---------------------------------------|------------------|-----------------------------------|-----------------------------------|--------------------------------------------|--------------------------------------------|--------------------|

**Example of a Test Failure. Note that the Column marked “FAILURES” has a number indicating how many times the test has caused AMITS to stop.**

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**10.3. Current Test Information**

Within the Dashboard test matrix are additional fields called DHR and LOG. When clicked they access further information associated only with each sub-test. The information regarding these tools is extensive, and have been given separate sections within this document.

| Field | Description                                                                                                                                                                                                                                                                                                                                              |
|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DHR   | <p>Device History Record. This link opens a summary of the sub test results. It allows the user to quickly access the test results, and look at any rework actions performed if a test had failed.</p> <p>A printed copy of this page will be inserted into the manufacturing test section of the instruments DHR folder.</p> <p>Refer to section 15</p> |
| LOG   | <p>This is a complete log of all the actions the software has performed to run the sub test. It includes tuning values, read back values, calculations and acquisition results such as spectra and chromatograms. It can be printed out if necessary for diagnostic assistance.</p> <p>Refer to section 16</p>                                           |

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**10.4. Navigating through Test Sections and Tests**

Manufacturing Test for the Acquity QDa is broken down into a number of test sections.

- Manufacturing Pre Test – involves Manual assistance
- Positive Mode Quad Tuning and Testing
- Negative Mode Quad Tuning and Testing
- Detector Testing
- Positive Mode Performance Testing
- Negative Mode Performance Testing
- Positive Mode Fast Scan Quad Tuning and Testing
- Negative Mode Fast Scan Quad Tuning and Testing
- Final Beam Testing.

Each test section consists of a number of test modules.

The test section labels on the bottom of the screen allow a user to navigate between each section. If the tests are currently running, the back ground colour of the test section shows which have passed, (Green) or are currently running (Yellow). If AMITS has stopped due to a failure, or by the engineer stopped the tests manually, the back ground colour will be red..

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Test Run Details
Dashboard
Test Log
Summary
DHR
Sigma Data
History
Admin

### Manufacturing Test for Serial Number

|              | MANUFACTURING PRE-TEST          | STATUS         | FAILURES         | DHR LOG |
|--------------|---------------------------------|----------------|------------------|---------|
| Start        | Kestrel Configuration           | PASS           |                  |         |
|              | Instrument Preparation          | PASS           |                  |         |
|              | Manual Interlock                | PASS           |                  |         |
|              | Source Exhaust                  | PASS           |                  |         |
|              | Source Leak                     | PASS           |                  |         |
| Restart Here | Align Quad RF Generator         | PASS           |                  |         |
|              | Critical Voltages               | PASS           |                  |         |
|              | RF Breakdown                    | PASS           |                  |         |
|              | Desolvation Heater              | PASS           |                  |         |
|              | Calibrant Heater                | PASS           |                  |         |
| Restart Here | Source Heater                   | PASS           |                  |         |
|              | Basic Beam - Positive           | PASS           |                  |         |
|              | Basic Beam - Negative           | PASS           |                  |         |
|              | Initial Tune                    | PASS           |                  |         |
|              | Positive Ion Creation Stability | PASS           |                  |         |
|              | Negative Ion Creation Stability | PASS           |                  |         |
|              | Low Mass Sensitivity            | PASS           |                  |         |
|              | Source and Ion Guide Charging   | PASS           |                  |         |
|              | Mass Switching Snowboy          | PASS           |                  |         |
|              | Stop                            | State: Unknown | API Gas: Unknown |         |

MANUFACTURING PRE-TEST
POSITIVE MODE QUAD TUNING AND TESTING
NEGATIVE MODE QUAD TUNING AND TESTING
DETECTOR TESTING
POSITIVE MODE PERFORMANCE TESTING
NEGATIVE MODE PERFORMANCE TESTING
POSITIVE FAST SCAN QUAD TUNING AND TESTING
NEGATIVE FAST SCAN QUAD TUNING AND TESTING
FINAL BEAM TESTING

## 10.5. Review Previously Acquired Test Information

One of the most significant differences between manually testing an instrument using MassLynx, and using AMITS is the location of the active project folder.

MassLynx Project Folders are generated manually by test engineers. Once the testing has been completed, the project folders are manually copied to a shared location on one of the test site's servers.

AMITS generates and appends a project folder 'live' on the site server specified when AMITS was installed.

Viewing this data is simple.

- (1) Double click the icon to start AMITS and open the 'Manufacturing Test Run Details' page.



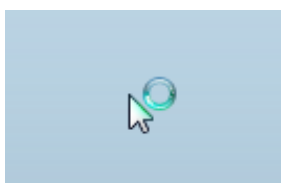
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- (2) Select the product type, and enter the serial number of the tested part into the 'Test Run Details' page.
- (3) Press f5 or click on the Chrome fresh button. This will remove any previous data from the dashboard, and show only the results from the serial number entered.
- (4) Click on the Dashboard tab to open the Dashboard Page.
- (5) It will take AMITS a minute to rebuild the information. During the rebuild, the mouse arrow will turn into a  if it is rolled into the serial number box, or the Windows recycle arrow if the mouse is moved into the main body of the window.



- (6) The record will then display the Statuses when ready .

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**11. QUICK START GUIDE – ACQUITY QDa AMITS FOR NEW INSTRUMENTS, ASSEMBLIES AND SPARES**

- (1) Check that MassLynx is not currently running.
- (2) If testing a new instrument, follow Document [46202](#) TSP- Acquity QDa Automated Manufacturing Test, and connect the Acquity QDa to:
  - Host PC LAN cable
  - Backing Pump Interlock Box Cable
  - Backing Pump Control Cable
  - Backing Pump Vacuum Hose
  - Sample Divert Test Box TB668 Cable
  - Sample Divert Test Box TB668 Sample delivery tube to Probe
  - Power Cable (must be a 13A kettle lead) – and turn on supply.
  - Nitrogen Line (7Bar, 100PSI) – and turn on supply.
  - Source exhaust pipe – must not raise above the level of the outlet on the side of the instrument.
  - Serial Cable (optional for Telnet/Putty access)

If testing a Spares or Assembly item, check the test rig is connected to the above list.

- (3) After checking that the backing pump has power available, turn on the Acquity QDa and allow to pump down and allow the instrument to complete the first automated Source Pressure Test. (Refer to [46202](#) and the use of Telnet EPC, Masslynx or third party software such as Putty to monitor when this process has completed.)



- (4) Start Acquity QDa AMITS by double clicking the  icon located on the desktop. AMITS will open on the Test Run Details Page.
- (5) Complete the Test Run Details::
  - **Product Type.** From the drop down list, select the item being tested.
  - **Serial Number.** For instruments **always** use the following format “KAB1234” – capital Letter, four digit numbers, and no spaces. For Assemblies and Spares **always** use a hyphen (-) instead on a slash (/). i.e. 05-1234
  - **Sample Batch Number, Always** use a hyphen to separate the sample batch serial number details.
  - **Sample Use By Date. Always** use the Waters date format of DD MMM YY
  - **Test Box Number. Always** use a hyphen to separate the test box number from its serial number. i.e. TB668-A. Do not just enter “A”
  - **Test Rig Number.** For instrument testing, re-enter the instrument’s serial number. For Assembly or Spares testing, enter the QDa RIG number, or the serial number of the instrument being used to test the item.

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- **Procedure Document Version.** Enter the TSP document number, and the TSP document version separated by a hyphen. For example, [46202](#) rev 3
- **Production** (Manchester) or **Factory** (Wexford) order number. **Always** use a hyphen to separate any number sequences.

| Manufacturing Test Run Details           |                 |
|------------------------------------------|-----------------|
| Product Type:                            | Acquity_QDaMKII |
| Serial Number:                           | KAD2908_PQ      |
| Acquity QDa Setup Solution Batch Number: | A17-003         |
| Acquity QDa Setup Solution Use By Date:  | 08-FEB-17       |
| Test Box Number:                         | TB668-X         |
| Test Rig Number:                         | KAD2908         |
| Procedure Document Version:              | 46202 v4        |
| Production / Factory Order:              | 123-456         |

Instrument Test Run Details Example.

| Manufacturing Test Run Details           |                          |
|------------------------------------------|--------------------------|
| Product Type:                            | QDaMKII_Detector_Housing |
| Serial Number:                           | 3-05-0579                |
| Acquity QDa Setup Solution Batch Number: | A17-003                  |
| Acquity QDa Setup Solution Use By Date:  | 08-FEB-17                |
| Test Box Number:                         | TB668-X                  |
| Test Rig Number:                         | QDa RIG 2                |
| Procedure Document Version:              | 46202 v4                 |
| Production / Factory Order:              | 123-456                  |

QDa Detector Housing Test Run Details Example

(6) Click on the 'Dashboard' tab.

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- (7) For Instrument, Assemblies or Spares that have not been tested before, click the 'Start' button. A new test item can be identified by every test having no Status values, as in the images below.

Test Run Details | **Dashboard** | Test Log | Summary | DHR | Sigma Data | History | Admin

**Manufacturing Test for Serial Number** KAD3500

| MANUFACTURING PRE-TEST                                                                                                                                                                                                                                                                                                                                                                                                                                                     | STATUS | FAILURES | DHR LOG |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|----------|---------|
| <b>Start</b><br>Kestrel Configuration<br>Instrument Preparation<br>Manual Interlock<br>Source Exhaust<br>Source Leak<br>Align Quad RF Generator<br>Critical Voltages<br>RF Breakdown<br>Desolvation Heater<br>Calibrant Heater<br>Source Heater<br>Basic Beam - Positive<br>Basic Beam - Negative<br>Initial Tune<br>Positive Ion Creation Stability<br>Negative Ion Creation Stability<br>Low Mass Sensitivity<br>Source and Ion Guide Charging<br>Mass Switching Snowboy |        |          |         |

**Stop**      State: Unknown      API Gas: Unknown

|                        |                                       |                                       |                  |                                   |                                   |                                            |                                            |                    |
|------------------------|---------------------------------------|---------------------------------------|------------------|-----------------------------------|-----------------------------------|--------------------------------------------|--------------------------------------------|--------------------|
| MANUFACTURING PRE-TEST | POSITIVE MODE QUAD TUNING AND TESTING | NEGATIVE MODE QUAD TUNING AND TESTING | DETECTOR TESTING | POSITIVE MODE PERFORMANCE TESTING | NEGATIVE MODE PERFORMANCE TESTING | POSITIVE FAST SCAN QUAD TUNING AND TESTING | NEGATIVE FAST SCAN QUAD TUNING AND TESTING | FINAL BEAM TESTING |
|------------------------|---------------------------------------|---------------------------------------|------------------|-----------------------------------|-----------------------------------|--------------------------------------------|--------------------------------------------|--------------------|

Example of a new instrument test dashboard

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[Test Run Details](#)
[Dashboard](#)
[Test Log](#)
[Summary](#)
[DHR](#)
[Sigma Data](#)
[History](#)
[Admin](#)

**Manufacturing Test for Serial Number** 06-05-0579

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | MANUFACTURING PRE-TEST            | STATUS                                           | FAILURES                                         | DHR LOG                     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|--------------------------------------------------|--------------------------------------------------|-----------------------------|
| <div>Start</div> <div>                     Kestrel Configuration<br/>                     Instrument Preparation<br/>                     Align Quad RF Generator<br/>                     Critical Voltages<br/>                     RF Breakdown<br/>                     Basic Beam - Positive<br/>                     Basic Beam - Negative<br/>                     Initial Tune<br/>                     Positive Ion Creation Stability<br/>                     Negative Ion Creation Stability<br/>                     Mass Switching Snowboy                 </div> |                                   |                                                  |                                                  |                             |
| <div>Stop</div> <div>State: Unknown      API Gas: Unknown</div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                   |                                                  |                                                  |                             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <div>MANUFACTURING PRE-TEST</div> | <div>POSITIVE MODE QUAD TUNING AND TESTING</div> | <div>NEGATIVE MODE QUAD TUNING AND TESTING</div> | <div>DETECTOR TESTING</div> |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <div>FINISH</div>                 |                                                  |                                                  |                             |

Example of a new Detector Housing Test Dashboard.

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- (8) If it is a new untested serial number, AMITS will request the Test Engineer name and their password before starting the test sequence. A test engineer will only be given an account once they have reviewed this document to the satisfaction of a senior engineer or PAE. An AMITS administrator will then create a user account and allow the engineer to create their own password.
- (9) AMITS also asks if the engineer wishes to perform System Status Tests before starting the AMITS test sequence. Part of the system status checks is an optional time delay. Refer to section 24.

- (10) The System Status Tool checks a range of known system failure modes before starting or restarting the test record. It takes less than a minute to run. The tests capture some of the more annoying AMITS test failure modes associated with the system under test. The checks include:

- Checks include:
- Link to Data Server
- MassLynx presence
- Health Check configuration
- DHCP and Water File Services (Host PC performance and link)
- AMITS status ("Busy")
- Pump Down Status
- API Gas Status
- AMITS control over the instrument (Instrument status)

- (11) The tool can be deselected whenever a test sequence is started or restarted. However, it is recommended to always run it

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**Enter Name**

Test Engineer: UKPLMPSL Password:

☒ Would you like to run the system status tests first?

MassLynx and Telnet must be shut down

**Enter Rework Action**

Test Engineer: UKPLMPSL Password:

☒ Would you like to run the system status tests first?

Rework Action:

MassLynx and Telnet must be shut down

- (12) If the status tool stops a test run from restarting, the Rework Action is not saved. This will mean the engineer has to re-enter the rework action when the engineer is ready to rerun the status tests. It is advisable to copy any lengthy rework actions before starting a test run.
- (13) If the password is not accepted, AMITS will not start the test sequence and return to the Dashboard page.
- (14) If a check fails, AMITS suggests a rework action most likely to fix the problem.

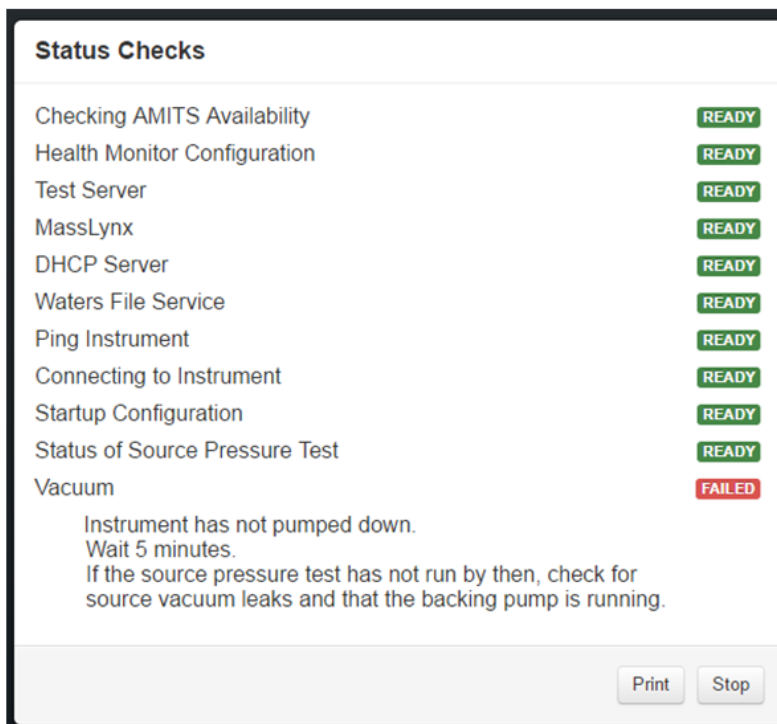
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For example, if the vacuum status fails.



(15) Once the Status Checks have been completed, and no time delay has been selected, Acquity QDa AMITS will then start running through the tests found within each of the test sections on the Dashboard: The tests that are run will depend on the assembly or Spares item selected in the Test Run Details page. The test **sections** available are:

- Manufacturing Pre Test – (involves some Manual assistance)
- Positive Mode Quad Tuning and Testing
- Negative Mode Quad Tuning and Testing
- Detector Testing
- Positive Mode Performance Testing
- Negative Mode Performance Testing
- Positive Mode Fast Scan Quad Tuning and Testing
- Negative Mode Fast Scan Quad Tuning and Testing
- Final Beam Testing.

(16) Refer to Section 10 regarding using the Dashboard to access test results.

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(17) Certain tests within the first test section (Manufacturing Pre Test) require manual assistance. The messages sent by AMITS during these tests are reviewed within Section 9 of this document.

(18) Once the manual tests have been completed, AMITS can be left to complete the test sequence, or to stop once a test fails.

(19) If the instrument fails a test and stops AMITS, refer to:

- Section 16 regarding analysing the Log Record to help diagnose the fault
- [46202](#) for the rework matrix regarding whether a test needs to be restarted or continued based on the rework action performed,
- Section 19, regarding how to continue using AMITS after a rework action.

(20) Once AMITS has completed testing **an instrument**, refer to:

- [46202](#) for the final sign off procedure
- Section 15 regarding DHR review and print off, and Section 17 regarding the DHR Summary and print off .

This will complete the Automated testing of the Acquity QDa.

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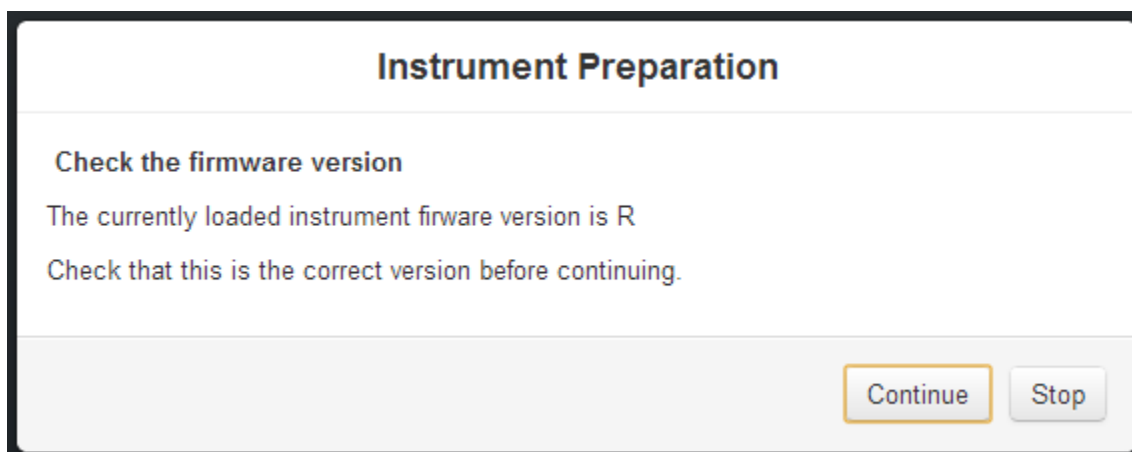
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## 12. TESTS THAT REQUIRE MANUAL ASSISTANCE

### Instrument Preparation:

- (1) AMITS first removes any previous IP addresses from the host PC. This prevents IP Address saturation. If AMITS is unable to stop or restart the DHCP service on the host PC, it will stop the testing process. The host PC usually requires to be rebooted in these circumstances.
- (2) Once the host PC has been refreshed and communications with the instrument have been established, AMITS is programmed to record the current firmware version. Before it does this, the engineer has to confirm that the firmware is the correct value.

### Firmware Confirmation.



- (3) If this is not the latest value, AMITS should be stopped and the latest firmware installed using MS SWAT. Once the firmware has been installed, click on the 'Continue Tests' button and record that the firmware has been updated within the instrument log book. The correct version should now be displayed in the window above.

### Manual Interlock:

- (4) Manufacturing Pre-Test – Manual assistance is required during the manual Interlock, Source Exhaust and Source Leak tests to prove the safety interlocks function. Whenever an engineer's assistance is required, AMITS will post a command window with instructions.

**Status Tool Note:** The test will fail if the instrument can not go into operate due to instrument failure. This could be due to AMITS being started before the instrument has fully pumped down and completed a number of firmware tasks – including a preliminary source pressure test. It will also fail if the background nitrogen pressure in the source is too high. The status tools will help capture these failure types before the AMITS tests are started.

Before starting an AMITS test sequence, MassLynx could also be used to confirm the source pressure tests have been completed, by checking that the instrument can go into operate. Operate is only achieved if the API gas can be activated, which in turn can only be turned on if the instrument has passed its preliminary source pressure test, and has not got a

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API failure.

If MassLynx is used to confirm the instrument is ready for AMITS, it must be shut down before starting an AMITS test sequence. This is because a communication related conflict can occur if both software packages are controlling the instrument at the same time.

### Manual Interlock

**Open front**

Open the front moulding, or remove the magnet from the front moulding sensor, or remove the link from J32.

This test checks that the instrument switches out of operate when it recognises the source front moulding has been opened.

### Manual Interlock

**Disconnect exhaust and close front**

Disconnect the source exhaust gas pipe from the side of the instrument.

Close the front moulding, or refit the magnet from the front moulding sensor, or complete the link in J32.

**Title: Acquity QDa Reference Manual**

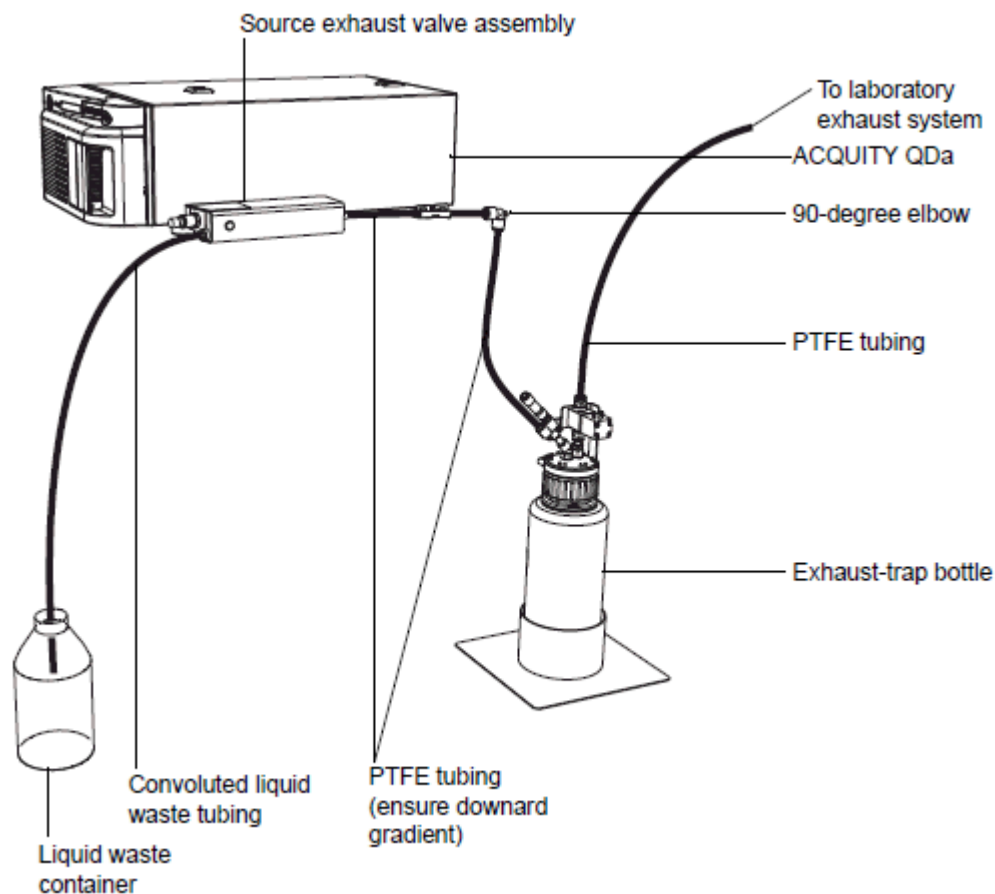
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All pre-KAD QDa test rigs and instruments must have a Source Exhaust Valve Assembly fitted to the exhaust port on the side of the instrument. MKI instruments have the arrangement depicted below.

MKII KAD models or later are fitted with an internal source exhaust assembly.



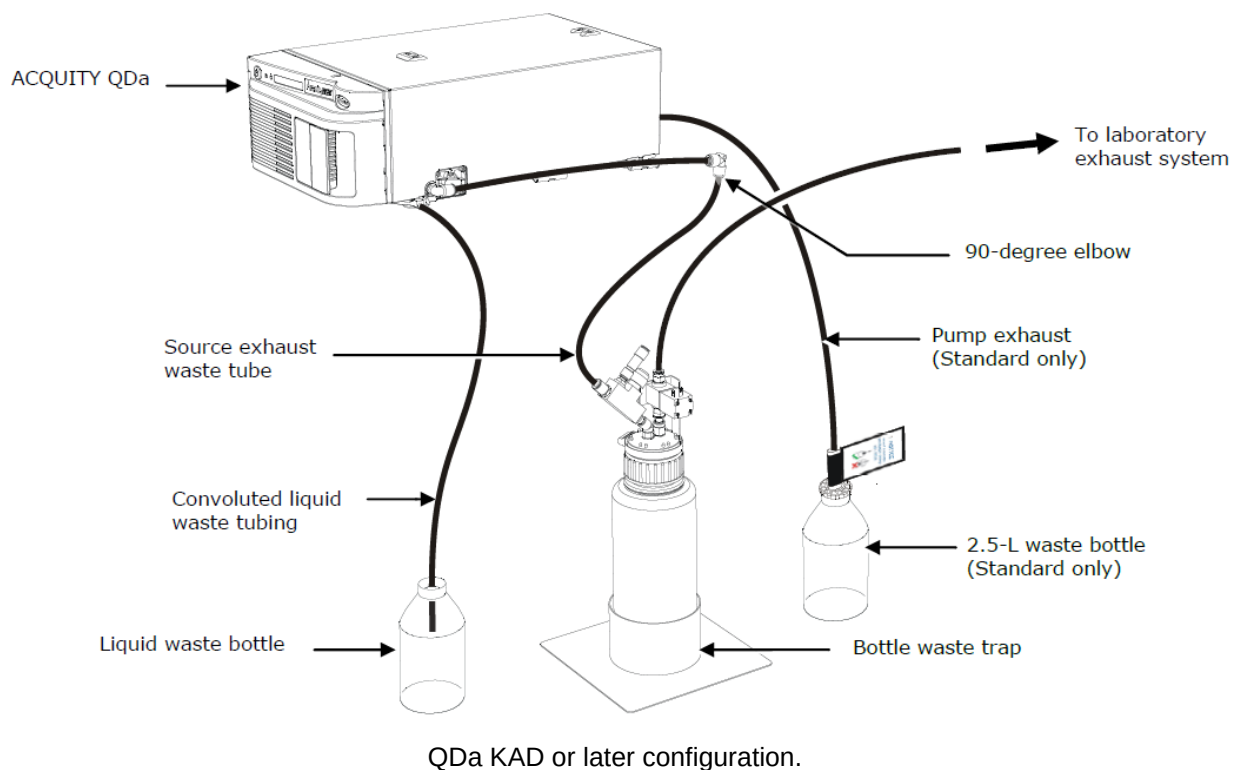
Pre KAD configuration.

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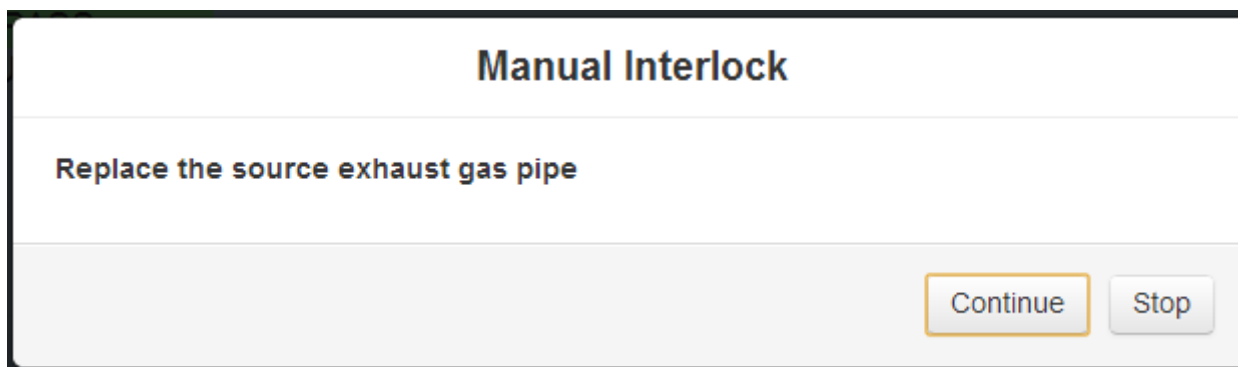
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The source pressure test confirms the instrument recognises a source leak either within the instrument, or through a Source Exhaust Valve Assembly.

The exhaust PTFE tubing should be removed from the rear of the Source Exhaust Valve Assembly in this test.

Once the continue button is pressed, the source pressure test will be run – but will not be able to pass. The test will take up to 3.5 minutes to complete.



The engineer should refit the PTFE tubing to the Source Exhaust Valve Assembly and press the continue button.

The instrument will then perform a source pressure test to reset the interlock status to a pass state. (Assuming there is no leak present).

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**Source Exhaust:**

### Source Exhaust

**Partly close exhaust.**

Check that the source waste bottle is attached to the instrument.

After pressing <Continue>, partly close the test bay exhaust or crimp the exhaust tube.

After the continue button has been pressed, the software will wait 30 seconds for the engineer to increase the back pressure in the source exhaust system to greater than 15mBar, but less than 150mBar. If this action is not performed, AMITS will fail the instrument for not recognising that the source pressure has exceeded 15mBar.

### Source Exhaust

**Fully close exhaust.**

Fully close the test bay exhaust or crimp the exhaust tube.

After the continue button has been pressed, the software will wait 30 seconds for the engineer to fully close the pipe. If this action is not performed, AMITS will fail the instrument for not recognising that the source pressure has exceeded 150mBar.

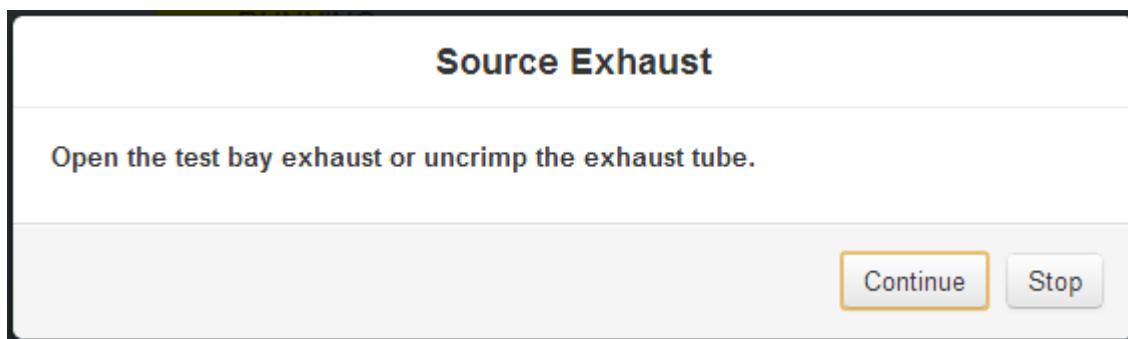
If the engineer accidentally passed the 150mBar limit during the “Partly close exhaust” test step, the software will recognise this and pass the test.

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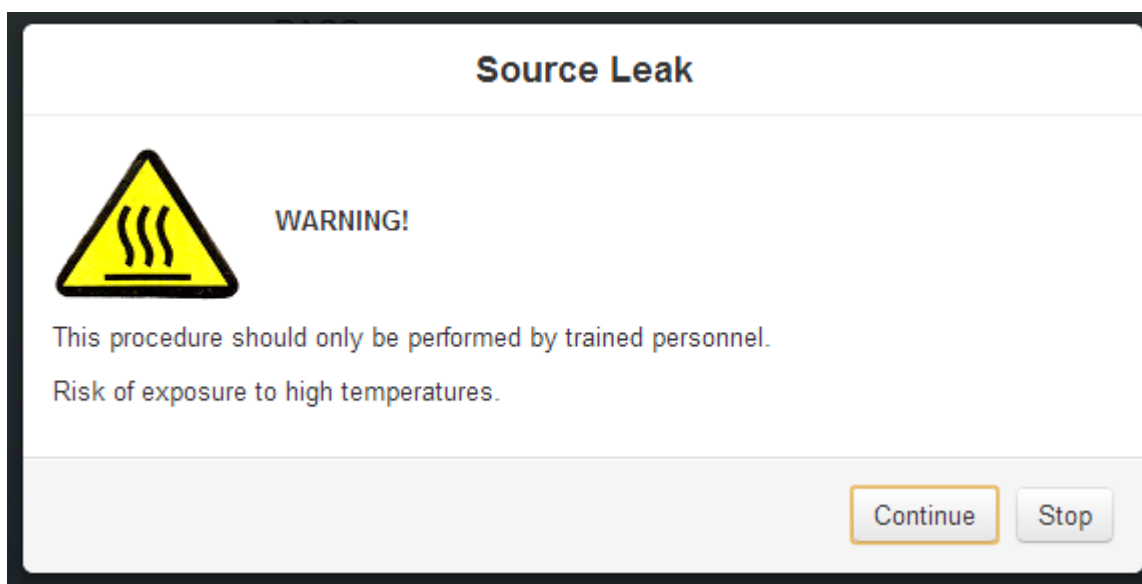


Once the engineer restores a clear path for the source exhaust, and presses the “Continue” button, the instrument will then perform a source pressure test to reset the interlock status to a pass state. (Assuming there is no leak present).

### Source Leak Test

The instrument has already performed this test a number of times by this point. This time the test is designed to confirm that the seal between the source enclosure and the analyser body is robust enough to be broken and resealed.

Follow the instructions delivered by AMITS.



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### Source Leak



Open front

Open the front moulding, or remove the magnet from the front moulding sensor, or remove the link from J32.

### Source Leak



Inspect enclosure

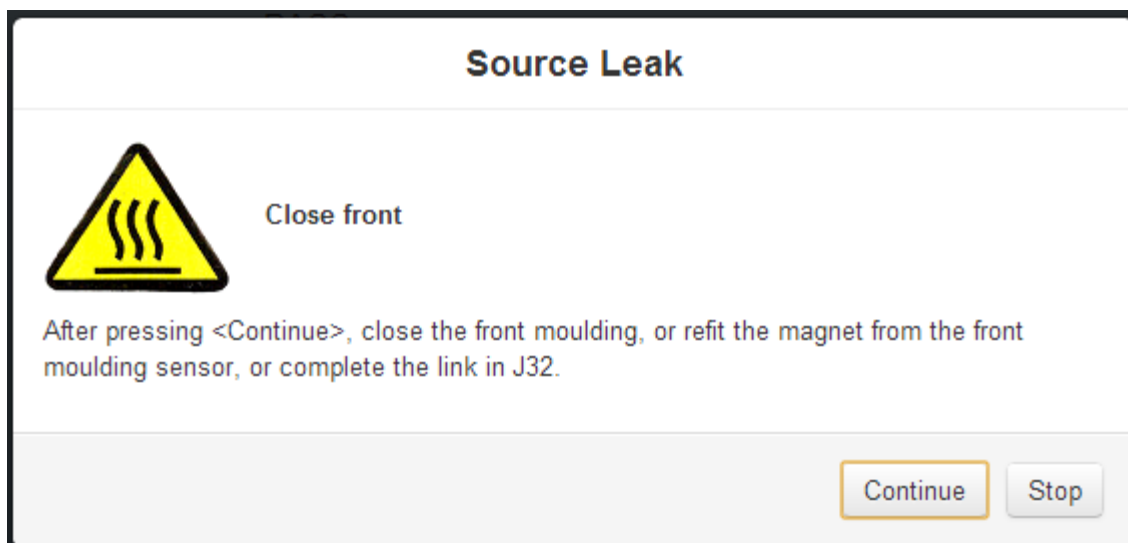
Remove the source enclosure, inspect the seals for any signs of damage, and refit the source enclosure

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The instrument will then perform a source leak test to confirm the instrument can still hold pressure.

- (5) After this point, the software no longer requires engineer assistance and can be left to test the instrument. Average test time is approximately 6.5 hours.
  - (6) **TIME DELAY** – it is recommended that if a delay time is required to dry the calibration pin assembly, the test sequence is stopped at RF Align. It can be immediately restarted, but using a suitable time delay.
- If a test fails, refer to [46202](#) TSP Acquity QDa Automated Manufacturing Test, and section 16 within this document regarding how to use AMITS QDa Log Records and the History Log to recognize possible causes of AMIT error messages. Also refer to section 19 regarding restarting tests.

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**13. QUICK START GUIDE – ACQUITY QDa AMITS FOR PREVIOUSLY TESTED INSTRUMENTS**

1. Check that MassLynx is not currently running.
2. Follow Document [46202](#) TSP- Acquity QDa Automated Manufacturing Test, and confirm the Acquity QDa is linked to:
  - Host PC LAN cable
  - Backing Pump Interlock Box Cable
  - Backing Pump Control Cable
  - Backing Pump Vacuum Hose
  - Sample Divert Test Box TB668 Cable
  - Sample Divert Test Box TB668 Sample delivery tube to Probe
  - Power Cable (must be a 13A kettle lead) – and turn on supply.
  - Nitrogen Line (7Bar, 100PSI) – and turn on supply.
  - Source exhaust pipe – must not raise above the level of the outlet on the side of the instrument.
  - Serial Cable (optional for Telnet/Putty access)
3. After checking that the backing pump has power available, turn on the Acquity QDa and allow to pump down. Allow the instrument to complete the first automated Source Pressure Test. (Refer to 46202 and the use of Telnet EPC, Masslynx or third party software such as Putty to monitor when this process has completed.



4. Start Acquity QDa AMITS by double clicking the  icon located on the desktop. AMITS will open on the Test Run Details Page with the last run serial number displayed.
5. Select the product type being tested and enter the serial number of the item to be tested.

**REFRESH THE WEB PAGE BY PRESSING F5 OR USING THE CHROME REFRESH BUTTON. THIS WILL ENSURE THE RECORD YOU ARE VIEWING IS FOR THE SERIAL NUMBER YOU WANT TO TEST.**

6. Once the web page has refreshed, complete the rest of the Test Run Details. See Section 12 for screen shots.
7. Click on the 'Dashboard' tab.
8. AMITS has to first populate its self with previously acquired data. This can take up to 3 minutes depending on the complexity of the test record, and the quality of the connection to server where the data is stored.

**YOU MUST WAIT UNTIL THE RECORD IS POPULATED UNTIL ATTEMPTING TO APPEND IT.**

Once the Manufacturing Pre Test tests are listed and the STATUS column has PASS, FAIL, OR PENDING displayed, the record is ready to be appended to. This assumes step 5 **HAS** been followed.

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Test Run Details
Dashboard
Test Log
Summary
DHR
Sigma Data
History
Admin

Manufacturing Test for Serial Number
KAB0435K

| MANUFACTURING PRE-TEST |                                 | STATUS | FAILURES | DHR LOG |
|------------------------|---------------------------------|--------|----------|---------|
| Start                  | Kestrel Configuration           | PASS   |          |         |
| Continue               | Instrument Preparation          | FAIL   | 1        |         |
|                        | Manual Interlock                |        |          |         |
|                        | Source Exhaust                  |        |          |         |
|                        | Source Leak                     |        |          |         |
|                        | Align Quad RF Generator         |        |          |         |
|                        | Critical Voltages               |        |          |         |
|                        | RF Breakdown                    |        |          |         |
|                        | Desolvation Heater              |        |          |         |
|                        | Calibrant Heater                |        |          |         |
|                        | Source Heater                   |        |          |         |
|                        | Basic Beam - Positive           |        |          |         |
|                        | Basic Beam - Negative           |        |          |         |
|                        | Positive Ion Creation Stability |        |          |         |
|                        | Negative Ion Creation Stability |        |          |         |
|                        | Source and Ion Guide Charging   |        |          |         |
|                        | Mass Switching Snowboy          |        |          |         |
|                        | Low Mass Sensitivity            |        |          |         |
| Stop                   |                                 |        |          |         |

MANUFACTURING PRE-TEST
POSITIVE MODE QUAD TUNING AND TESTING
NEGATIVE MODE QUAD TUNING AND TESTING
DETECTOR TESTING
POSITIVE MODE PERFORMANCE TESTING
NEGATIVE MODE PERFORMANCE TESTING
POSITIVE FAST SCAN QUAD TUNING AND TESTING
NEGATIVE FAST SCAN QUAD TUNING AND TESTING
INTERNAL CALIBRANT TESTING

Example of an incomplete Instrument test sequence

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| MANUFACTURING PRE-TEST                                                                                                                                                                         |                                 | STATUS | FAILURES | DHR LOG |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|--------|----------|---------|
| Start                                                                                                                                                                                          | Kestrel Configuration           | PASS   | 1        |         |
|                                                                                                                                                                                                | Instrument Preparation          | PASS   | 2        |         |
|                                                                                                                                                                                                | Align Quad RF Generator         | PASS   |          |         |
|                                                                                                                                                                                                | Critical Voltages               | PASS   |          |         |
|                                                                                                                                                                                                | RF Breakdown                    | PASS   |          |         |
|                                                                                                                                                                                                | Basic Beam - Positive           | PASS   |          |         |
|                                                                                                                                                                                                | Basic Beam - Negative           | PASS   |          |         |
|                                                                                                                                                                                                | Positive Ion Creation Stability | PASS   |          |         |
|                                                                                                                                                                                                | Negative Ion Creation Stability | PASS   |          |         |
|                                                                                                                                                                                                | Mass Switching Snowboy          | PASS   |          |         |
| Stop                                                                                                                                                                                           |                                 |        |          |         |
| <div> <div>MANUFACTURING PRE-TEST</div> <div>POSITIVE MODE QUAD TUNING AND TESTING</div> <div>NEGATIVE MODE QUAD TUNING AND TESTING</div> <div>DETECTOR TESTING</div> <div>FINISH</div> </div> |                                 |        |          |         |

Example of an incomplete Detector Housing test sequence

9. For previously tested instruments, there are a number of ways to restart or continue the test sequence, depending on the failure mode, and the rework action required to fix the failure mode. Selecting the correct action is made by using the retest / continue test flow charts. These are stored within [46202](#) and in Section 19 of this document.
10. Once the restart or continue test option has been selected, AMITS will request the Test Engineer name, their password, and details regarding the Rework Action/s performed to justify restarting test using AMITS.

**SOME KIND OF INVESTIGATION MUST HAVE TAKEN PLACE. IT IS UNACCEPTABLE TO REPEAT A TEST PURELY BECAUSE IT HAS FAILED, UNLESS THE SAMPLE DELIVERY WAS THE SUSPECTED CAUSE OF FAILURE.**

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### Enter Rework Action

Test Engineer:  Password:

☒ Would you like to run the system status tests first?

Minutes for calibrant pin preparation:

Rework Action:

MassLynx and Telnet must be shut down OK

If the password is not accepted, or the rework action left blank, AMITS will not start the test sequence and return to the Dashboard page. **NOTE: to abandon a rework action window, press the ESCAPE button.**

**THIS DOES NOT REPLACE THE HISTORY SHEET WITHIN THE LOGBOOK. THE HISTORY SHEET IS THE AUDITABLE 'QUALITY RECORD' FOR THE INSTRUMENT.**

11. AMITS will then continue to test the instrument using the restart or continue option selected from the [46202](#) flow charts. If a **time delay** was selected, AMITS will not run until the countdown clock has completed.

If a test fails, refer to [46202](#) TSP Acquity QDa Automated Manufacturing Test, and section 16 within this document regarding how to use AMITS QDa Log Records to help diagnose a cause of failure.

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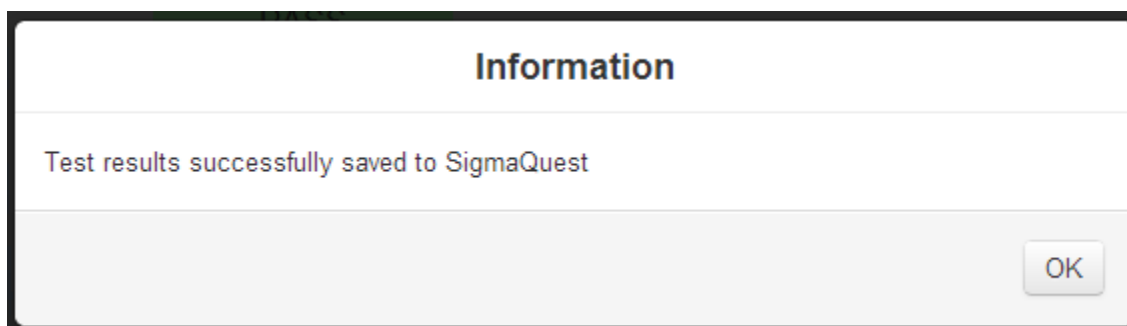
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**14. COMPLETING TEST USING AMITS**

- (1) Once testing has completed, the following message will be displayed.



- (2) Clicking the OK button will then send a copy of the test record to SigmaSure..  
Refer to Section 18 regarding the use of SigmaSure

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**15. DEVICE HISTORY RECORD REVIEW**

- (1) Refer to [46202](#) TSP – Acquity QDa Automated Manufacturing Test Procedure regarding the DHR review.

**15.1. How to view individual DHR reports**

- (2) Select the Test Section that contains the test module of interest.
- (3) Roll the mouse over the space in line with the Column Header “DHR” and the Test Module of interest. The space will be highlighted as well as the test name.

Test Run Details | Dashboard | Test Log | Summary | DHR | Sigma Data | History | Admin

**Manufacturing Test for Serial Number** KAD2907\_PQ

|                              | POSITIVE MODE QUAD TUNING AND TESTING | STATUS | FAILURES | DHR LOG |
|------------------------------|---------------------------------------|--------|----------|---------|
| <a href="#">Restart Here</a> | Pump Stability                        | PASS   |          |         |
|                              | Low Mass Ion Energy                   | PASS   |          |         |
|                              | High Mass Ion Energy                  | PASS   |          |         |
|                              | Quad Quality                          | PASS   |          |         |
|                              | Resolution Tune                       | PASS   |          |         |
|                              | Low Mass Position                     | PASS   |          |         |
|                              | High Mass Position                    | PASS   |          |         |
|                              | Prefilter                             | PASS   |          |         |
| <a href="#">Continue</a>     | Full Mass Range Peak Shape Analysis   | FAIL   | 1        |         |

Stop State: Unknown API Gas: Unknown

MANUFACTURING PRE-TEST | POSITIVE MODE QUAD TUNING AND TESTING | NEGATIVE MODE QUAD TUNING AND TESTING | DETECTOR TESTING | POSITIVE MODE PERFORMANCE TESTING | NEGATIVE MODE PERFORMANCE TESTING | POSITIVE FAST SCAN QUAD TUNING AND TESTING | NEGATIVE FAST SCAN QUAD TUNING AND TESTING | FINAL BEAM TESTING

- (4) Click the space to open the test’s DHR report.

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[Test Run Details](#)
[Dashboard](#)
[Test Log](#)
[Summary](#)
[DHR](#)
[Sigma Data](#)
[History](#)
[Admin](#)

[Print](#)
**Device History Record for Serial Number KAD2907\_PQ 24 Jan 2017**

**POSITIVE MODE QUAD TUNING AND TESTING**  
**Full Mass Range Peak Shape Analysis**

Status: FAIL Failures: 1

Product Type: Acquity\_QDaMKII  
 Product Number: 186008511  
 Serial Number: KAD2907\_PQ  
 Production / Factory Order: N/A  
 Software Version: Acquity QDa MKII AMITS V3.1  
 Test Run Number: 4  
 Test Engineer: UKPLMPSL  
 Test Date: Tue Jan 24 2017 18:51:33 GMT+0000 (GMT Standard Time)  
 Acquity QDa Setup Solution Batch Number: A17-003  
 Acquity QDa Setup Solution Use By Date: 08-FEB-2017  
 Test Box Number: TB668-X  
 Test Rig Number: KAD2899  
 Station Name: MM5159  
 Procedure Document Version: 46202 v4

DC Polarity: positive

pos DCpos User Low Mass Resolution: 0.0000 (sf: 5)  
 pos DCpos Low Mass Resolution: 0.49268 (sf: 5)  
 pos DCpos Low Mass Position: 0.79565 (sf: 5)  
 pos DCpos User High Mass Resolution: 0.0000 (sf: 5)  
 pos DCpos High Mass Resolution: -9.4514 (sf: 5)  
 pos DCpos High Mass Position: -2.8584 (sf: 5)  
 pos DCpos Resolution Linearity: 64.639 (sf: 5)  
 pos DCpos Ion Energy: -0.82979 (sf: 5)  
 pos DCpos High Mass Ion Energy: 0.16640 (sf: 5)

74.10Da Peak Assessment (C4H11NH)

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## 15.2. DHR Structure

The DHR report is split into the following sections:

- Test Name - Test Section, and Test Module Name
- Test Status - PASS or FAIL, and a note regarding the number of failures where AMITS was stopped when running this test.
- Test Header - All the **latest** test details, including those captured through the Test Run Details page. This includes:
  - Product Type
  - Product Part Number
  - Serial Number
  - Production / Factory Order number
  - Software Version
  - Current test sequence run number for this test.
  - Test Engineer who started the current test sequence run number
  - Test Date and Time when the test was started
  - Sample Batch Number
  - Sample Use By Date
  - Test Box Number
  - Test Rig Number
  - Station Name (Host PC name)
  - Procedure document number
- Test Result - The test result information, including any tuning values, spectra or chromatographic data and reference to any lower / upper specification limits.
- Test footer - times, Rework Log information associated with restarting the test after a failure. Test and the test result (Pass, Fail, Abandoned).

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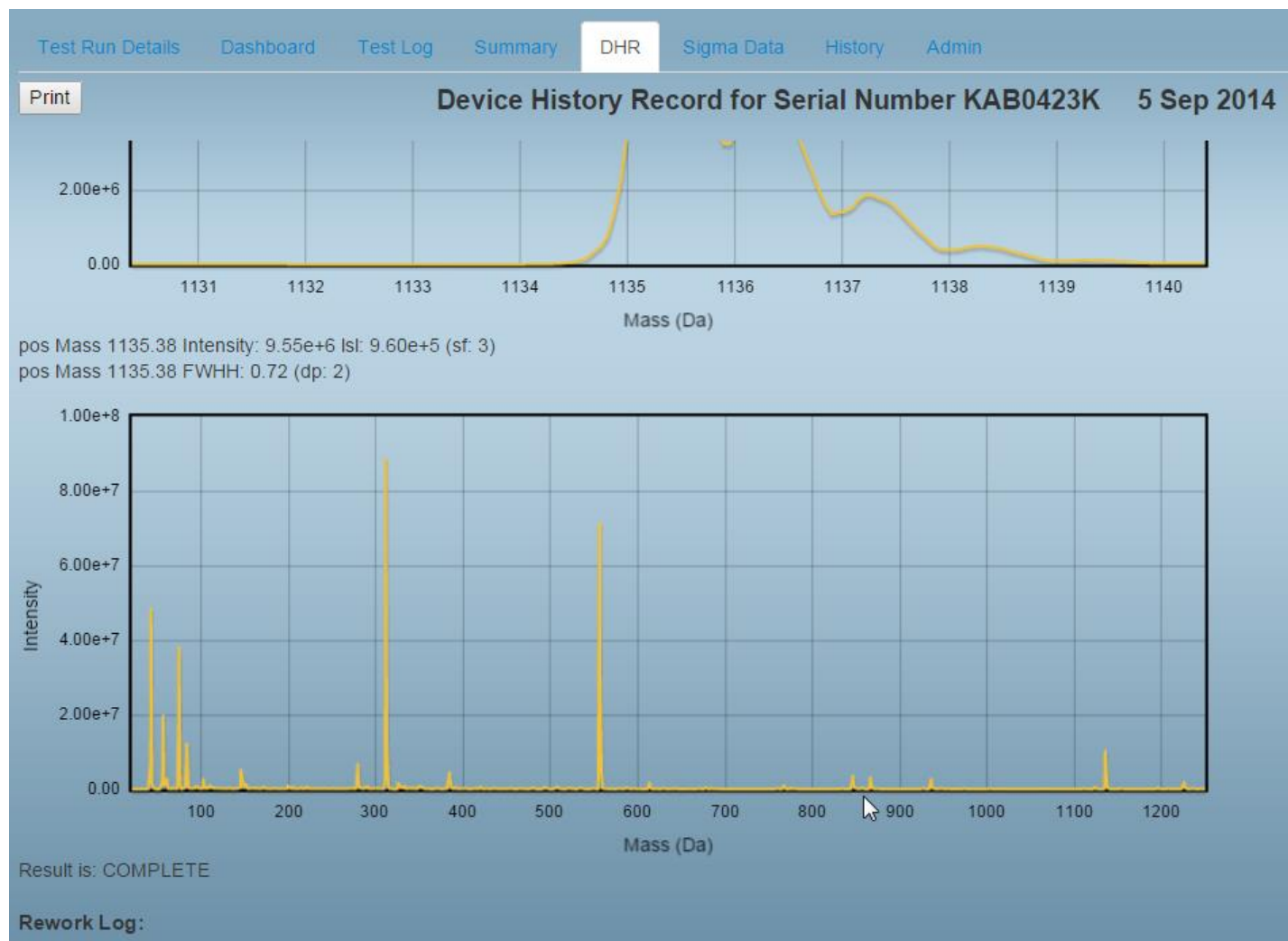
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## 15.3. Interactive Plots

The plots within the DHR report can be interacted with if using a mouse with a central roll button.

- (1) **To Zoom In.** Place the cursor on the detail of interest. In the example below, it will be some peaks at roughly 850Da. For details such as peaks it is important to place the cursor below the horizontal axis line, but above the scale numbering to prevent zooming into just the peak top. For all other plots, just point at the detail of interest and zoom.



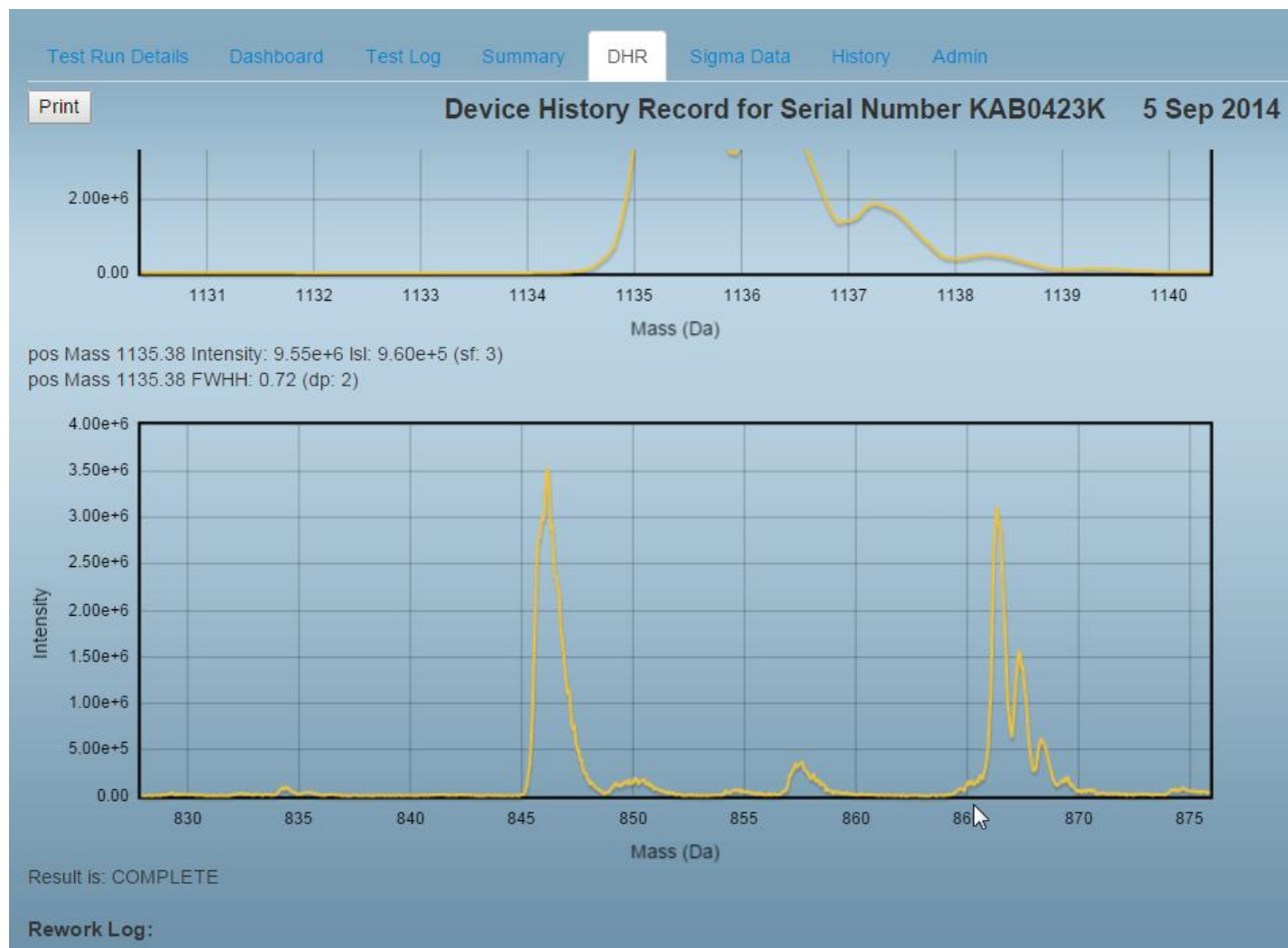
- (2) Roll the scroll wheel forward (finger away from you) until the feature has zoomed in to the required amount.

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- (3) **To Zoom Out** – For partial zoom out, roll the scroll wheel backwards (draw the finger back toward you).
- (4) **To Reset Zoom** – This is not possible to use the mouse for this function with the DHR report, only with the Log Page. Select the Dashboard tab and return to the DHR Report to reset the zoom.

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## 15.4. Example DHR Report

Below is an example of a printed DHR for the Positive ionization mode, Quad Tuning and Testing – Full mass peak shape analysis. Printing a record from a single test would be used for diagnostic purposes only, i.e. to show to other engineers for advice.

12/11/2014

Device History Record KAB0423K - POSITIVE MODE QUAD TUNING AND TESTING - Full Mass Range Peak Shape Analysis

**Device History Record for Serial Number KAB0423K 5 Sep 2014**

**POSITIVE MODE QUAD TUNING AND TESTING**  
**Full Mass Range Peak Shape Analysis**

Status: PASS

Product Type: Acquity\_QDa  
Product Number: 186006511  
Serial Number: KAB0423K  
Production / Factory Order: 481709  
Software Version: Acquity QDa AMITS V2.0  
Test Run Number: 1  
Test Engineer: UKSYTNHA  
Test Date: Fri Sep 05 2014 17:00:27 GMT+0100 (GMT Daylight Time)  
Sample Batch Number: H14 452  
Sample Use By Date: 15Sep2014  
Test Box Number: R  
Test Rig Number: G271.52  
Station Name: BETA-012  
Procedure Document Version: 1

DC Polarity: positive

pos DCpos User Low Mass Resolution: 0.0000 (sf: 5)  
pos DCpos Low Mass Resolution: 0.53613 (sf: 5)  
pos DCpos Low Mass Position: 0.70800 (sf: 5)  
pos DCpos User High Mass Resolution: 0.0000 (sf: 5)  
pos DCpos High Mass Resolution: -5.9574 (sf: 5)  
pos DCpos High Mass Position: 0.79616 (sf: 5)  
pos DCpos Resolution Linearity: 82.466 (sf: 5)  
pos DCpos Ion Energy: -0.60860 (sf: 5)  
pos DCpos High Mass Ion Energy: -0.34598 (sf: 5)

74.10Da Peak Assessment (C4H11NH)

pos DCpos Peak 1 Mass: 74.10 lsl: 73.60 usl: 74.60 (dp: 2)  
pos DCpos Peak 1 FWHM: 0.68 lsl: 0.60 usl: 0.80 (dp: 2)  
pos DCpos Peak 1 Asymmetry: 0.84426 usl: 2.8000 (sf: 5)  
pos DCpos Peak 1 Valley Height %: 0.0000 usl: 70.000 (sf: 5)  
pos DCpos Peak 1 Precursor Height % (if negative add 100): 1.4458 lsl: -10.000 usl: 5.0000 (sf: 5)  
pos DCpos Peak 1 Precursor Gap (Da): 0.083835 usl: 0.10500 (sf: 5)  
pos DCpos Peak 1 Shoulder Height % (if negative add 100): 0.0000 lsl: -10.000 usl: 10.000 (sf: 5)  
pos DCpos Peak 1 Impurity: 116.09 usl: 85.500 (sf: 5)  
pos DCpos Peak 1 Leading Edge Distance (Da): 0.51356 usl: 100.00 (sf: 5)

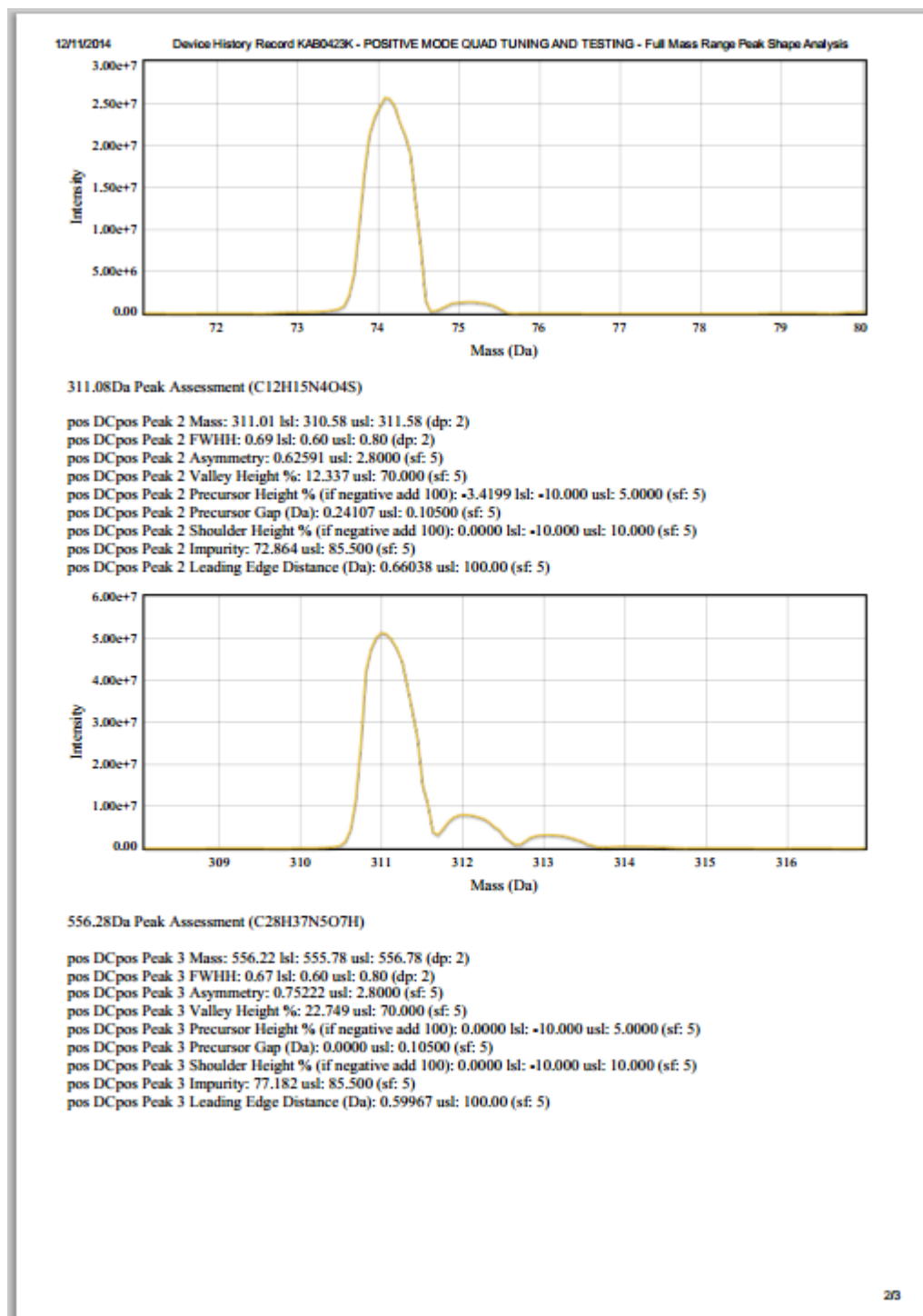
1/3

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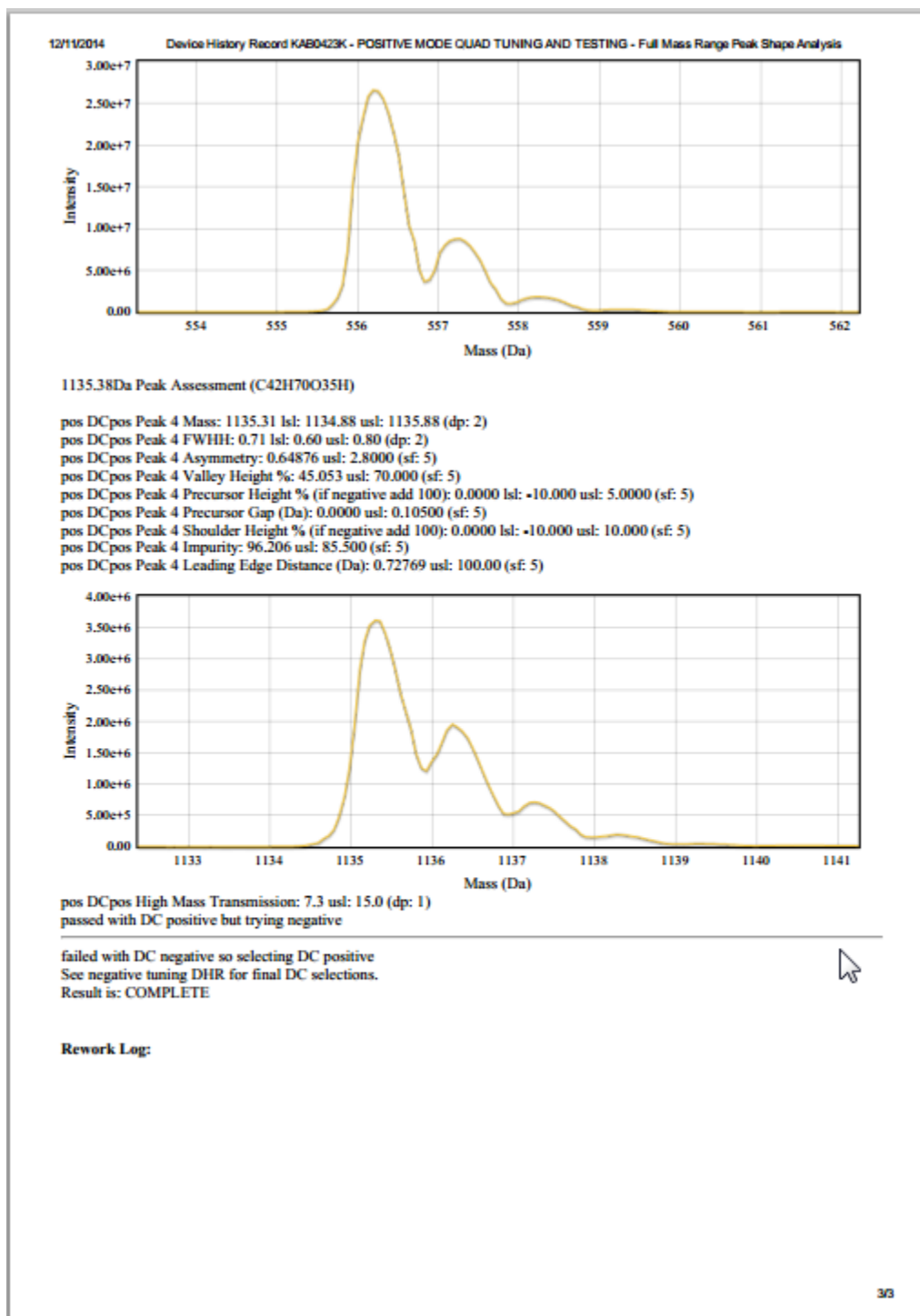


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### 15.5. Opening all available DHRs

All the available Device History Records for the instrument need to be printed so they can be stored in the instrument DHR folder. This function will only work if the test sequence has completed.

- (1) Click on the DHR tab located on the top of the window.

**Manufacturing Test for Serial Number** KAB0423K

| POSITIVE MODE QUAD TUNING AND TESTING | STATUS | FAILURES | DHR LOG |
|---------------------------------------|--------|----------|---------|
| Pump Stability                        | PASS   |          |         |
| Low Mass Ion Energy                   | PASS   |          |         |
| High Mass Ion Energy                  | PASS   |          |         |
| Quad Quality                          | PASS   |          |         |
| Low Mass Resolution                   | PASS   |          |         |
| High Mass Resolution                  | PASS   |          |         |
| Low Mass Position                     | PASS   |          |         |
| High Mass Position                    | PASS   |          |         |
| Prefilter                             | PASS   |          |         |
| Peak Shape Analysis                   | PASS   |          |         |
| Linearity Tuning                      | PASS   |          |         |
| Full Mass Range Peak Shape Analysis   | PASS   |          |         |

MANUFACTURING PRE-TEST POSITIVE MODE QUAD TUNING AND TESTING NEGATIVE MODE QUAD TUNING AND TESTING DETECTOR TESTING POSITIVE MODE PERFORMANCE TESTING NEGATIVE MODE PERFORMANCE TESTING POSITIVE FAST SCAN QUAD TUNING AND TESTING NEGATIVE FAST SCAN QUAD TUNING AND TESTING INTERNAL CALIBRANT TESTING

- (2) AMITS will create all the DHRs associated with the instrument on a single page. This may take a few minutes to complete as the data is stored on a server, and not on the host PC.

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Test Run Details Dashboard Test Log Summary **DHR** Sigma Data History Admin

**Print** Device History Record for Serial Number KAB0423K 8 Sep 2014

**MANUFACTURING PRE-TEST**  
**Instrument Preparation**

Status: PASS

Product Type: Acquity\_QDa  
Product Number: 186006511  
Serial Number: KAB0423K  
Production / Factory Order: 481709  
Software Version: Acquity QDa AMITS V2.0  
Test Run Number: 1  
Test Engineer: UKSYTNHA  
Test Date: Fri Sep 05 2014 15:37:24 GMT+0100 (GMT Daylight Time)  
Sample Batch Number: H14 452  
Sample Use By Date: 15Sep2014  
Test Box Number: R  
Test Rig Number: G271 52  
Station Name: BETA-012  
Procedure Document Version: 1

Vacuum pump power: 48.000 lsf: 37.000 usf: 55.000 (sf: 5)  
Firmware Version T  
Firmware Version: 21507 (dp: 0)  
Result is: COMPLETE

**Rework Log:**

**MANUFACTURING PRE-TEST**  
**Manual Interlock**

- (3) Always check that the DHR record has completed rendering all the graphs before printing the record. This can be achieved by waiting for the “Swirl” mouse icon to turn back to a normal mouse, or by scrolling to the last record in the list and waiting any <GRAPH> comments to be rendered into a plot.

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**15.6. How to Print a DHR, or all the DHRs**

- (1) Click the Print button on the DHR page to open the record in a format suitable for printing.

**Test Run Details** **Dashboard** **Test Log** **Summary** **DHR** **Sigma Data** **History** **Admin**

**Print** **Device History Record for Serial Number KAB0423K 8 Sep 2014**

**MANUFACTURING PRE-TEST**  
**Instrument Preparation**

Status: PASS

Product Type: Acquity\_QDa  
Product Number: 186006511  
Serial Number: KAB0423K  
Production / Factory Order: 481709  
Software Version: Acquity QDa AMITS V2.0  
Test Run Number: 1  
Test Engineer: UKSYTNHA  
Test Date: Fri Sep 05 2014 15:37:24 GMT+0100 (GMT Daylight Time)  
Sample Batch Number: H14 452  
Sample Use By Date: 15Sep2014  
Test Box Number: R  
Test Rig Number: G271 52  
Station Name: BETA-012  
Procedure Document Version: 1

Vacuum pump power: 48.000 l/s: 37.000 usl: 55.000 (sf: 5)  
Firmware Version T  
Firmware Version: 21507 (dp: 0)  
Result is: COMPLETE

**Rework Log:**

**MANUFACTURING PRE-TEST**  
**Manual Interlock**

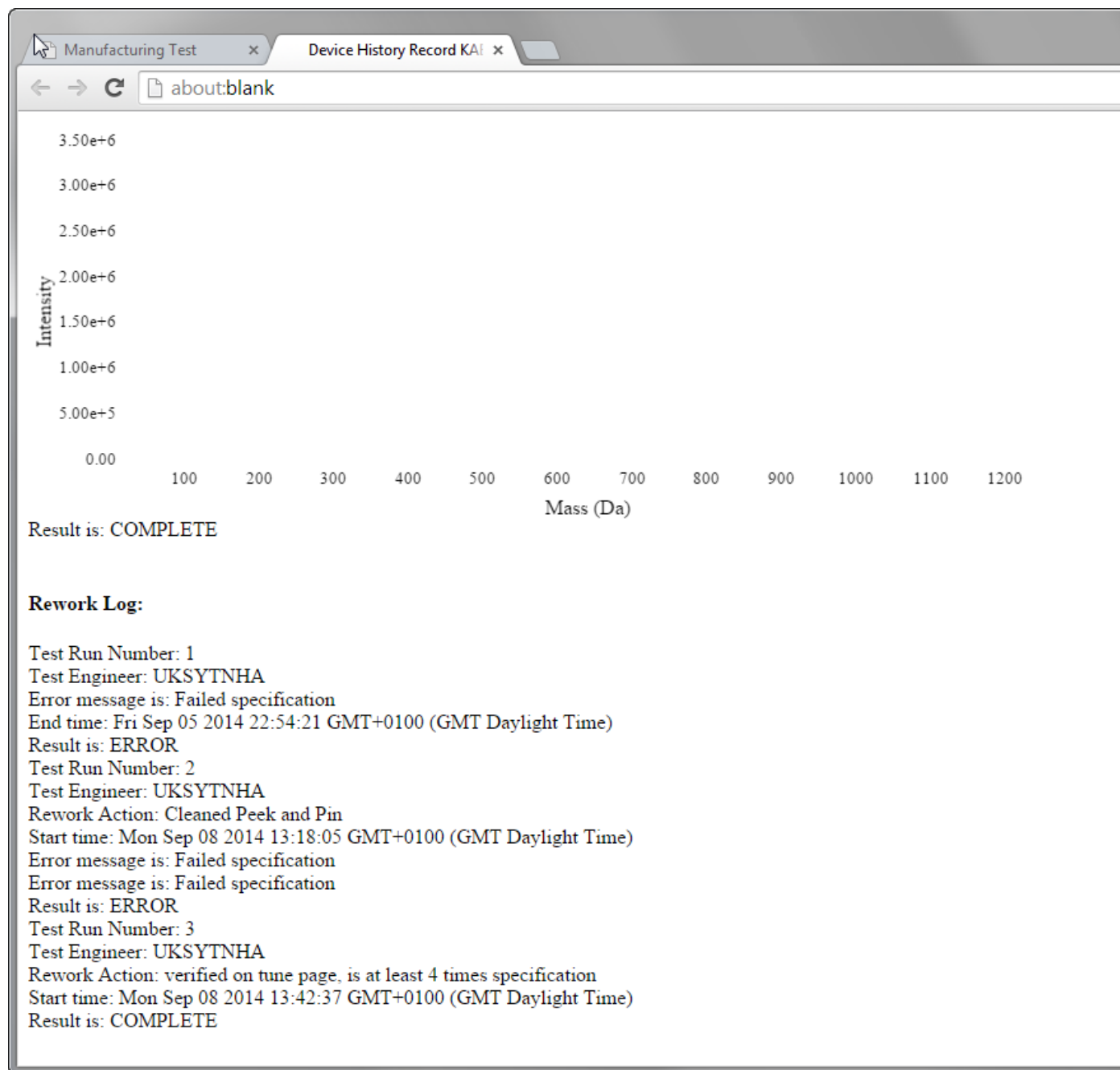
- (2) Always check that the DHR record has completed rendering all the graphs within the all the tests before moving to the next step. This check can be performed by scrolling to the last record in the list and waiting any plot to be rendered.

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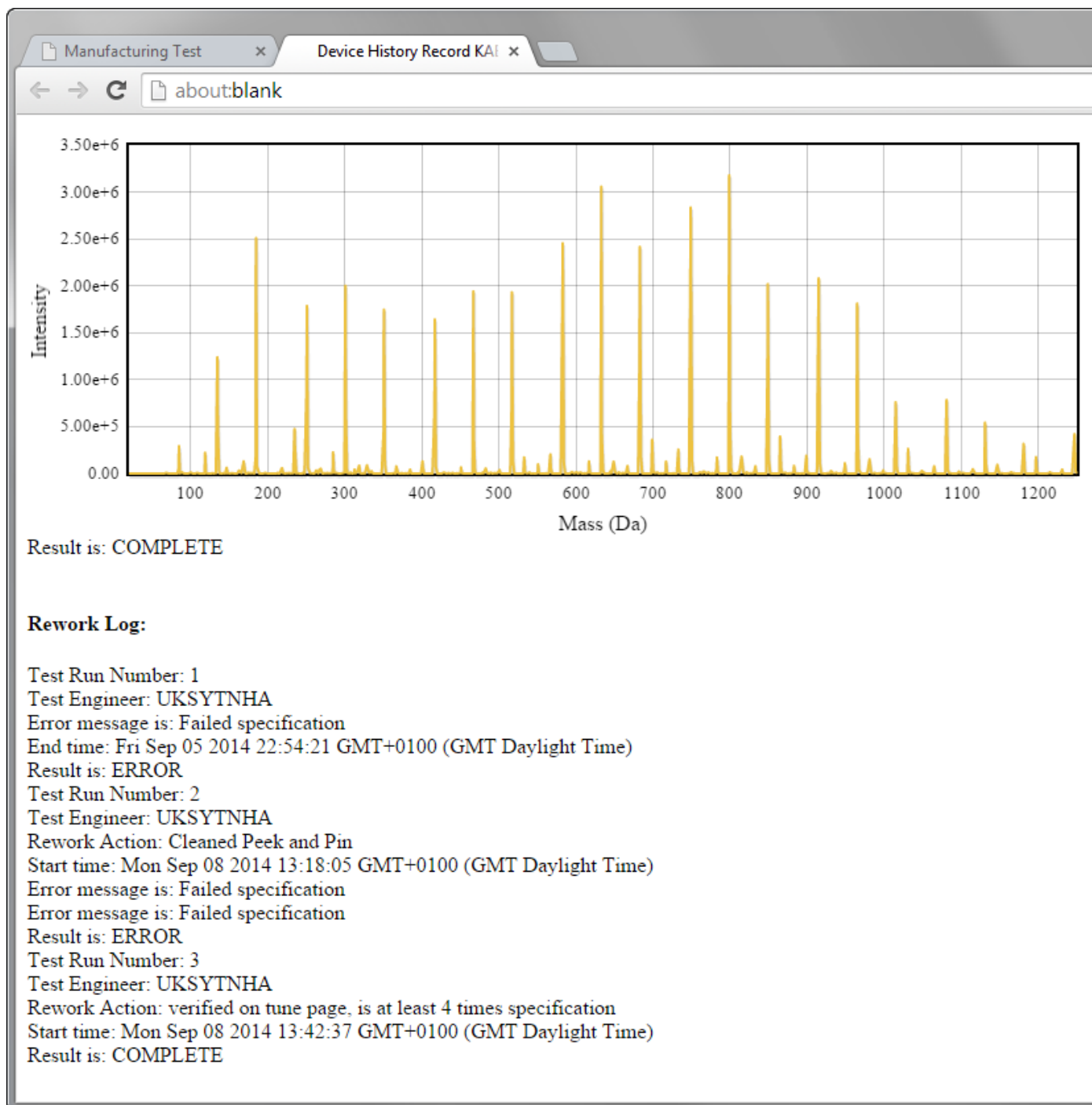
Plot has not completed rendering.

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Last plot has completed rendering.

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- (3) Chrome printing tool. Right mouse the DHR record, and select "Print...."



Manufacturing Test x Device History Record KAI x

about:blank

Intensity

Mass (Da)

Result is: COMPLETE

**Rework Log:**

Test Run Number: 1  
Test Engineer: UKSYTNHA  
Error message is: Failed specification  
End time: Fri Sep 05 2014 22:54:21 GMT+0100  
Result is: ERROR

Test Run Number: 2  
Test Engineer: UKSYTNHA  
Rework Action: Cleaned Peek and Pin  
Start time: Mon Sep 08 2014 13:18:05 GMT+0100  
Error message is: Failed specification  
Error message is: Failed specification  
Result is: ERROR

Test Run Number: 3  
Test Engineer: UKSYTNHA  
Rework Action: verified on tune page, is at least 4 times specification  
Start time: Mon Sep 08 2014 13:42:37 GMT+0100 (GMT Daylight Time)  
Result is: COMPLETE

Back  
Forward  
Reload  
Save as...  
**Print...**  
Translate to English  
View page source  
View page info  
Inspect element

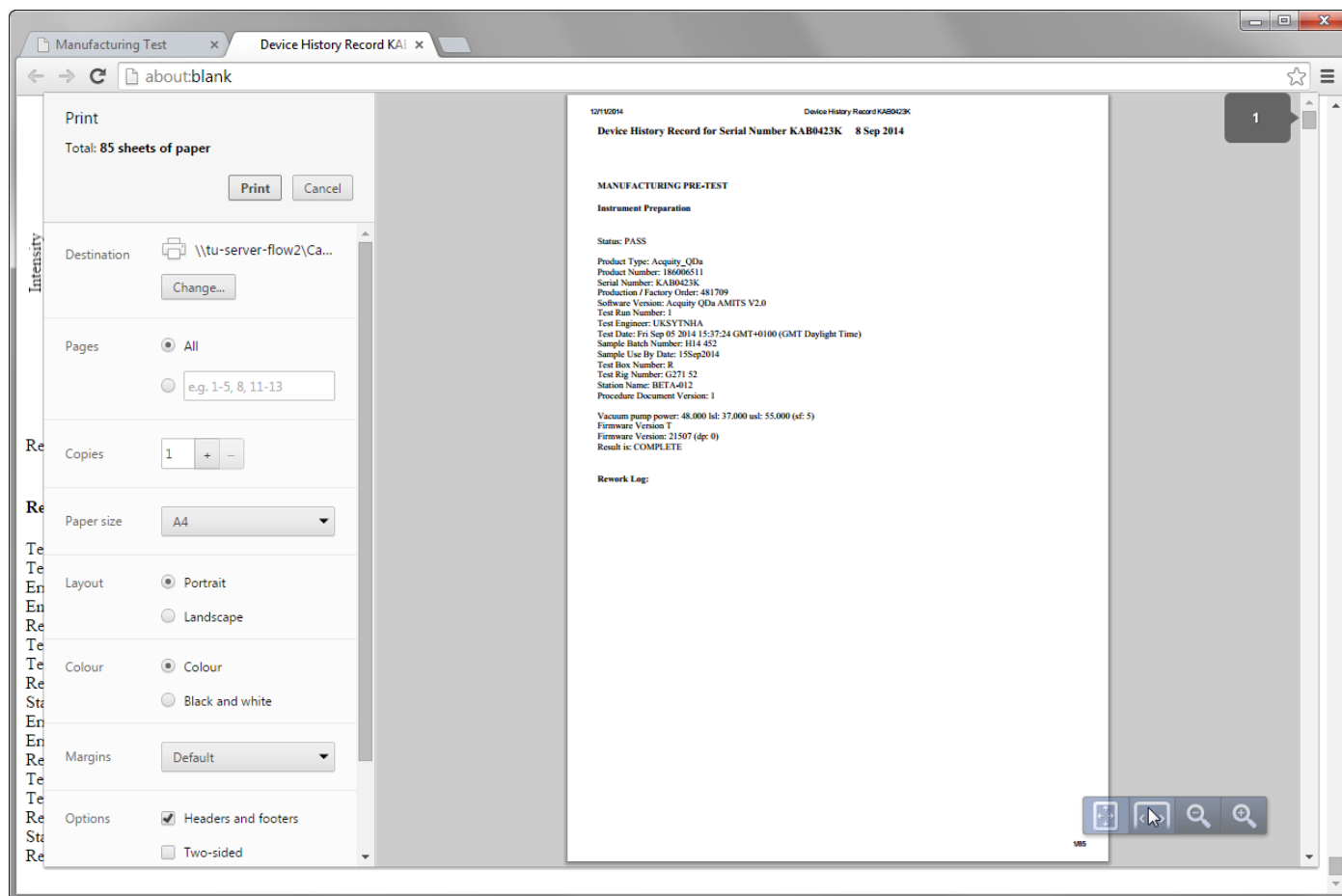
- (4) This tool parses the printouts onto single pages. Because of this, the printout generate can take a couple of minutes to complete. If Chrome warns of unresponsive page, click the wait button and AMITS will complete building the printout.

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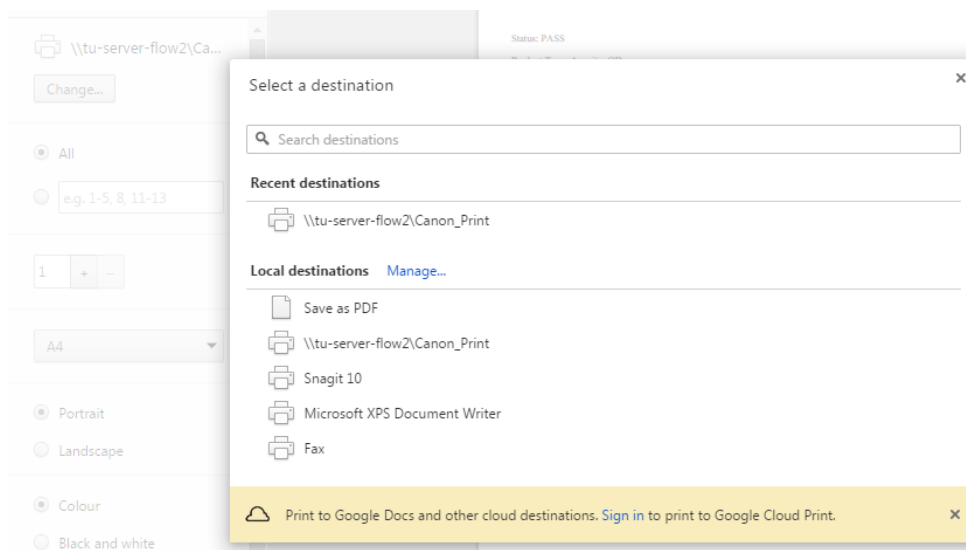
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- (5) Confirm the correct printer or PDF destination has been selected. Click on Change button to select the printer or to select a PDF copy to be saved within the instrument's MassLynx Project folder



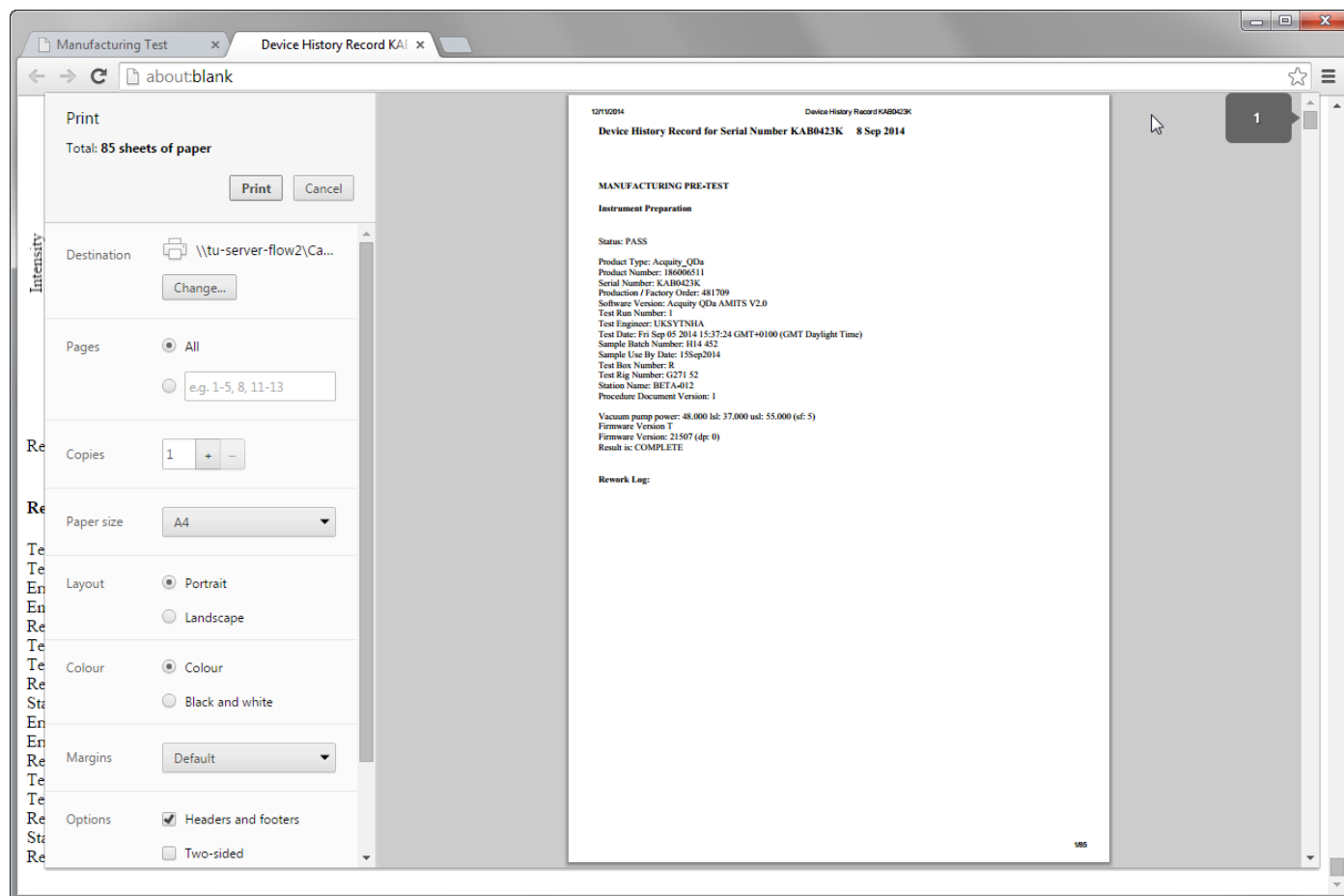
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(6) Click the “Print” button to print a hardcopy or to save the PDF.



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## 16. TEST LOG

The test log contains all the steps used by AMITS to achieve a test result. Although it was designed as a diagnostic tool for the software's development, the Test Log can be used to help in diagnosing test failures.

### 16.1. "Live" Log Reports

While AMITS is acquiring a test run, it is possible to leave AMITS in a 'live' Log view, instead of the Dashboard Page. This 'Live' view will update whenever a response is appended to the log.

- (1) During a test run, select the Test Log tab on the TOP of the screen.

**Manufacturing Test for Serial Number** KAB0538\_PQ

| MANUFACTURING PRE-TEST          | STATUS | FAILURES | DHR LOG |
|---------------------------------|--------|----------|---------|
| Kestrel Configuration           | PASS   |          |         |
| Instrument Preparation          | PASS   |          |         |
| Manual Interlock                | PASS   | 1        |         |
| Source Exhaust                  | PASS   |          |         |
| Source Leak                     | PASS   |          |         |
| Align Quad RF Generator         | PASS   |          |         |
| Critical Voltages               | PASS   |          |         |
| RF Breakdown                    | PASS   |          |         |
| Desolvation Heater              | PASS   |          |         |
| Calibrant Heater                | PASS   |          |         |
| Source Heater                   | PASS   |          |         |
| Basic Beam - Positive           | PASS   |          |         |
| Basic Beam - Negative           | PASS   |          |         |
| Positive Ion Creation Stability | PASS   |          |         |
| Negative Ion Creation Stability | PASS   |          |         |
| Source and Ion Guide Charging   | PASS   |          |         |
| Mass Switching Snowboy          | PASS   |          |         |
| Low Mass Sensitivity            | PASS   |          |         |

Start Stop

MANUFACTURING PRE-TEST POSITIVE MODE QUAD TUNING AND TESTING NEGATIVE MODE QUAD TUNING AND TESTING DETECTOR TESTING POSITIVE MODE PERFORMANCE TESTING NEGATIVE MODE PERFORMANCE TESTING POSITIVE FAST SCAN QUAD TUNING AND TESTING NEGATIVE FAST SCAN QUAD TUNING AND TESTING INTERNAL CALIBRANT TESTING

- (2) This will open the **current** test log and the data will be automatically appended to, and will display the latest information at the bottom of the page. If the user scrolls through the page, AMITS switches off the command to show the latest data at the bottom of the page.

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**16.2. How to view individual Log reports – Post Test**

- (1) Select the Test Section that contains the test module of interest.
- (2) Roll the mouse over the space in line with the Column Header “LOG” and the Test Module of interest. The space will be highlighted as well as the test name.

Test Run Details | Dashboard | Test Log | Summary | DHR | Sigma Data | History | Admin

**Manufacturing Test for Serial Number** KAD2907\_PQ

|                              | POSITIVE MODE QUAD TUNING AND TESTING | STATUS | FAILURES | DHR LOG |
|------------------------------|---------------------------------------|--------|----------|---------|
| <a href="#">Restart Here</a> | Pump Stability                        | PASS   |          |         |
|                              | Low Mass Ion Energy                   | PASS   |          |         |
|                              | High Mass Ion Energy                  | PASS   |          |         |
|                              | Quad Quality                          | PASS   |          |         |
|                              | Resolution Tune                       | PASS   |          |         |
|                              | Low Mass Position                     | PASS   |          |         |
|                              | High Mass Position                    | PASS   |          |         |
|                              | Prefilter                             | PASS   |          |         |
| <a href="#">Continue</a>     | Full Mass Range Peak Shape Analysis   | FAIL   | 1        |         |

Stop    State: Unknown    API Gas: Unknown

MANUFACTURING PRE-TEST | POSITIVE MODE QUAD TUNING AND TESTING | NEGATIVE MODE QUAD TUNING AND TESTING | DETECTOR TESTING | POSITIVE MODE PERFORMANCE TESTING | NEGATIVE MODE PERFORMANCE TESTING | POSITIVE FAST SCAN QUAD TUNING AND TESTING | NEGATIVE FAST SCAN QUAD TUNING AND TESTING | FINAL BEAM TESTING

- (3) Click the space to open the test's LOG report.

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Test Run Details
Dashboard
Test Log
Summary
DHR
Sigma Data
History
Admin

Print
Full Mass Range Peak Shape Analysis

```

PRUVE_HEATER_CURRENT_RB: 0.00
PWM_REQUESTED_RATE_CALIBRATION_RB: 0.00
CALIBRATION_TEMPERATURE_RB: 23.21
UNCORRECTED_CALIBRATION_TEMPERATURE_RB: 1.13
CALIBRATION_HEATER_CURRENT_RB: 0.00
TURBO_SPEED_PERCENTAGE_RB: 100.00
SET_ROTATION_SPEED_RB: 1500.00
ACTUAL_ROTATION_SPEED_RB: 1500.00
VACUUM_POWER_RB: 44.00
PFIEFFER_ERROR_CODE_STATUS: 808464000.00
PRESSURE_SENSOR_RB: 5.68
PMT_RB: 511.72
DYNODE_VOLTAGE_RB: -7985.00
PHOSPHOR_VOLTAGE_RB: 8981.00
TEMPERATURE_ELECTRONIC_RB: 43.00
TEMPERATURE_PUMP_BOTTOM_RB: 35.00
TEMPERATURE_BEARING_RB: 39.00
TEMPERATURE_MOTOR_RB: 53.00
QUAD_TEMPERATURE_RB: 48.42
total scan time: 00:02:26, elapsed time: 00:03:09
overall scan time: 04:39:11, overall run time: 05:44:06
stopping fluidics, stop gas flow, switch to standby
set (command) internalCalibrantHV to off
set (command) internalCalibrantValve to close
set (registry) calibrantActive to 0
set (command) externalSampleValve to close
sent telnet command SearchandRemovellegalHalEntries
test failed
End time: Wed Aug 20 2014 10:04:05 GMT+0100 (GMT Daylight Time)
Result is: ERROR

```

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### 16.3. Log Report Structure

The “Test Log” is broken into the following sections **FOR EVERY RUN ATTEMPTED** within the LOG:

- **Test header -** All the test details, including those captured through the Test Run Details page. This includes:
  - Product Type
  - Product Part Number
  - Serial Number
  - Production / Factory Order number
  - Software Version
  - Software Build
  - Test sequence run number for test run attempt being inspected.
  - Test Engineer who started the test sequence run being inspected
  - Test Date and Time when the test was started
  - Sample Batch Number
  - Sample Use By Date
  - Test Box Number
  - Test Rig Number
  - Station Name (Test bay for instrument, or test rig number for assemblies)
  - Procedure document number
- **Test Settings -** All the tuning settings used before starting to tune for the test.
- **Test Tuning -** All the initial tuning settings used for the test, (Refer to test configuration details), and any modifications to those settings by the tuning process. Display ‘real time’ spectra or chromatogram data where prudent.
- **Test Result -** The test result information, including any spectra or chromatogram data and reference to any lower / upper specification limits.
- **Read Backs -** Capture key read back and status results at the end of the test.
- **Test footer -** Rework information associated with restarting the test after a failure. The time the individual test tool to complete. The overall manufacturing test time up to this point. and the test result (Complete, Fail, Abandoned).

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Each test run is separated by a white line

**Full Mass Range Peak Shape Analysis**

Print

DYNODE\_VOLTAGE\_RB: -7985.00  
 PHOSPHOR\_VOLTAGE\_RB: 8991.00  
 TEMPERATURE\_ELECTRONIC\_RB: 43.00  
 TEMPERATURE\_PUMP\_BOTTOM\_RB: 35.00  
 TEMPERATURE\_BEARING\_RB: 38.00  
 TEMPERATURE\_MOTOR\_RB: 51.00  
 QUAD\_TEMPERATURE\_RB: 48.38  
 total scan time: 00:02:26, elapsed time: 00:03:06  
 overall scan time: 00:56:14, overall run time: 01:23:03  
 End time: Fri Aug 15 2014 11:03:55 GMT+0100 (GMT Daylight Time)  
 Result is: COMPLETE

---

script path is: C:/Program Files (x86)/AMITS/MTestModules/PositiveSlowScanQuadTuning/FullMassRangePeakShapeAnalysis/PositiveModePeakShapeAnalysis.lua  
 Product Type: Acquity\_QDa  
 Product Number: 186006511  
 Serial Number: KAB0538\_PQ  
 Production / Factory Order: 482455  
 Software Version: Acquity QDa AMITS V2.0  
 Software Build: 767  
 Test Run Number: 2  
 Test Engineer: IRJKEKM  
 Test Date: Fri Aug 15 2014 11:36:31 GMT+0100 (GMT Daylight Time)  
 Sample Batch Number: H14-001  
 Sample Use By Date: 07-Sep-14  
 Test Box Number: TB668-L  
 Test Rig Number: KAB0538  
 Station Name: Test Station 7  
 Procedure Document Version: 46202rev1

The steps used within the test tuning will be captured within the flow charts within the Appendix of version 3 of this document. At the time of writing, contact Product Assurance for advice regarding AMITS test logic.

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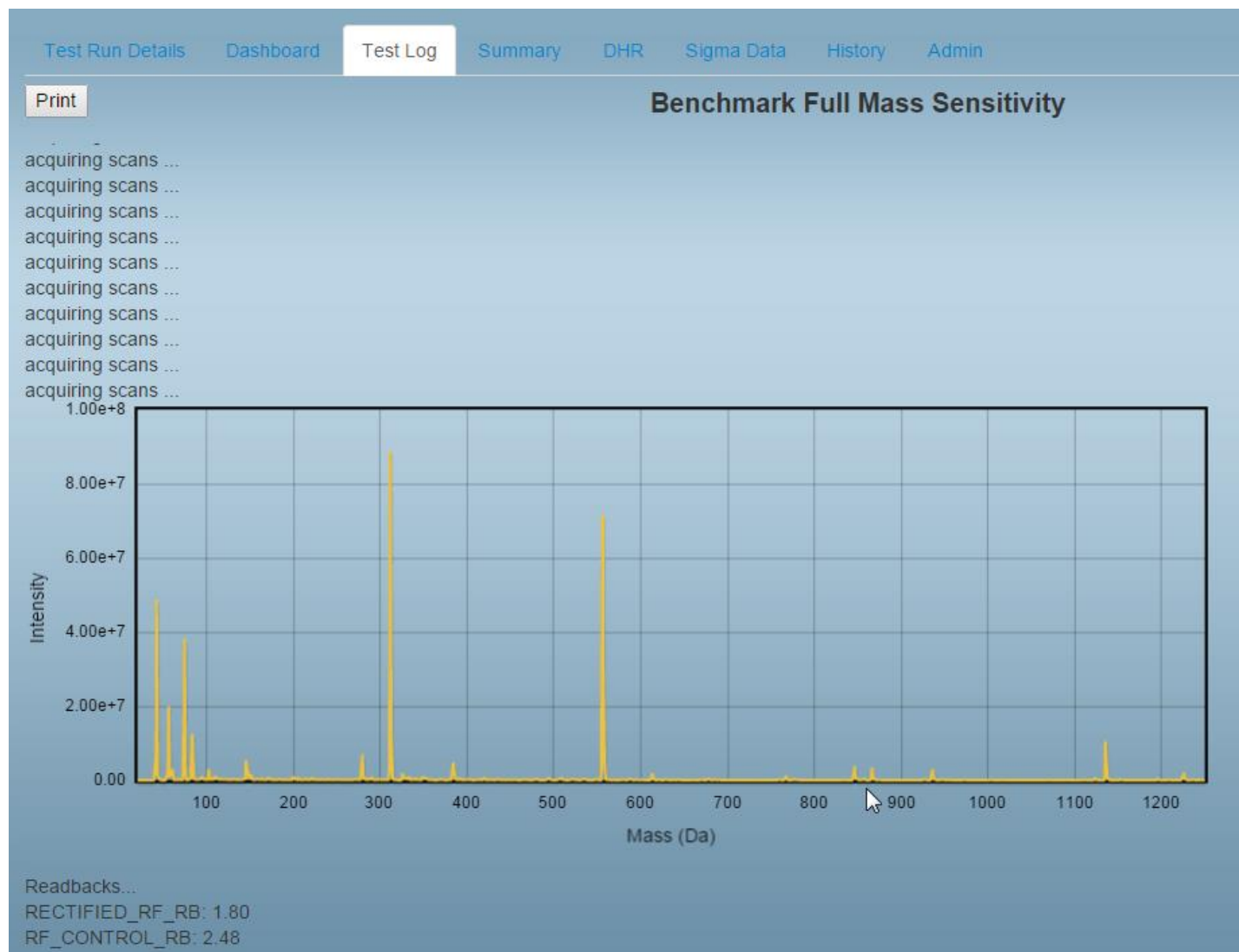
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## 16.4. Interactive Plots

The plots within the Test Log can be interacted with if using a mouse with a central roll button.

- (5) **To Zoom In.** Place the cursor on the detail of interest. In the example below, it will be some peaks at roughly 850Da. For details such as peaks it is important to place the cursor below the horizontal axis line, but above the scale numbering to prevent zooming into just the peak top. For all other plots, just point at the detail of interest and zoom.



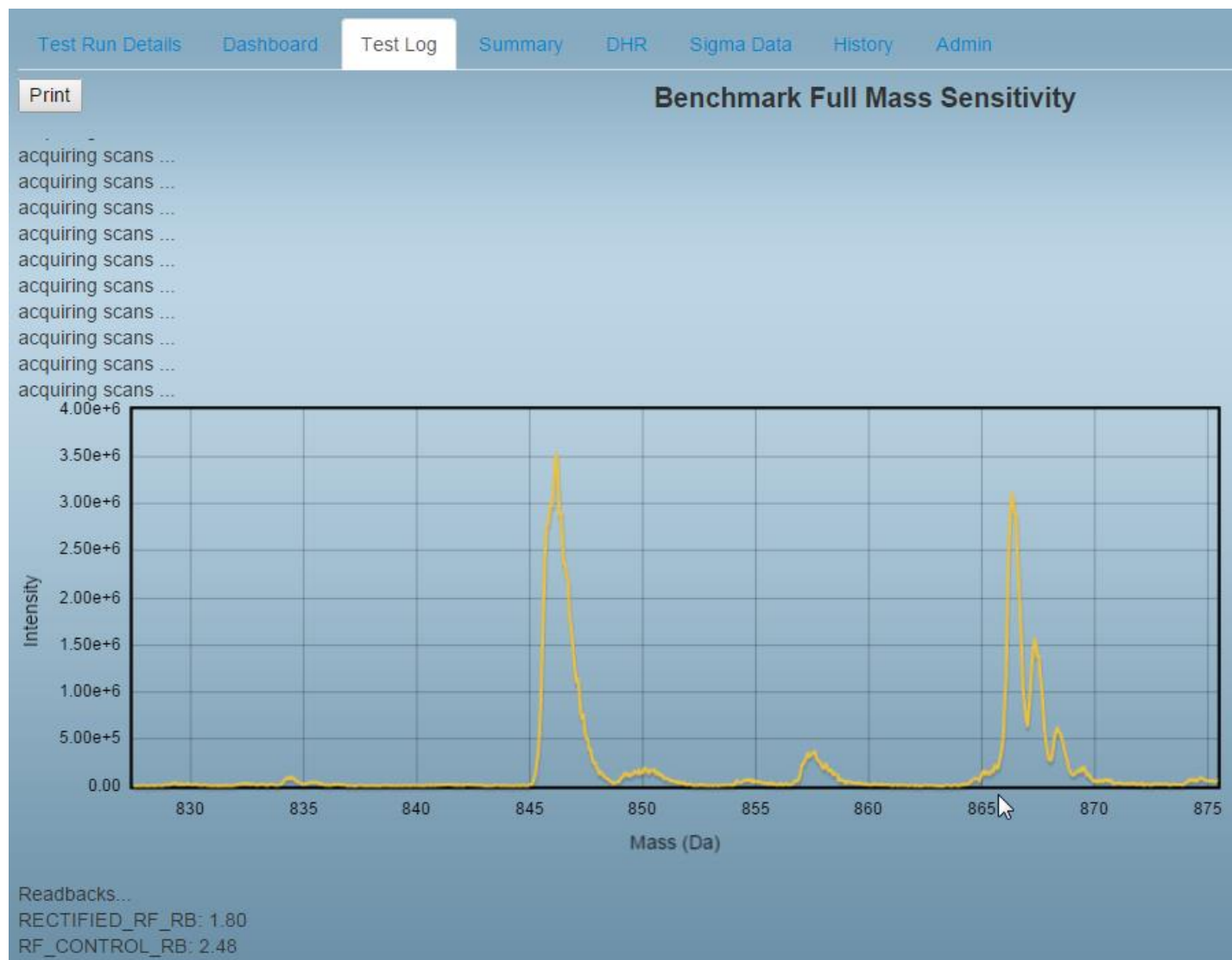
- (6) Roll the scroll wheel forward (finger away from you) until the feature has zoomed in to the required amount.

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- (7) **To Zoom Out** – For partial zoom out, roll the scroll wheel backwards (draw the finger back toward you).
- (8) **To Reset Zoom** – To reset the zoom, just click the image once using the Left mouse button.

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## 16.5. Example Test Log

Below is an example of a test log. This is not a quality record, but for diagnostic purposes only. i.e. to show to other engineers for advice. Printing a test log can be achieved by using the print button and following the instructions in 15.6

```

12/11/2014                                Low Mass Sensitivity Test Log

script path is: C:/Program Files (x86)/AMITS/MTTestModules/PreTest/LowMassSensitivity/LowMassSensitivity.lua
Product Type: Acquity_QDa
Product Number: 186006511
Serial Number: KAB0423K
Production / Factory Order: 481709
Software Version: Acquity QDa AMITS V2.0
Software Build: 767
Test Run Number: 1
Test Engineer: UKSYTNHA
Test Date: Fri Sep 05 2014 16:28:11 GMT+0100 (GMT Daylight Time)
Sample Batch Number: H14 452
Sample Use By Date: 15Sep2014
Test Box Number: R
Test Rig Number: G271 52
Station Name: BETA-012
Procedure Document Version: 1

Start time: Fri Sep 05 2014 16:28:11 GMT+0100 (GMT Daylight Time)
connecting to mass spec...
connected
polarity set to positive
set (local) polarity to positive
setting tune parameters.....
set (command) DCPolarity to positive
set (rio) capillaryVoltage to 1.5
set (rio) coneVoltage to 30
set (rio) desolvationTemperature to 200
set (registry) dynamicHighMassIonEnergy to 0
set (registry) dynamicHighMassPosition to 0
set (registry) dynamicHighMassResolution to 0
set (registry) dynamicHighMassSetup to 0
set (registry) dynamicLowMassIonEnergy to 0
set (registry) dynamicLowMassPosition to 0
set (registry) dynamicLowMassResolution to 0
set (registry) dynamicLowMassSetup to 0
set (registry) dynamicResolutionLinearity to 0
set (command) externalSampleValve to open
set (rio) highMassIonEnergy to 0
set (rio) highMassPosition to 0
set (rio) highMassResolution to 0
set (local) ionCountingThreshold to 25
set (rio) ionEnergy to 0
set (rio) ionGuide1Offset to 3
set (rio) ionGuide2Gradient to 3
set (rio) ionGuide2Offset to 1
set (rio) lowMassPosition to 0
set (rio) lowMassResolution to 0
set (rio) multiplierVoltage to 511
set (rio) prefilter to 10
set (rio) resolutionLinearity to 100
set (registry) rfAutoMode to 1
set (registry) rfFrequency to 1135200
set (rio) sourceOffset to 30
set (rio) sourceTemperature to 120
set (rio) stepwaveBodyGradient to 35
set (rio) stepwaveHeadGradient to 35
set (rio) stepwaveOffset to 15
set (rio) userHighMassResolution to 0
set (rio) userLowMassResolution to 0

set (rio) coneVoltage to 10
starting acquisition, mass range: 39.10 - 109.10, scan time: 0.500, function: 1
set (rio) lowMassResolution to 0
set (rio) highMassResolution to 0
acquiring 2 scans from function 1 ...

1/5

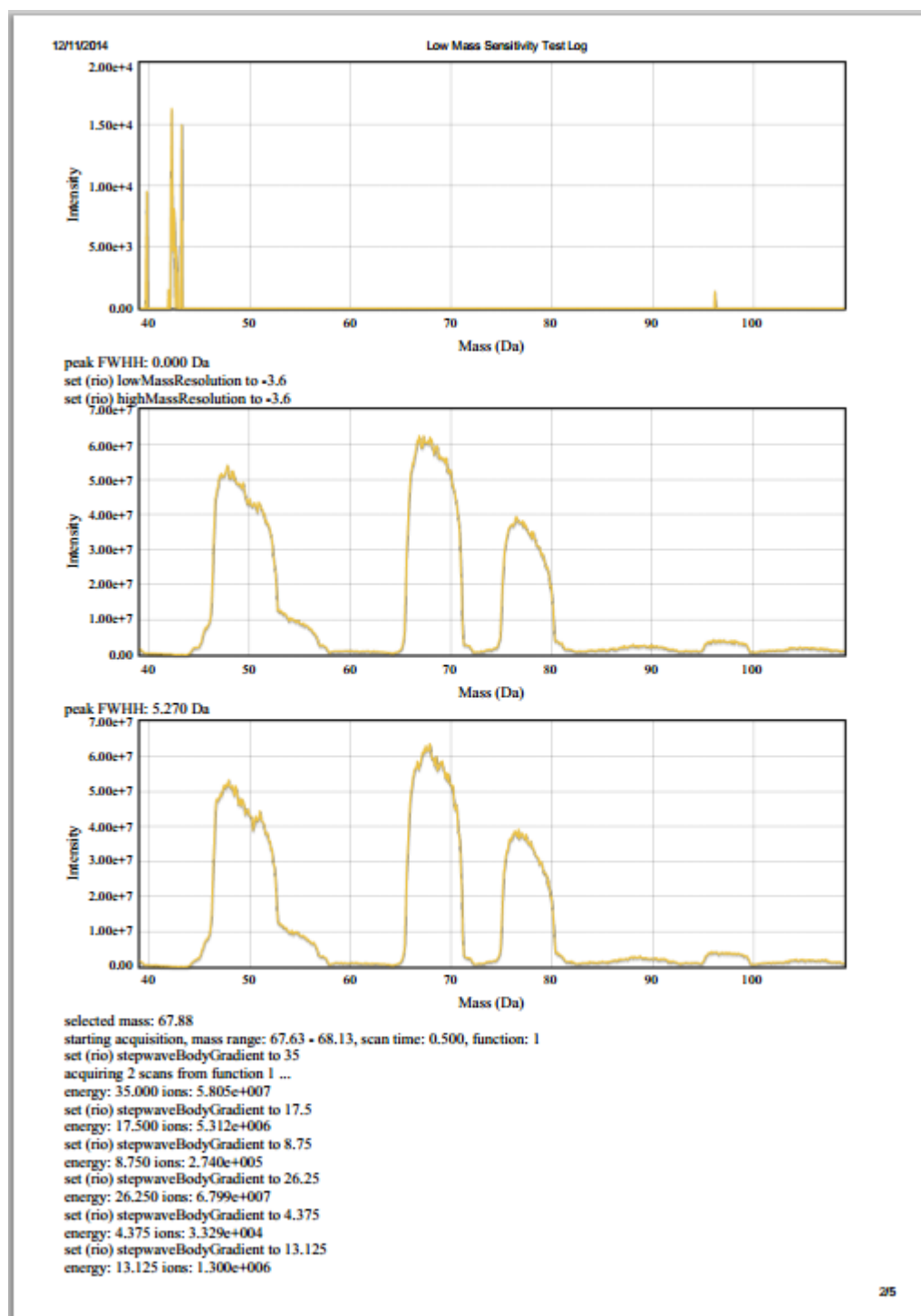
```

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12/11/2014 Low Mass Sensitivity Test Log

set (rio) stepwaveBodyGradient to 21.875  
acquiring scans ...  
energy: 21.875 ions: 4.258e+007  
set (rio) stepwaveBodyGradient to 30.625  
energy: 30.625 ions: 6.487e+007  
set (rio) stepwaveBodyGradient to 2.1875  
energy: 2.188 ions: 6.340e+003  
set (rio) stepwaveBodyGradient to 6.5625  
energy: 6.563 ions: 1.389e+005  
set (rio) stepwaveBodyGradient to 10.9375  
energy: 10.938 ions: 7.065e+005  
set (rio) stepwaveBodyGradient to 15.3125  
energy: 15.313 ions: 2.545e+006  
set (rio) stepwaveBodyGradient to 19.6875  
acquiring scans ...  
energy: 19.688 ions: 1.843e+007  
set (rio) stepwaveBodyGradient to 24.0625  
energy: 24.063 ions: 5.607e+007  
set (rio) stepwaveBodyGradient to 28.4375  
energy: 28.438 ions: 5.995e+007  
set (rio) stepwaveBodyGradient to 32.8125  
energy: 32.813 ions: 5.532e+007  
set (rio) stepwaveBodyGradient to 1.09375  
energy: 1.094 ions: 2.064e+003  
set (rio) stepwaveBodyGradient to 3.28125  
energy: 3.281 ions: 1.513e+004  
set (rio) stepwaveBodyGradient to 5.46875  
acquiring scans ...  
energy: 5.469 ions: 7.202e+004  
set (rio) stepwaveBodyGradient to 7.65625  
energy: 7.656 ions: 2.132e+005  
set (rio) stepwaveBodyGradient to 9.84375  
energy: 9.844 ions: 4.778e+005  
set (rio) stepwaveBodyGradient to 12.03125  
energy: 12.031 ions: 8.997e+005  
set (rio) stepwaveBodyGradient to 14.21875  
energy: 14.219 ions: 1.716e+006  
set (rio) stepwaveBodyGradient to 16.40625  
energy: 16.406 ions: 3.779e+006  
set (rio) stepwaveBodyGradient to 18.59375  
acquiring scans ...  
energy: 18.594 ions: 1.055e+007  
set (rio) stepwaveBodyGradient to 20.78125  
energy: 20.781 ions: 2.804e+007  
set (rio) stepwaveBodyGradient to 22.96875  
energy: 22.969 ions: 4.956e+007  
set (rio) stepwaveBodyGradient to 25.15625  
energy: 25.156 ions: 5.904e+007  
set (rio) stepwaveBodyGradient to 27.34375  
energy: 27.344 ions: 6.340e+007  
set (rio) stepwaveBodyGradient to 29.53125  
energy: 29.531 ions: 6.240e+007  
set (rio) stepwaveBodyGradient to 31.71875  
acquiring scans ...  
energy: 31.719 ions: 5.971e+007  
set (rio) stepwaveBodyGradient to 33.90625  
energy: 33.906 ions: 5.663e+007

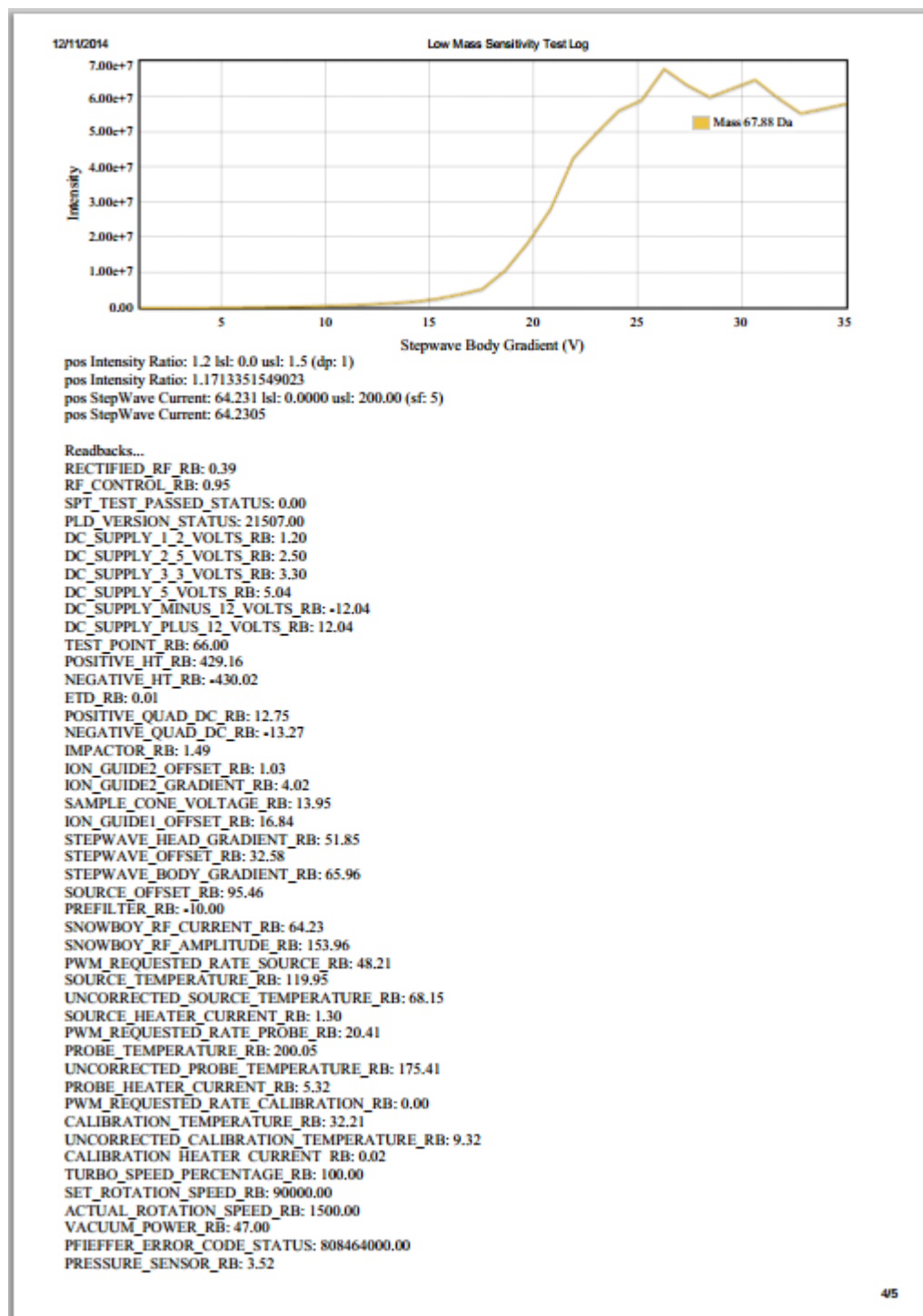
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12/11/2014 Low Mass Sensitivity Test Log  
PMT\_RB: 504.74  
DYNODE\_VOLTAGE\_RB: -7991.00  
PHOSPHOR\_VOLTAGE\_RB: 9001.00  
TEMPERATURE\_ELECTRONIC\_RB: 47.00  
TEMPERATURE\_PUMP\_BOTTOM\_RB: 38.00  
TEMPERATURE\_BEARING\_RB: 40.00  
TEMPERATURE\_MOTOR\_RB: 57.00  
QUAD\_TEMPERATURE\_RB: 48.19  
total scan time: 00:01:02, elapsed time: 00:01:12  
overall scan time: 00:22:29, overall run time: 00:34:29  
End time: Fri Sep 05 2014 16:29:24 GMT+0100 (GMT Daylight Time)  
Result is: COMPLETE

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### 17. DHR SUMMARY SHEET

Once an instrument has completed manufacturing test, a summary of the DHR results is printed. This is a summary of all the results that are printed using the DHR tool, and is a quick reference source for results and final tuning settings.

#### 17.1. Opening the DHR Summary Sheet

- (1) Open AMITS and select the Instrument or Assembly that requires a DHR Summary print.
- (2) Click on the **Summary** option in the top tool bar of AMITS
- (3) This will make AMITS build and then display the DHR Summary Sheet

**Acquity QDa AMITS Final Test Run Details**

|                             |                                                       |
|-----------------------------|-------------------------------------------------------|
| Serial Number:              | KAB0650_PQ                                            |
| Production / Factory Order: | 482453                                                |
| Software Version:           | Acquity QDa AMITS V2.0                                |
| Final Test Run Number:      | 2                                                     |
| Final Test Engineer:        | IRTREKM                                               |
| Test Start Time:            | Wed Aug 20 2014 15:12:22 GMT+0100 (GMT Daylight Time) |
| Test Finish Time:           | Thu Aug 21 2014 08:31:49 GMT+0100 (GMT Daylight Time) |
| Sample Batch Number:        | H14-002                                               |
| Sample Use By Date:         | 12 Sep 14                                             |
| Test Box Number:            | 668 L                                                 |
| Test Rig Number:            | KAB0650                                               |
| Final Station Name:         | Test Station 7                                        |
| Procedure Document Version: | 46202-1                                               |

**Acquity QDa AMITS User List**

IRTREKM

**Acquity QDa AMITS Final Tune Settings**

|                            |          |                           |          |
|----------------------------|----------|---------------------------|----------|
| Postitive Ionisation Mode: |          | Negative Ionisation Mode: |          |
| Slow Scan Tuned            | AMITS    | Slow Scan Tuned           | AMITS    |
| Fast Scan Tuned            | AMITS    | Fast Scan Tuned           | AMITS    |
| DC Polarity                | positive | DC Polarity               | positive |
| Low Mass Resolution        | 0.00     | Low Mass Resolution       | -0.02    |
| High Mass Resolution       | 0.00     | High Mass Resolution      | 0.06     |
| Ion Energy                 | -0.78    | Ion Energy                | -0.45    |
| High Mass Ion Energy       | 0.12     | High Mass Ion Energy      | 0.11     |

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**17.2. DHR Summary Sheet Structure**

The DHR Summary Sheet is broken into the following sections:

|                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Final Test Run Details | <p>All the test details, including those captured through the Test Run Details page from the last run used to pass the instrument. This includes:</p> <ul style="list-style-type: none"><li>Serial Number</li><li>Production / Factory Order number</li><li>Software Version</li><li>Test sequence last run number.</li><li>Test Engineer who started the test sequence run being inspected</li><li>Test Date and Time when the first test run was Started</li><li>Test Date and Time when the last test run was Completed</li><li>Sample Batch Number of the sample used for the last run.</li><li>Sample Use By Date</li><li>Test Box Number</li><li>Test Rig Number</li><li>Final Station Name (Test bay for instrument, or test rig number for assemblies)</li><li>Procedure document number</li></ul> |
| User List              | <p>List all the engineers who have worked on this product serial number</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Final Tune Settings    | <p>(Only displayed for full Instrument results, not in Assemblies or Spares)</p> <p>This is summary of the tuning settings used by AMITS to pass the instrument.</p> <p>The format is in MassLynx format for ease of use.</p> <p>It also displays clearly which DC polarity was used, and if any target registry tuning values were used to achieve the pass.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Final Test Results     | <p>A summary of the test statuses, number of failures, result value and any lower and upper limits are tabulated into Test Section Blocks.</p> <p>Any tests that are associated with the tuning process are not displayed.</p> <p>Final tuning results are displayed.</p> <p>Any peak shape result is summarized as position and peak width.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

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**17.3. Example DHR Summary Sheet**

Below is an example from a printed DHR Summary Sheet for an instrument. The actual report is 17 pages long and so has been truncated for the purposes of this reference manual.

| 10/02/2017                                           |                                                       | Summary KAD2908_PQ |  |
|------------------------------------------------------|-------------------------------------------------------|--------------------|--|
| <b>Acquity QDa MKII AMITS Summary Sheet</b>          |                                                       |                    |  |
| <b>Acquity QDa MKII AMITS Final Test Run Details</b> |                                                       |                    |  |
| Serial Number:                                       | KAD2908_PQ                                            |                    |  |
| Production / Factory Order:                          | N/A                                                   |                    |  |
| Software Version:                                    | Acquity QDa MKII AMITS V3.1                           |                    |  |
| Final Test Run Number:                               | 2                                                     |                    |  |
| Final Test Engineer:                                 | UKPLMPSL                                              |                    |  |
| Test Start Time:                                     | Wed Jan 25 2017 10:32:30 GMT+0000 (GMT Standard Time) |                    |  |
| Test Finish Time:                                    | Wed Jan 25 2017 16:56:55 GMT+0000 (GMT Standard Time) |                    |  |
| Acquity QDa Setup Solution Batch Number:             | A17-003                                               |                    |  |
| Acquity QDa Setup Solution Use By Date:              | 08FEB2017                                             |                    |  |
| Test Box Number:                                     | TB668-X                                               |                    |  |
| Test Rig Number:                                     | KAD2908                                               |                    |  |
| Final Station Name:                                  | MM5159                                                |                    |  |
| Procedure Document Version:                          | 46202 v 4                                             |                    |  |
| <b>Acquity QDa MKII AMITS User List</b>              |                                                       |                    |  |
| IRJKEKM                                              |                                                       |                    |  |
| UKPLMPSL                                             |                                                       |                    |  |
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**Acquity QDa MKII AMITS Final Tune Settings**

| Positive Ionisation Mode:    |          | Negative Ionisation Mode:    |          |
|------------------------------|----------|------------------------------|----------|
| Slow Scan Tuned              | AMITS    | Slow Scan Tuned              | AMITS    |
| Fast Scan Tuned              | AMITS    | Fast Scan Tuned              | AMITS    |
| Capillary Voltage            | 1.50     | Capillary Voltage            | 0.80     |
| DC Polarity                  | negative | DC Polarity                  | negative |
| Low Mass Resolution          | 0.00     | Low Mass Resolution          | 0.14     |
| High Mass Resolution         | 0.00     | High Mass Resolution         | 0.06     |
| Ion Energy                   | -0.91    | Ion Energy                   | -0.34    |
| High Mass Ion Energy         | 0.22     | High Mass Ion Energy         | -0.01    |
| Low Mass Position            | 0.77     | Low Mass Position            | 0.77     |
| High Mass Position           | -1.52    | High Mass Position           | -1.52    |
| Low Mass Setup               | 0.40     | Low Mass Setup               | 0.40     |
| High Mass Setup              | -10.20   | High Mass Setup              | -10.20   |
| Linearity                    | 66.62    | Linearity                    | 66.62    |
| Dynamic Low Mass Resolution  | 0.00     | Dynamic Low Mass Resolution  | 0.06     |
| Dynamic High Mass Resolution | 0.00     | Dynamic High Mass Resolution | -0.21    |
| Dynamic Ion Energy           | 0.00     | Dynamic Ion Energy           | 0.00     |
| Dynamic High Mass Ion Energy | 0.15     | Dynamic High Mass Ion Energy | -0.06    |
| Dynamic Low Mass Position    | -0.55    | Dynamic Low Mass Position    | -0.55    |
| Dynamic High Mass Position   | -1.79    | Dynamic High Mass Position   | -1.79    |
| Dynamic Low Mass Setup       | 0.38     | Dynamic Low Mass Setup       | 0.38     |
| Dynamic High Mass Setup      | 0.03     | Dynamic High Mass Setup      | 0.03     |
| Dynamic Linearity            | -8.75    | Dynamic Linearity            | -8.75    |

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Acquity QDa MKII AMITS Final Test Results

MANUFACTURING PRE-TEST

| TEST MODULE             | STATUS | FAILURES | RESULT                   | VALUE   | LSL     | USL      |
|-------------------------|--------|----------|--------------------------|---------|---------|----------|
| Kestrel Configuration   | PASS   |          |                          |         |         |          |
| Instrument Preparation  | PASS   |          | Vacuum pump power        | 42.000  | 37.000  | 55.000   |
|                         |        |          | Firmware Version         | 22016   |         |          |
| Manual Interlock        | PASS   |          |                          |         |         |          |
| Source Exhaust          | PASS   |          |                          |         |         |          |
| Source Leak             | PASS   |          | Source Pressure Time 1   | 3.0000  |         | 30.000   |
| Align Quad RF Generator | PASS   |          | Rectified RF             | 1.70    | 1.00    | 10.00    |
|                         |        |          | Quad Frequency           | 1131400 | 900000  | 1200000  |
| Critical Voltages       | PASS   |          | pos capillaryVoltage     | 1.5067  | 1.2000  | 1.8000   |
|                         |        |          | pos coneVoltage          | 24.043  | 21.000  | 27.000   |
|                         |        |          | pos dynodeVoltage        | -8006.0 | -9000.0 | -7000.0  |
|                         |        |          | pos ionGuide1Offset      | 26.721  | 23.000  | 31.000   |
|                         |        |          | pos ionGuide2Gradient    | 4.1392  | 3.5000  | 4.5000   |
|                         |        |          | pos ionGuide2Offset      | 1.0067  | 0.80000 | 1.2000   |
|                         |        |          | pos multiplierVoltage    | 500.44  | 400.00  | 650.00   |
|                         |        |          | pos phosphorVoltage      | 9003.0  | 8000.0  | 10000    |
|                         |        |          | pos prefilter            | -10.000 | -12.000 | -7.0000  |
|                         |        |          | pos sourceOffset         | 107.06  | 98.000  | 116.00   |
|                         |        |          | pos stepWaveRFAmplitude  | 153.38  | 140.00  | 160.00   |
|                         |        |          | pos stepwaveBodyGradient | 77.022  | 70.000  | 84.000   |
|                         |        |          | pos stepwaveHeadGradient | 61.730  | 55.000  | 69.000   |
|                         |        |          | pos stepwaveOffset       | 41.541  | 37.000  | 47.000   |
|                         |        |          | pos vacuumPumpPower      | 42.000  | 37.000  | 60.000   |
|                         |        |          | neg capillaryVoltage     | 0.80537 | 0.50000 | 1.1000   |
|                         |        |          | neg coneVoltage          | -24.249 | -27.000 | -21.000  |
|                         |        |          | neg dynodeVoltage        | 8006.0  | 7000.0  | 9000.0   |
|                         |        |          | neg ionGuide1Offset      | -27.235 | -31.000 | -23.000  |
|                         |        |          | neg ionGuide2Gradient    | -4.1392 | -4.5000 | -3.5000  |
|                         |        |          | neg ionGuide2Offset      | -1.0470 | -1.2000 | -0.80000 |
|                         |        |          | neg multiplierVoltage    | 500.44  | 400.00  | 650.00   |
|                         |        |          | neg phosphorVoltage      | 9003.0  | 8000.0  | 10000    |
|                         |        |          | neg prefilter            | 9.8974  | 7.0000  | 12.000   |
|                         |        |          | neg sourceOffset         | -107.06 | -116.00 | -98.000  |
|                         |        |          | neg stepWaveRFAmplitude  | 153.50  | 140.00  | 160.00   |
|                         |        |          | neg stepwaveBodyGradient | -77.198 | -84.000 | -70.000  |
|                         |        |          | neg stepwaveHeadGradient | -62.554 | -69.000 | -55.000  |
|                         |        |          | neg stepwaveOffset       | -42.068 | -47.000 | -37.000  |

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Middle of report not displayed

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Summary KAD2908\_PO

FINAL BEAM TESTING

| TEST MODULE                  | STATUS | FAILURES | RESULT                           | VALUE   | LSL     | USL     |
|------------------------------|--------|----------|----------------------------------|---------|---------|---------|
| Pump Stability               | PASS   |          | Pump RSD Percent                 | 1       |         | 5       |
| Final Beam - Positive        | PASS   |          | pos DCneg Peak 1 Mass            | 74.05   | 73.60   | 74.60   |
|                              |        |          | pos DCneg Peak 1 FWHH            | 0.68    | 0.60    | 0.80    |
|                              |        |          | pos DCneg Peak 1 Intensity       | 8.99e+6 | 6.39e+6 |         |
|                              |        |          | pos DCneg Peak 2 Mass            | 310.97  | 310.58  | 311.58  |
|                              |        |          | pos DCneg Peak 2 FWHH            | 0.69    | 0.60    | 0.80    |
|                              |        |          | pos DCneg Peak 2 Intensity       | 4.69e+7 | 2.06e+7 |         |
|                              |        |          | pos DCneg Peak 3 Mass            | 556.13  | 555.78  | 556.78  |
|                              |        |          | pos DCneg Peak 3 FWHH            | 0.65    | 0.60    | 0.80    |
|                              |        |          | pos DCneg Peak 3 Intensity       | 3.47e+7 | 2.24e+7 |         |
|                              |        |          | pos DCneg Peak 4 Mass            | 1135.32 | 1134.88 | 1135.88 |
|                              |        |          | pos DCneg Peak 4 FWHH            | 0.69    | 0.60    | 0.80    |
|                              |        |          | pos DCneg Peak 4 Intensity       | 3.30e+6 | 9.60e+5 |         |
|                              |        |          | pos DCneg High Mass Transmission | 10.5    |         | 15.0    |
| Final Beam - Negative        | PASS   |          | neg DCneg Peak 1 Mass            | 178.94  | 178.56  | 179.56  |
|                              |        |          | neg DCneg Peak 1 FWHH            | 0.69    | 0.60    | 0.80    |
|                              |        |          | neg DCneg Peak 1 Intensity       | 1.13e+6 | 5.04e+5 |         |
|                              |        |          | neg DCneg Peak 2 Mass            | 554.09  | 553.76  | 554.76  |
|                              |        |          | neg DCneg Peak 2 FWHH            | 0.71    | 0.60    | 0.80    |
|                              |        |          | neg DCneg Peak 2 Intensity       | 1.57e+6 | 5.35e+5 |         |
|                              |        |          | neg DCneg Peak 3 Mass            | 554.09  | 553.76  | 554.76  |
|                              |        |          | neg DCneg Peak 3 FWHH            | 0.71    | 0.60    | 0.80    |
|                              |        |          | neg DCneg Peak 3 Intensity       | 1.59e+6 | 5.35e+5 |         |
|                              |        |          | neg DCneg Peak 4 Mass            | 1179.25 | 1178.87 | 1179.87 |
|                              |        |          | neg DCneg Peak 4 FWHH            | 0.69    | 0.60    | 0.80    |
|                              |        |          | neg DCneg Peak 4 Intensity       | 3.35e+6 | 2.28e+5 |         |
| Internal Calibrant Benchmark | PASS   | 1        | pos Peak 169 Intensity           | 6.51e+5 | 2.50e+5 |         |
|                              |        |          | pos Peak 169 Slow Scan FWHH      | 0.77    | 0.50    | 0.90    |
|                              |        |          | pos Peak 479 Intensity           | 5.61e+6 | 2.50e+5 |         |
|                              |        |          | pos Peak 479 Slow Scan FWHH      | 0.75    | 0.50    | 0.90    |
|                              |        |          | pos Peak 761 Intensity           | 2.15e+6 | 2.50e+5 |         |
|                              |        |          | pos Peak 761 Slow Scan FWHH      | 0.71    | 0.50    | 0.90    |
|                              |        |          | pos Peak 1159 Intensity          | 8.62e+5 | 2.50e+5 |         |
|                              |        |          | pos Peak 1159 Slow Scan FWHH     | 0.69    | 0.50    | 0.90    |
|                              |        |          | pos Peak 169 Fast Scan           | 0.86    | 0.50    | 0.90    |

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|                       |      |                    |                          |         |         |      |
|-----------------------|------|--------------------|--------------------------|---------|---------|------|
| 10/02/2017            |      | Summary KAD2908_PQ |                          |         |         |      |
|                       |      |                    | FWHH                     |         |         |      |
|                       |      |                    | pos Peak 479 Fast Scan   | 0.79    | 0.50    | 0.90 |
|                       |      |                    | FWHH                     |         |         |      |
|                       |      |                    | pos Peak 761 Fast Scan   | 0.83    | 0.50    | 0.90 |
|                       |      |                    | FWHH                     |         |         |      |
|                       |      |                    | pos Peak 1159 Fast Scan  | 0.69    | 0.50    | 0.90 |
|                       |      |                    | FWHH                     |         |         |      |
|                       |      |                    | neg Peak 135 Intensity   | 1.41e+6 | 2.50e+5 |      |
|                       |      |                    | neg Peak 135 Slow Scan   | 0.67    | 0.50    | 0.90 |
|                       |      |                    | FWHH                     |         |         |      |
|                       |      |                    | neg Peak 417 Intensity   | 4.94e+6 | 2.50e+5 |      |
|                       |      |                    | neg Peak 417 Slow Scan   | 0.75    | 0.50    | 0.90 |
|                       |      |                    | FWHH                     |         |         |      |
|                       |      |                    | neg Peak 748.9 Intensity | 9.33e+6 | 2.50e+5 |      |
|                       |      |                    | neg Peak 748.9 Slow Scan | 0.70    | 0.50    | 0.90 |
|                       |      |                    | FWHH                     |         |         |      |
|                       |      |                    | neg Peak 1081 Intensity  | 7.14e+6 | 2.50e+5 |      |
|                       |      |                    | neg Peak 1081 Slow Scan  | 0.72    | 0.50    | 0.90 |
|                       |      |                    | FWHH                     |         |         |      |
|                       |      |                    | neg Peak 135 Fast Scan   | 0.84    | 0.50    | 0.90 |
|                       |      |                    | FWHH                     |         |         |      |
|                       |      |                    | neg Peak 417 Fast Scan   | 0.73    | 0.50    | 0.90 |
|                       |      |                    | FWHH                     |         |         |      |
|                       |      |                    | neg Peak 748.9 Fast Scan | 0.85    | 0.50    | 0.90 |
|                       |      |                    | FWHH                     |         |         |      |
|                       |      |                    | neg Peak 1081 Fast Scan  | 0.90    | 0.50    | 0.90 |
|                       |      |                    | FWHH                     |         |         |      |
| Save Factory Defaults | PASS |                    |                          |         |         |      |
| Shutdown              | PASS |                    |                          |         |         |      |

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#### 17.4. How to Print a DHR Summary Sheet

- (1) Click the Print button on the DHR Summary page to open the record in a format suitable for printing.
- (2) Follow the steps described in section 15.6 to print the summary in PDF or as a hardcopy.

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**18. SIGMA DATA**

Prior to AMITS, when an instrument had completed manufacturing test, engineers manually collected key result data and stored it within an Excel environment.

AMITS V2.0 stored key data automatically within SigmaQuest 6, AMITS V3.1 stores the key data within SigmaSure7. This data over time has been shown to be useful in identifying:

- Normal tune settings, along with a tolerance value.
- Flagging instruments that deviate from the expected tune settings due to unexpected component / sample / test bay environment variation.
- Flagging instruments that deviate from the expected test result values (but still within specification limits) due to unexpected component / sample / test bay environment variation.
- Creating data for marketing purposes or for comparison with new instrument designs.

The second from last point is an example of Statistical Process Control, and the use of control limits. However, this tool is designed for mass production measurements – not variation in mass spec results.

To store this information, Waters is moving towards the use of SigmaSure. This is a web based package that can be used to analyse key data and perform trend analysis, along with other functions that will assist in performance traceability.

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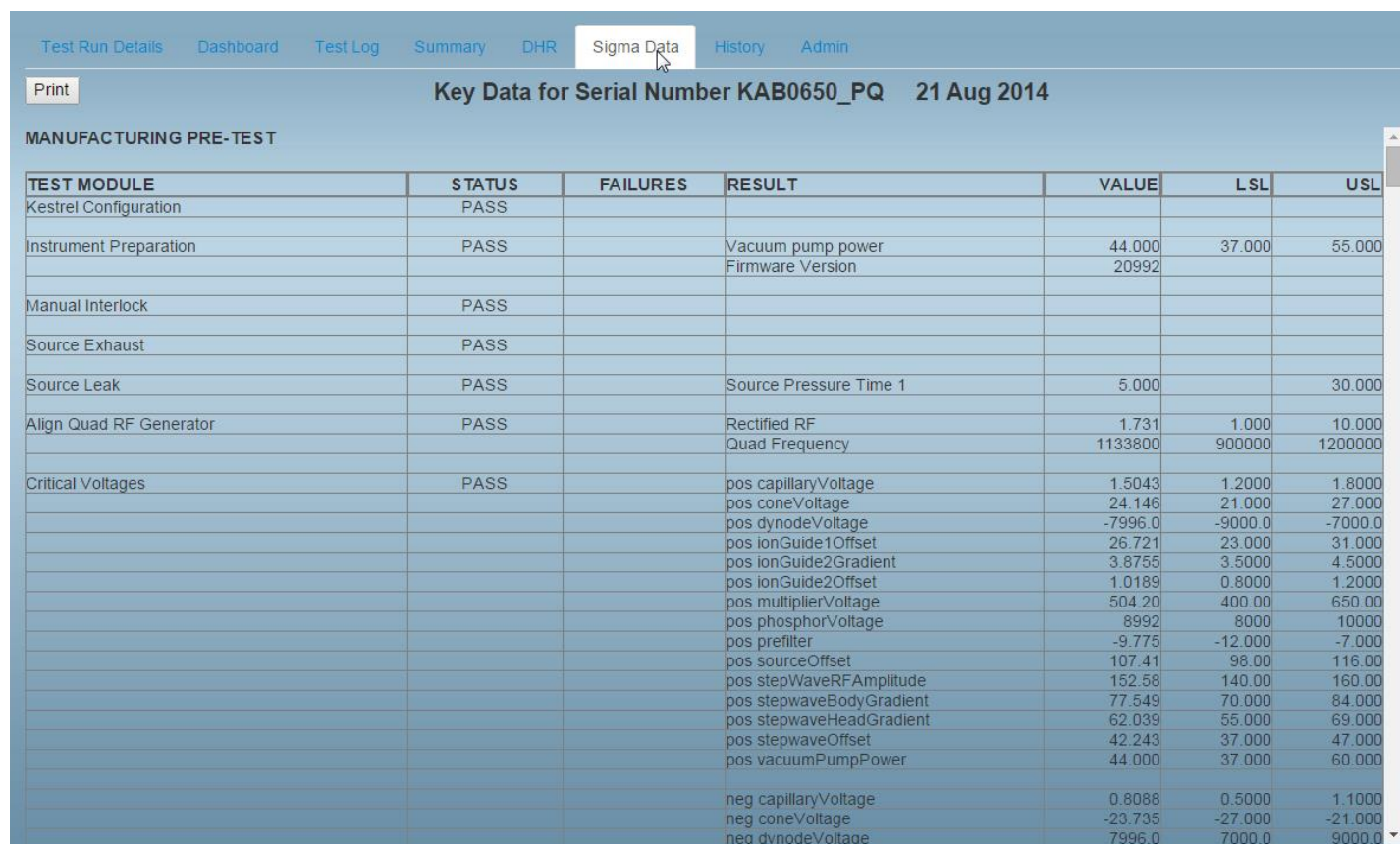
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## 18.1. Opening the Sigma Data

- (1) Open AMITS
- (2) Click on the Sigma Data option in the top tool bar of AMITS
- (3) This will make AMITS build and then display the Sigma Data



| TEST MODULE             | STATUS | FAILURES | RESULT                   | VALUE   | LSL     | USL     |
|-------------------------|--------|----------|--------------------------|---------|---------|---------|
| Kestrel Configuration   | PASS   |          |                          |         |         |         |
| Instrument Preparation  | PASS   |          | Vacuum pump power        | 44.000  | 37.000  | 55.000  |
|                         |        |          | Firmware Version         | 20992   |         |         |
| Manual Interlock        | PASS   |          |                          |         |         |         |
| Source Exhaust          | PASS   |          |                          |         |         |         |
| Source Leak             | PASS   |          | Source Pressure Time 1   | 5.000   |         | 30.000  |
| Align Quad RF Generator | PASS   |          | Rectified RF             | 1.731   | 1.000   | 10.000  |
|                         |        |          | Quad Frequency           | 1133800 | 900000  | 1200000 |
| Critical Voltages       | PASS   |          | pos capillaryVoltage     | 1.5043  | 1.2000  | 1.8000  |
|                         |        |          | pos coneVoltage          | 24.146  | 21.000  | 27.000  |
|                         |        |          | pos dynodeVoltage        | -7996.0 | -9000.0 | -7000.0 |
|                         |        |          | pos ionGuide1Offset      | 26.721  | 23.000  | 31.000  |
|                         |        |          | pos ionGuide2Gradient    | 3.8755  | 3.5000  | 4.5000  |
|                         |        |          | pos ionGuide2Offset      | 1.0189  | 0.8000  | 1.2000  |
|                         |        |          | pos multiplierVoltage    | 504.20  | 400.00  | 650.00  |
|                         |        |          | pos phosphorVoltage      | 8992    | 8000    | 10000   |
|                         |        |          | pos prefilter            | -9.775  | -12.000 | -7.000  |
|                         |        |          | pos sourceOffset         | 107.41  | 98.00   | 116.00  |
|                         |        |          | pos stepWaveRFAmplitude  | 152.58  | 140.00  | 160.00  |
|                         |        |          | pos stepwaveBodyGradient | 77.549  | 70.000  | 84.000  |
|                         |        |          | pos stepwaveHeadGradient | 62.039  | 55.000  | 69.000  |
|                         |        |          | pos stepwaveOffset       | 42.243  | 37.000  | 47.000  |
|                         |        |          | pos vacuumPumpPower      | 44.000  | 37.000  | 60.000  |
|                         |        |          | neg capillaryVoltage     | 0.8088  | 0.5000  | 1.1000  |
|                         |        |          | neg coneVoltage          | -23.735 | -27.000 | -21.000 |
|                         |        |          | neg dynodeVoltage        | 7996.0  | 7000.0  | 9000.0  |

- (4) The Sigma Data is designed for an upload to a database, and is not intended for engineers to refer to. The reason for this is that some of the field results are from intermediate stages of tuning, and not the final result. Care must be taken if manually exacting information from the Sigma Data. The safest way to extract information is from the DHR Report, and from the DHR Summary Sheet.

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## 18.2. Finding failures

Any results associated with a specification are measured against a lower specification limit and an upper specification limit. Where a specification limit has been left blank, the software assumes a null value, not zero.

Any result that lies outside of these limits is highlighted with a red background.

| <a href="#">Test Run Details</a> <a href="#">Dashboard</a> <a href="#">Test Log</a> <a href="#">Summary</a> <a href="#">DHR</a> <a href="#">Sigma Data</a> <a href="#">History</a> <a href="#">Admin</a> |  |                                                           |          |         |         |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-----------------------------------------------------------|----------|---------|---------|
| <a href="#">Print</a> <b>Key Data for Serial Number KAB0538_PQ 20 Aug 2014</b>                                                                                                                           |  |                                                           |          |         |         |
|                                                                                                                                                                                                          |  | pos DCpos Peak 3 Precursor Height % (if negative add 100) | 0.0      | -10.000 | 5.000   |
|                                                                                                                                                                                                          |  | pos DCpos Peak 3 Precursor Gap (Da)                       | 0.0      |         | 0.10500 |
|                                                                                                                                                                                                          |  | pos DCpos Peak 3 Shoulder Height % (if negative add 100)  | 0.0      | -10.000 | 10.000  |
|                                                                                                                                                                                                          |  | pos DCpos Peak 3 Impurity                                 | 78.476   |         | 85.500  |
|                                                                                                                                                                                                          |  | pos DCpos Peak 3 Leading Edge Distance (Da)               | 0.55     |         | 100.00  |
|                                                                                                                                                                                                          |  | pos DCpos Peak 4 Mass                                     | 1135.35  | 1134.88 | 1135.88 |
|                                                                                                                                                                                                          |  | pos DCpos Peak 4 FWHH                                     | 0.73320  | 0.60000 | 0.80000 |
|                                                                                                                                                                                                          |  | pos DCpos Peak 4 Asymmetry                                | 0.8043   |         | 2.8000  |
|                                                                                                                                                                                                          |  | pos DCpos Peak 4 Valley Height %                          | 48.774   |         | 70.000  |
|                                                                                                                                                                                                          |  | pos DCpos Peak 4 Precursor Height % (if negative add 100) | 0.092    | -10.000 | 5.000   |
|                                                                                                                                                                                                          |  | pos DCpos Peak 4 Precursor Gap (Da)                       | 1.4294   |         | 0.1050  |
|                                                                                                                                                                                                          |  | pos DCpos Peak 4 Shoulder Height % (if negative add 100)  | 0.0      | -10.000 | 10.000  |
|                                                                                                                                                                                                          |  | pos DCpos Peak 4 Impurity                                 | 100.57   |         | 85.50   |
|                                                                                                                                                                                                          |  | pos DCpos Peak 4 Leading Edge Distance (Da)               | 0.75     |         | 100.00  |
|                                                                                                                                                                                                          |  | pos DCpos High Mass Transmission                          | 20.994   |         | 15.000  |
|                                                                                                                                                                                                          |  | pos DCneg User Low Mass Resolution                        | 0        |         |         |
|                                                                                                                                                                                                          |  | pos DCneg Low Mass Resolution                             | 0.50757  |         |         |
|                                                                                                                                                                                                          |  | pos DCneg Low Mass Position                               | 0.72381  |         |         |
|                                                                                                                                                                                                          |  | pos DCneg User High Mass Resolution                       | 0        |         |         |
|                                                                                                                                                                                                          |  | pos DCneg High Mass Resolution                            | -7.5564  |         |         |
|                                                                                                                                                                                                          |  | pos DCneg High Mass Position                              | 1.0594   |         |         |
|                                                                                                                                                                                                          |  | pos DCneg Resolution Linearity                            | 56.260   |         |         |
|                                                                                                                                                                                                          |  | pos DCneg Ion Energy                                      | -0.92643 |         |         |
|                                                                                                                                                                                                          |  | pos DCneg High Mass Ion Energy                            | 0.18855  |         |         |
|                                                                                                                                                                                                          |  | pos DCneg Peak 1 Mass                                     | 74.069   | 73.600  | 74.600  |
|                                                                                                                                                                                                          |  | pos DCneg Peak 1 FWHH                                     | 0.66808  | 0.60000 | 0.80000 |
|                                                                                                                                                                                                          |  | pos DCneg Peak 1 Asymmetry                                | 0.6561   |         | 2.8000  |
|                                                                                                                                                                                                          |  | pos DCneg Peak 1 Valley Height %                          | 0.0      |         | 70.000  |
|                                                                                                                                                                                                          |  | pos DCneg Peak 1 Precursor Height %                       | 0.0      | -10.000 | 5.000   |

Example of failing data within the Sigma Data.

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**18.3. Using SigmaQuest**

The purpose of SigmaQuest for the Acquity QDa, is to easily access data that could be used to monitor trends. The trends can be based on any of the results collected by the Sigma Data upload.

The limitations of the system, as it has utilised for the Acquity QDa, are based on when a record is uploaded to the SigmaQuest database.

A pass record is uploaded when an instrument, assembly or spares item completes the suite of tests associated with that part.

A failure record is uploaded ONLY when the entire test sequence is restarted.

i.e. when a failure has resulted in the exposure of the analyser, and so the manufacturing pretests have to be repeated to ensure charging has not been introduced to the instrument.

Another complete retest scenario is when the DCC control board is replaced, and the pretests have to be repeated to confirm the safety interlocks are recognised.

As any other failure type that does not involve a full restart does not result in a record being transmitted to SigmaQuest, any yield or failure count statistic has to be used with caution.

The following few pages give examples of the tools SigmaQuest 6 can offer. Sigma 7 offers similar tools but the user interface is slightly different.

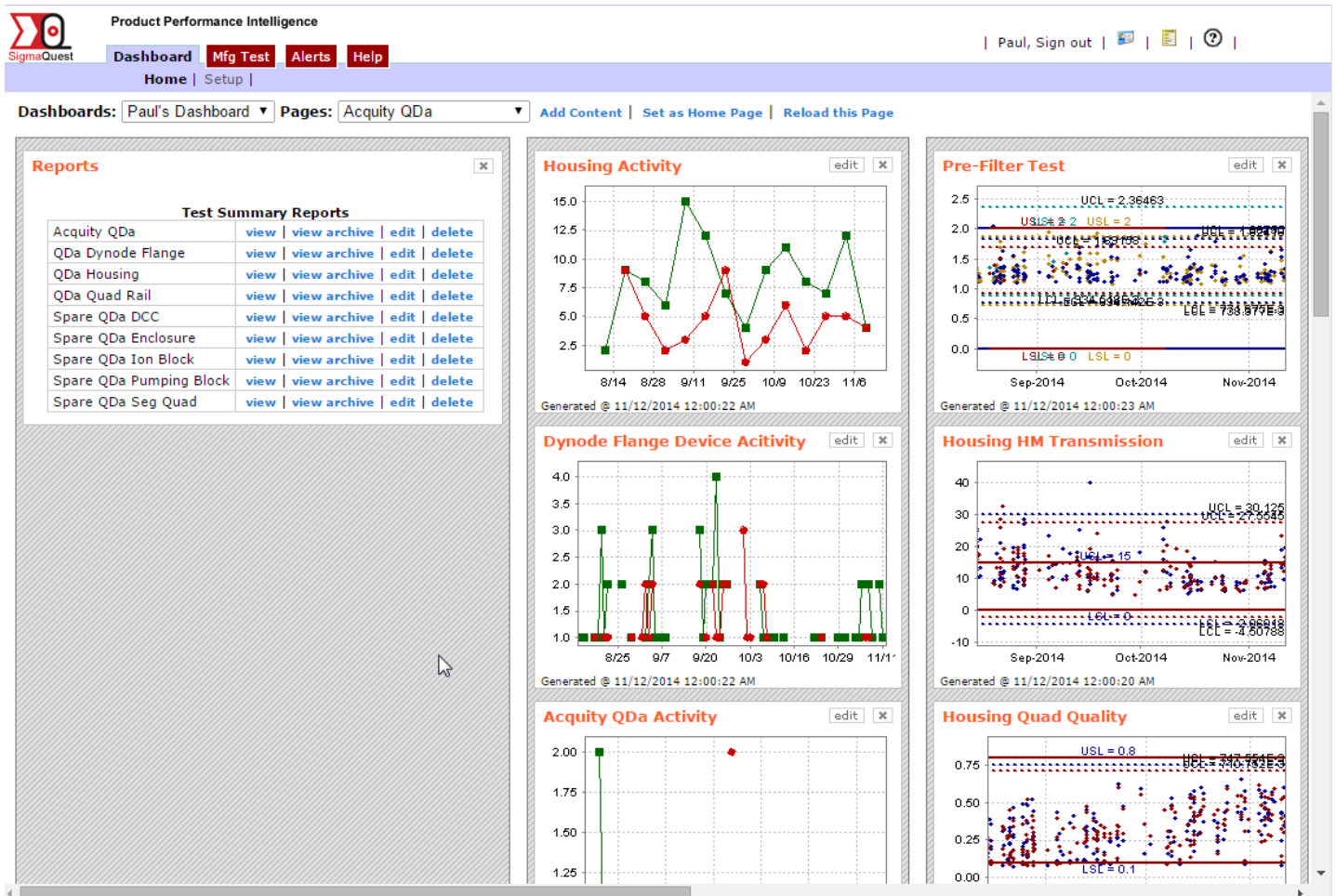
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## 18.3.1. SigmaQuest Dashboard



It is possible to quickly develop a “dashboard” that summarises results from a time period of your choice, and refreshed at a period of your choice.

This one stop shortcut to trend analysis can be a rapid means of observing and trends in production activity, and in any key performance tests that could highlight when production might be requiring pro-active action to prevent actual failure from occurring.

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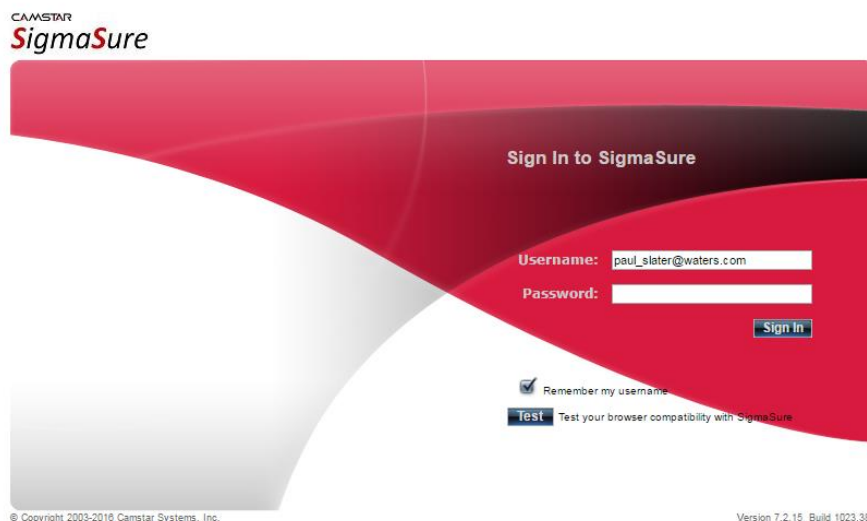
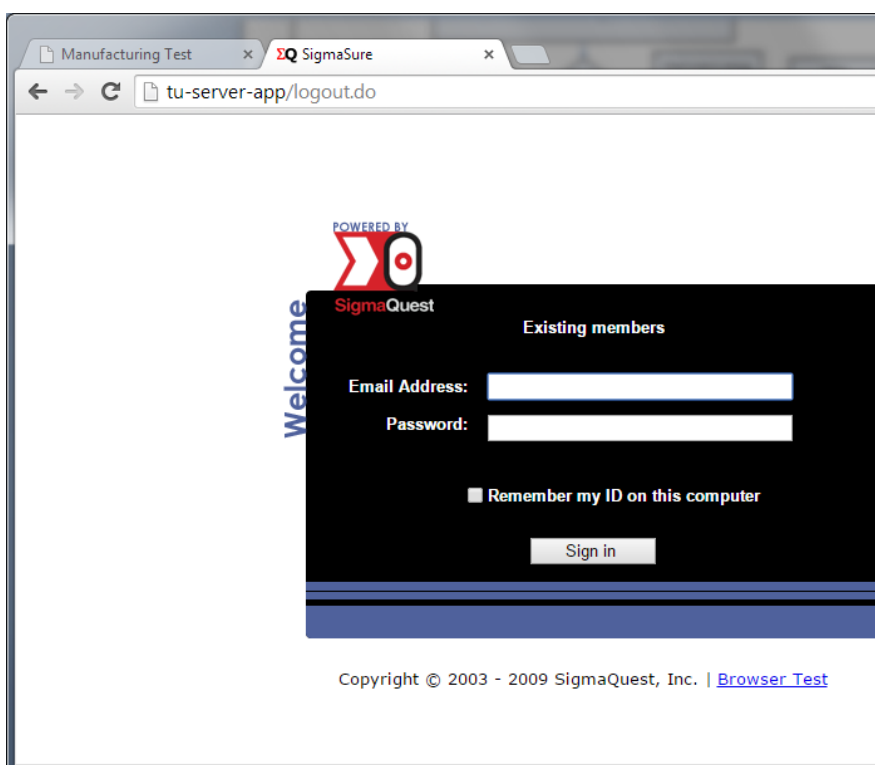
Open SigmaQuest.

Sigma 6 =

Tu-server-app

Sigma 7 =

<http://sigmaprod.corp.waters.com/sigma/welcome.do>

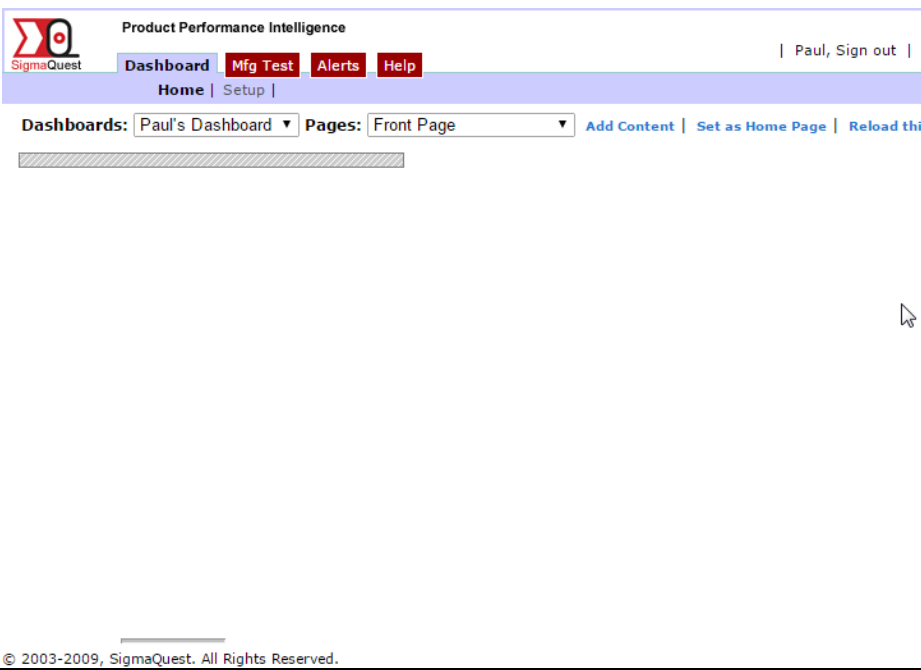


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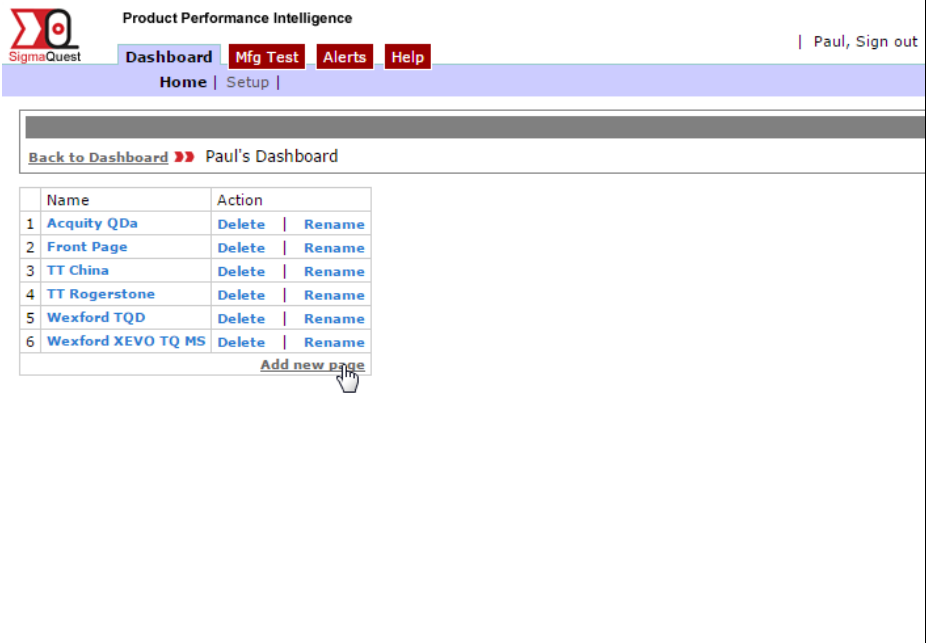
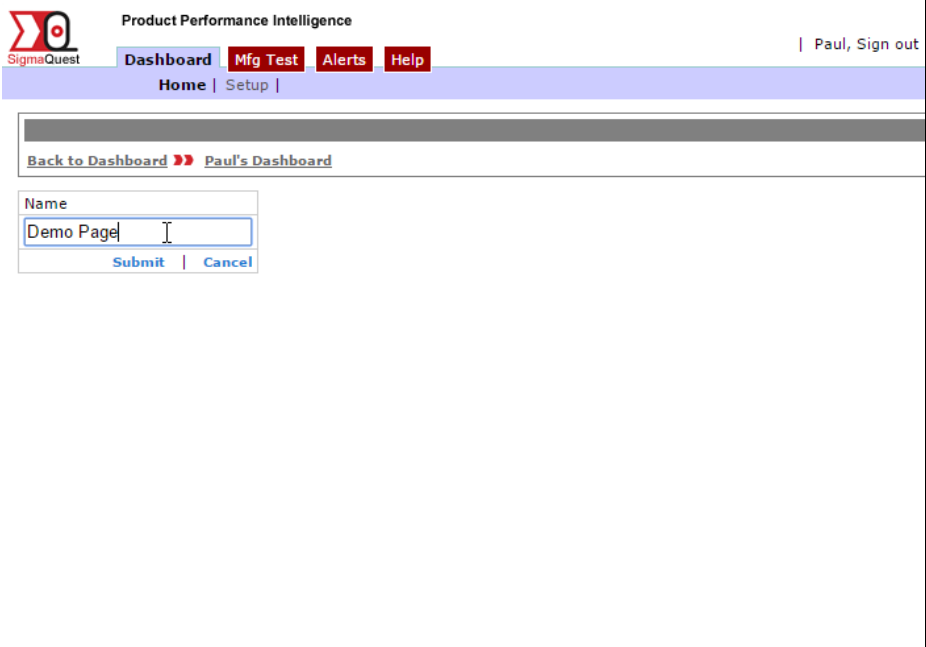
|                              |                                                                                      |
|------------------------------|--------------------------------------------------------------------------------------|
| <p>Select your Dashboard</p> |   |
| <p>Select Add Content</p>    |  |

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| <p>Select Add new Page</p>               |  <p>The screenshot shows the SigmaQuest 'Product Performance Intelligence' dashboard. At the top, there are navigation tabs: 'Dashboard' (selected), 'Mfg Test', 'Alerts', and 'Help'. Below these are links for 'Home' and 'Setup'. A user profile 'Paul, Sign out' is in the top right. The main content area has a 'Back to Dashboard' link and 'Paul's Dashboard'. A table lists existing pages:</p> <table border="1"> <thead> <tr> <th></th> <th>Name</th> <th>Action</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Acquity QDa</td> <td>Delete   Rename</td> </tr> <tr> <td>2</td> <td>Front Page</td> <td>Delete   Rename</td> </tr> <tr> <td>3</td> <td>TT China</td> <td>Delete   Rename</td> </tr> <tr> <td>4</td> <td>TT Rogerstone</td> <td>Delete   Rename</td> </tr> <tr> <td>5</td> <td>Wexford TQD</td> <td>Delete   Rename</td> </tr> <tr> <td>6</td> <td>Wexford XEVO TQ MS</td> <td>Delete   Rename</td> </tr> </tbody> </table> <p>Below the table is a link 'Add new page' with a mouse cursor pointing to it.</p> |                 | Name | Action | 1 | Acquity QDa | Delete   Rename | 2 | Front Page | Delete   Rename | 3 | TT China | Delete   Rename | 4 | TT Rogerstone | Delete   Rename | 5 | Wexford TQD | Delete   Rename | 6 | Wexford XEVO TQ MS | Delete   Rename |
|------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------|--------|---|-------------|-----------------|---|------------|-----------------|---|----------|-----------------|---|---------------|-----------------|---|-------------|-----------------|---|--------------------|-----------------|
|                                          | Name                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Action          |      |        |   |             |                 |   |            |                 |   |          |                 |   |               |                 |   |             |                 |   |                    |                 |
| 1                                        | Acquity QDa                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Delete   Rename |      |        |   |             |                 |   |            |                 |   |          |                 |   |               |                 |   |             |                 |   |                    |                 |
| 2                                        | Front Page                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Delete   Rename |      |        |   |             |                 |   |            |                 |   |          |                 |   |               |                 |   |             |                 |   |                    |                 |
| 3                                        | TT China                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Delete   Rename |      |        |   |             |                 |   |            |                 |   |          |                 |   |               |                 |   |             |                 |   |                    |                 |
| 4                                        | TT Rogerstone                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Delete   Rename |      |        |   |             |                 |   |            |                 |   |          |                 |   |               |                 |   |             |                 |   |                    |                 |
| 5                                        | Wexford TQD                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Delete   Rename |      |        |   |             |                 |   |            |                 |   |          |                 |   |               |                 |   |             |                 |   |                    |                 |
| 6                                        | Wexford XEVO TQ MS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Delete   Rename |      |        |   |             |                 |   |            |                 |   |          |                 |   |               |                 |   |             |                 |   |                    |                 |
| <p>Give the page a name, and submit.</p> |  <p>The screenshot shows the same SigmaQuest dashboard, but the 'Add new page' form is displayed. It has a 'Name' label and a text input field containing 'Demo Page'. Below the input field are 'Submit' and 'Cancel' buttons.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                 |      |        |   |             |                 |   |            |                 |   |          |                 |   |               |                 |   |             |                 |   |                    |                 |

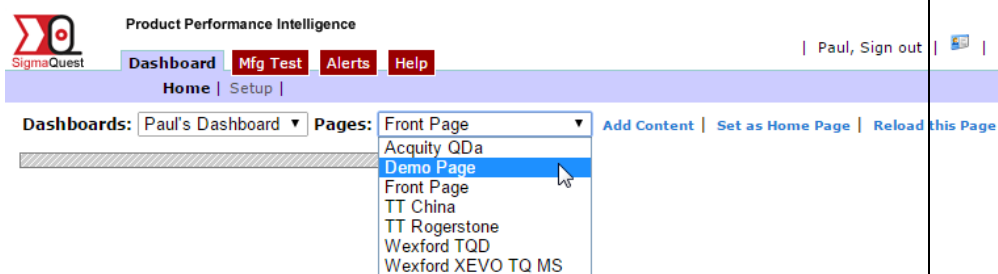
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Return to the dashboard, and confirm the new page is available.



The next section details some simple methods to populate the new dashboard page.

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### 18.3.2. Reports

### Reports

#### Test Summary Reports

|                         |                                                                                                     |
|-------------------------|-----------------------------------------------------------------------------------------------------|
| Acquity QDa             | <a href="#">view</a>   <a href="#">view archive</a>   <a href="#">edit</a>   <a href="#">delete</a> |
| QDa Dynode Flange       | <a href="#">view</a>   <a href="#">view archive</a>   <a href="#">edit</a>   <a href="#">delete</a> |
| QDa Housing             | <a href="#">view</a>   <a href="#">view archive</a>   <a href="#">edit</a>   <a href="#">delete</a> |
| QDa Quad Rail           | <a href="#">view</a>   <a href="#">view archive</a>   <a href="#">edit</a>   <a href="#">delete</a> |
| Spare QDa DCC           | <a href="#">view</a>   <a href="#">view archive</a>   <a href="#">edit</a>   <a href="#">delete</a> |
| Spare QDa Enclosure     | <a href="#">view</a>   <a href="#">view archive</a>   <a href="#">edit</a>   <a href="#">delete</a> |
| Spare QDa Ion Block     | <a href="#">view</a>   <a href="#">view archive</a>   <a href="#">edit</a>   <a href="#">delete</a> |
| Spare QDa Pumping Block | <a href="#">view</a>   <a href="#">view archive</a>   <a href="#">edit</a>   <a href="#">delete</a> |
| Spare QDa Sec Quad      | <a href="#">view</a>   <a href="#">view archive</a>   <a href="#">edit</a>   <a href="#">delete</a> |

### Test Summary Report

Time Period : 11/05/2014 00:00:00 GMT+00:00 to 11/12/2014 00:00:00 GMT+00:00

- AMITS for 289009064 @ Wexford

Transpose
Top

#### AMITS for 289009064 @ Wexford

| Product                               | 289009064 | % of Failure |
|---------------------------------------|-----------|--------------|
| Tested                                | 27        |              |
| Pass                                  | 13        |              |
| Fail                                  | 14        |              |
| Yield                                 | 48.148%   |              |
| MANUFACTURING PRE-TEST                | 3         | 11.111%      |
| Instrument Preparation                | 3         | 11.111%      |
| POSITIVE MODE QUAD TUNING AND TESTING | 7         | 25.926%      |
| Quad Quality                          | 3         | 11.111%      |
| NEGATIVE MODE QUAD TUNING AND TESTING | 7         | 25.926%      |
| Peak Shape Analysis                   | 1         | 3.704%       |
| Full Mass Range Peak Shape Analysis   | 2         | 7.407%       |
| Full Mass Range Peak Shape Analysis   | 6         | 22.222%      |
| Kestrel Configuration                 | 1         | 3.704%       |
| Prefilter                             | 1         | 3.704%       |

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Version: 6.4.3 Build: 1116

[First] [< >] [Last]

Serial Number

Showing 1 to 20 of 27 for All Reports on [ 289009064 ] @ Wexford

| START                         | DURATION | SITE    | STATION     | OPERATOR | TEST                               | Test Count | PRODUCT   | SERIAL                                 | SI Count | FAILURES                                                                                                                                                                                                                                                                                                                                                            | RESULT |
|-------------------------------|----------|---------|-------------|----------|------------------------------------|------------|-----------|----------------------------------------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| 11/11/2014 16:12:41 GMT+00:00 | 01:53:02 | Wexford | System Test | AMITS    | <a href="#">AMITS</a> [ 2nd of 2 ] | 2          | 289009064 | <a href="#">3-05-0575</a> [ 2nd of 2 ] | 2        | -                                                                                                                                                                                                                                                                                                                                                                   | PASS   |
| 11/11/2014 14:14:55 GMT+00:00 | 00:03:37 | Wexford | System Test | AMITS    | <a href="#">AMITS</a> [ 3rd of 4 ] | 4          | 289009064 | <a href="#">3-05-0572</a> [ 3rd of 4 ] | 4        | <ul style="list-style-type: none"> <li>POSITIVE MODE QUAD TUNING AND TESTING               <ul style="list-style-type: none"> <li>Full Mass Range Peak Shape Analysis</li> </ul> </li> <li>NEGATIVE MODE QUAD TUNING AND TESTING               <ul style="list-style-type: none"> <li>Full Mass Range Peak Shape Analysis</li> </ul> </li> </ul>                    | FAIL   |
| 11/11/2014 13:37:32 GMT+00:00 | 01:10:08 | Wexford | System Test | AMITS    | <a href="#">AMITS</a> [ 1st of 2 ] | 2          | 289009064 | <a href="#">3-05-0575</a> [ 1st of 2 ] | 2        | <ul style="list-style-type: none"> <li>POSITIVE MODE QUAD TUNING AND TESTING               <ul style="list-style-type: none"> <li>Full Mass Range Peak Shape Analysis</li> </ul> </li> </ul>                                                                                                                                                                        | FAIL   |
| 11/11/2014 12:01:39 GMT+00:00 | 00:00:06 | Wexford | System Test | AMITS    | <a href="#">AMITS</a> [ 4th of 4 ] | 4          | 289009064 | <a href="#">3-05-0579</a> [ 4th of 4 ] | 4        | <ul style="list-style-type: none"> <li>MANUFACTURING PRE-TEST               <ul style="list-style-type: none"> <li>Instrument Preparation</li> </ul> </li> <li>NEGATIVE MODE QUAD TUNING AND TESTING               <ul style="list-style-type: none"> <li>Full Mass Range Peak Shape Analysis</li> </ul> </li> <li>POSITIVE MODE QUAD TUNING AND TESTING</li> </ul> | FAIL   |
| 11/11/2014 10:21:22 GMT+00:00 | 00:52:53 | Wexford | System Test | AMITS    | <a href="#">AMITS</a> [ 3rd of 4 ] | 4          | 289009064 | <a href="#">3-05-0579</a> [ 3rd of 4 ] | 4        | <ul style="list-style-type: none"> <li>NEGATIVE MODE QUAD TUNING AND TESTING               <ul style="list-style-type: none"> <li>Full Mass Range Peak Shape Analysis</li> </ul> </li> </ul>                                                                                                                                                                        | FAIL   |
| 11/11/2014 08:11:43 GMT+00:00 | 00:49:04 | Wexford | System Test | AMITS    | <a href="#">AMITS</a> [ 2nd of 4 ] | 4          | 289009064 | <a href="#">3-05-0572</a> [ 2nd of 4 ] | 4        | <ul style="list-style-type: none"> <li>NEGATIVE MODE QUAD TUNING AND TESTING               <ul style="list-style-type: none"> <li>Full Mass Range Peak Shape Analysis</li> </ul> </li> </ul>                                                                                                                                                                        | FAIL   |
| 11/11/2014 08:10:31 GMT+00:00 | 01:48:05 | Wexford | System Test | AMITS    | <a href="#">AMITS</a> [ 1st of 1 ] | 1          | 289009064 | <a href="#">3-05-0573</a> [ 1st of 1 ] | 1        | -                                                                                                                                                                                                                                                                                                                                                                   | PASS   |
| 11/11/2014 08:05:36 GMT+00:00 | 00:00:01 | Wexford | System Test | AMITS    | <a href="#">AMITS</a> [ 2nd of 4 ] | 4          | 289009064 | <a href="#">3-05-0579</a> [ 2nd of 4 ] | 4        | <ul style="list-style-type: none"> <li>MANUFACTURING PRE-TEST               <ul style="list-style-type: none"> <li>Kestrel Configuration</li> <li>Instrument Preparation</li> </ul> </li> </ul>                                                                                                                                                                     | FAIL   |
| 11/11/2014 08:05:30 GMT+00:00 | 00:00:00 | Wexford | System Test | AMITS    | <a href="#">AMITS</a> [ 1st of 4 ] | 4          | 289009064 | <a href="#">3-05-0579</a> [ 1st of 4 ] | 4        | <ul style="list-style-type: none"> <li>MANUFACTURING PRE-TEST               <ul style="list-style-type: none"> <li>Instrument Preparation</li> </ul> </li> </ul>                                                                                                                                                                                                    | FAIL   |
| 11/10/2014 16:12:02 GMT+00:00 | 01:24:16 | Wexford | System Test | AMITS    | <a href="#">AMITS</a> [ 2nd of 2 ] | 2          | 289009064 | <a href="#">3-05-0579</a> [ 2nd of 2 ] | 2        | -                                                                                                                                                                                                                                                                                                                                                                   | PASS   |

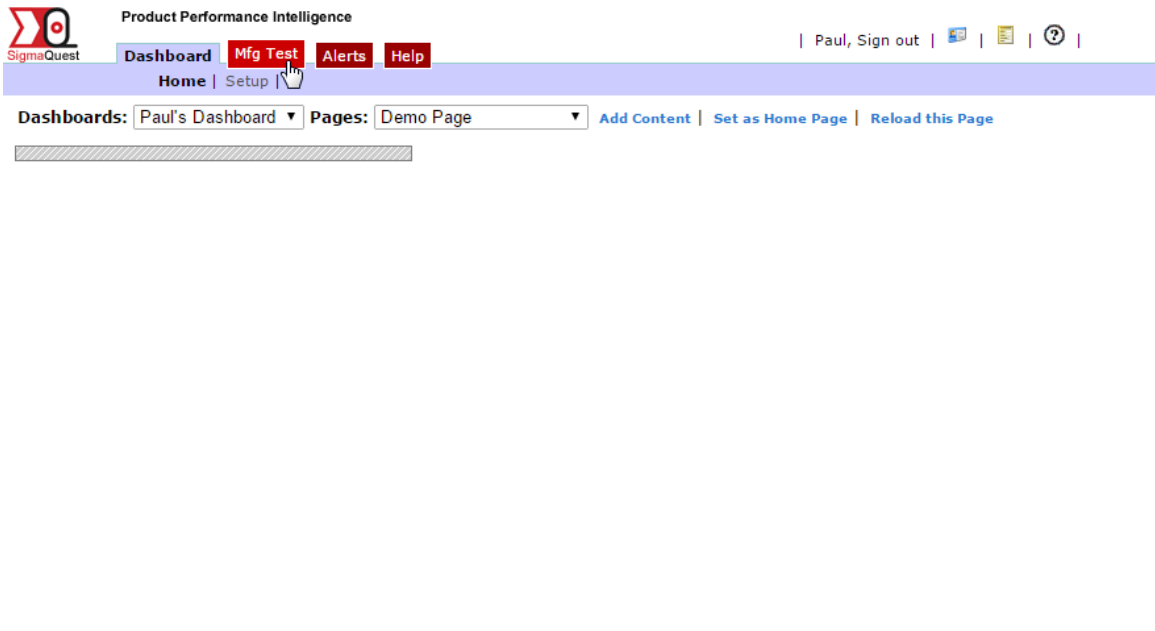
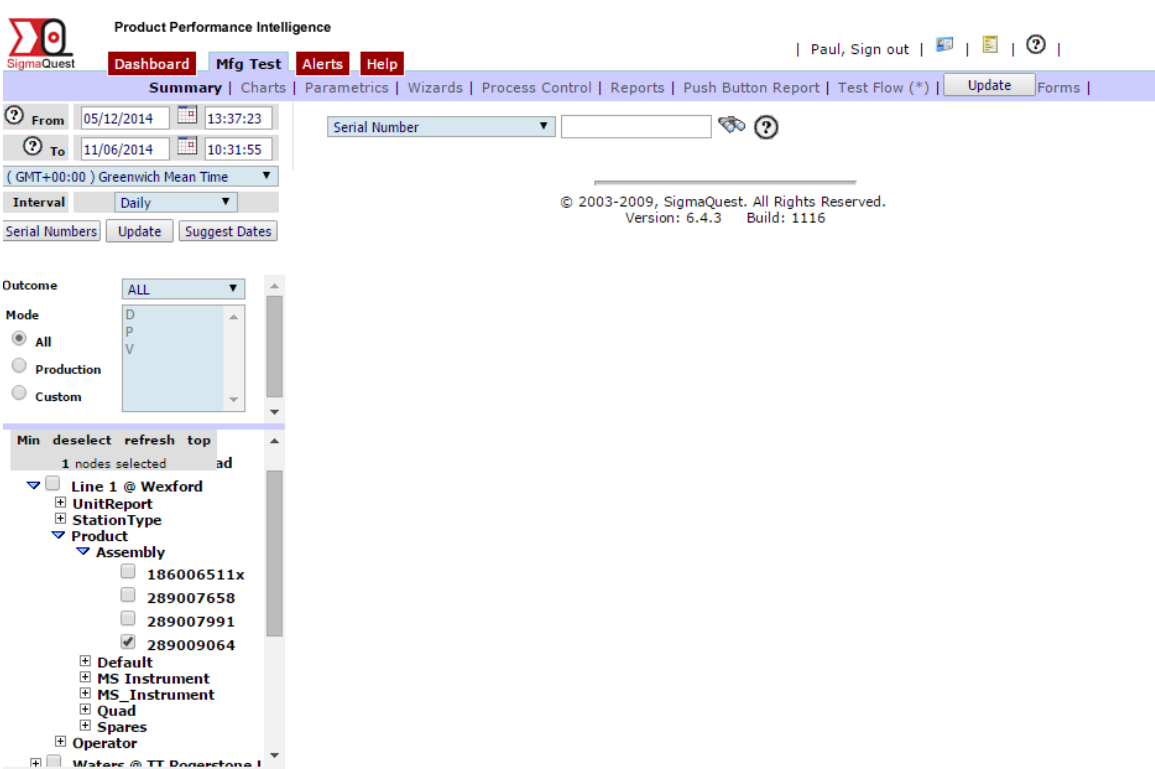
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Reports are a rapid means to breakdown assembly test results for the current period, and from the test summary report created, a rapid means of accessing the raw data reports.

|                                                                                                                     |                                                                                      |
|---------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| <p>Example: Test Summary Report</p> <p>Log on to SigmaQuest and click on the MFG TEST tab.</p>                      |   |
| <p>Select:</p> <p>Outcome = All</p> <p>Mode = All</p> <p>Line 1 @ Wexford,<br/>Product, Assembly,<br/>289009064</p> |  |

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Select:  
Suggest Dates  
Reports

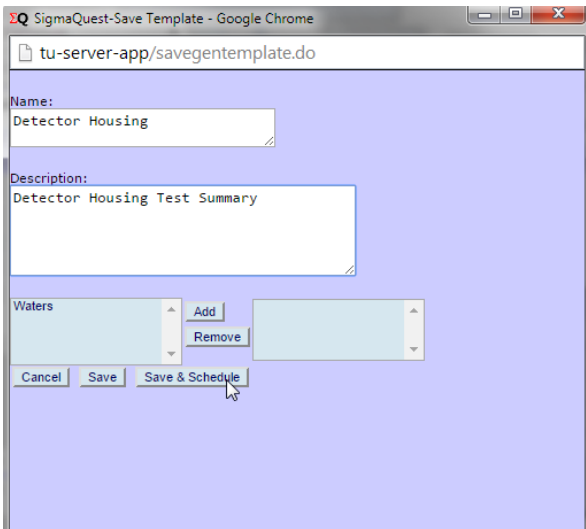
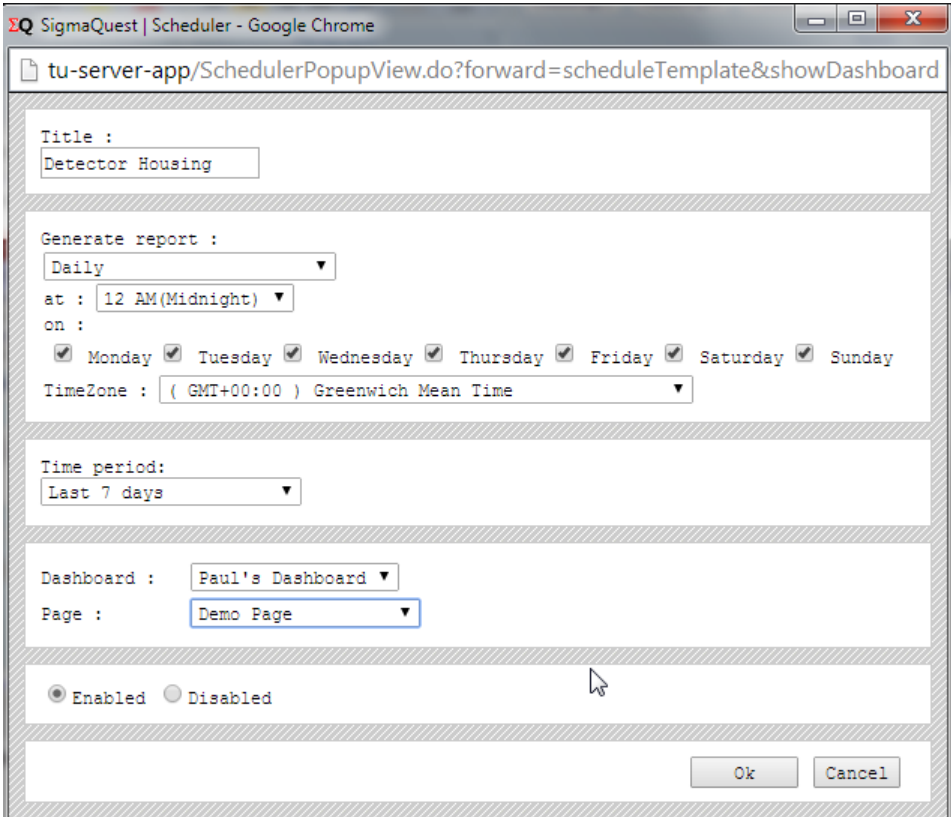
Save the report with the settings as displayed.

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|                                                                                                                                                                                                                                                                                                                                                     |                                                                                     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| <p>Give the report a small name – There is a limit to the number of characters.</p> <p>Give the report a description.</p> <p>Click on the save and schedule option.</p>                                                                                                                                                                             |   |
| <p>Set when the report is generated. In this example, a report will be generated daily at midnight.</p> <p>Set the time period over which the report's data will be gathered. In this example, a rolling period of seven days.</p> <p>Set in which dashboard page the report will be posted.</p> <p>Click the OK button to schedule the report.</p> |  |

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The new report will remain empty until the first report is generated.

The screenshot displays the SigmaQuest Product Performance Intelligence dashboard. At the top, there is a navigation bar with the SigmaQuest logo and the text 'Product Performance Intelligence'. The navigation bar includes links for 'Dashboard', 'Mfg Test', 'Alerts', and 'Help'. Below the navigation bar, there is a section for 'Dashboards' and 'Pages'. The 'Dashboards' section shows 'Paul's Dashboard' and the 'Pages' section shows 'Demo Page'. There are also links for 'Add Content', 'Set as Home Page', and 'Reload this Page'. The main content area features a 'Reports' section with a 'Test Summary Reports' table. The table has one row for 'Detector Housing' with links for 'view', 'view archive', 'edit', and 'delete'. The dashboard also includes a 'Home' link and a 'Setup' link.

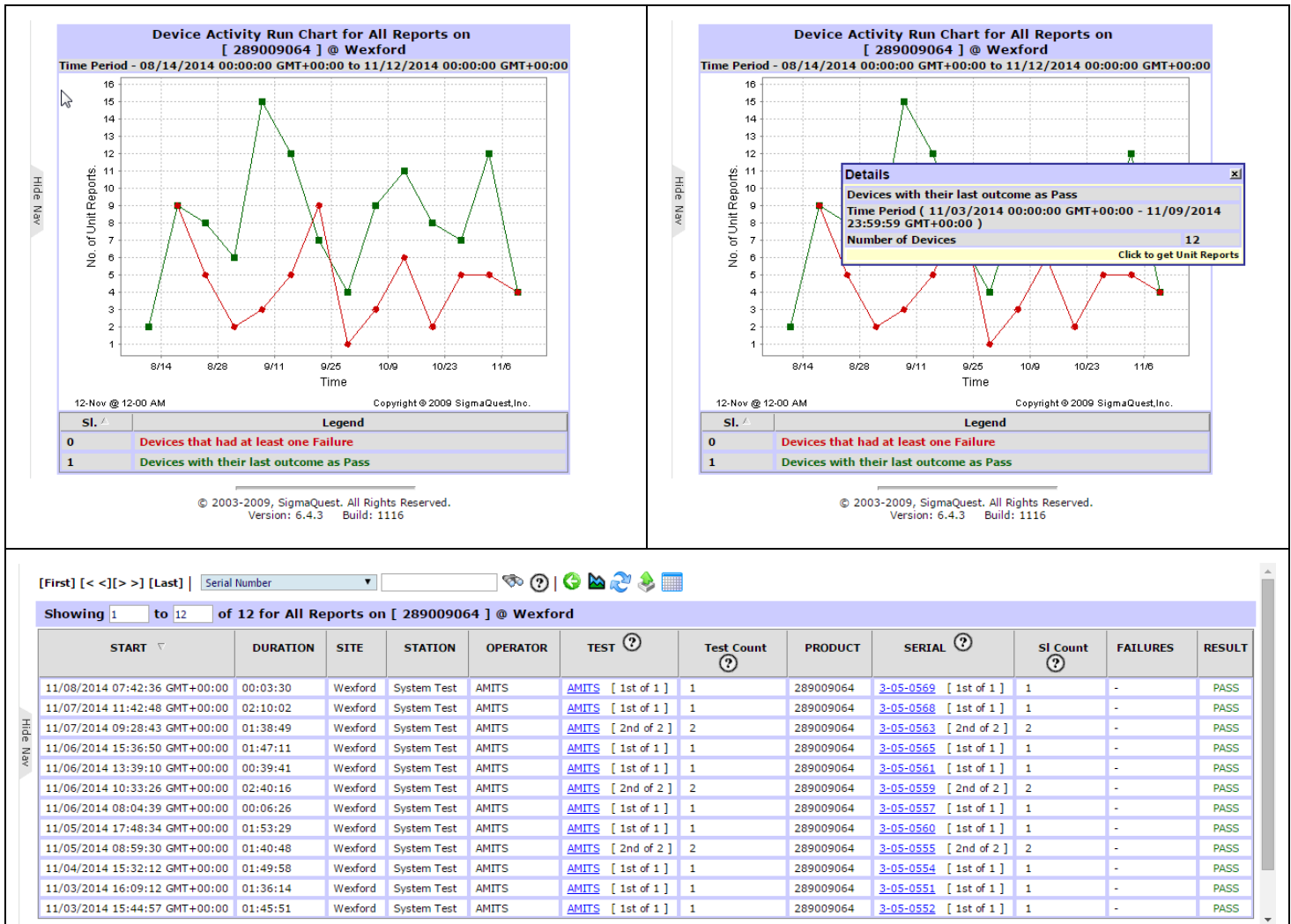
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### 18.3.3. Activity Charts



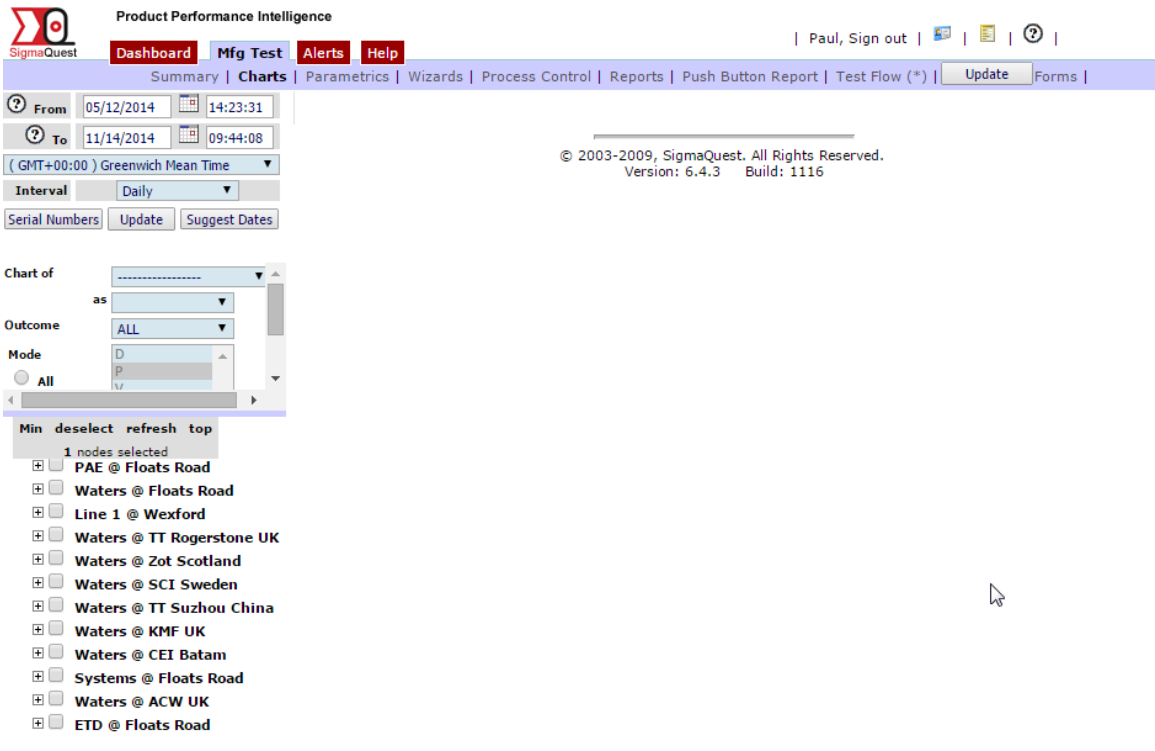
Activity Charts are a simple way to monitor trends in production, and to access pass or fail raw reports.

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|                                                                                                           |                                                                                      |
|-----------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| <p>Example: Detector Housing Test Activity</p> <p>Log on to SigmaQuest and click on the MFG TEST tab.</p> |    |
| <p>Click "Charts"</p>                                                                                     |  |

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Select:

Interval “Weekly”

Chart of: “Device Activity”

As “Run Chart”

Outcome = “All”

Mode = “All”

Line 1 @ Wexford /  
Product / Assembly /  
289009064

Click “Update”

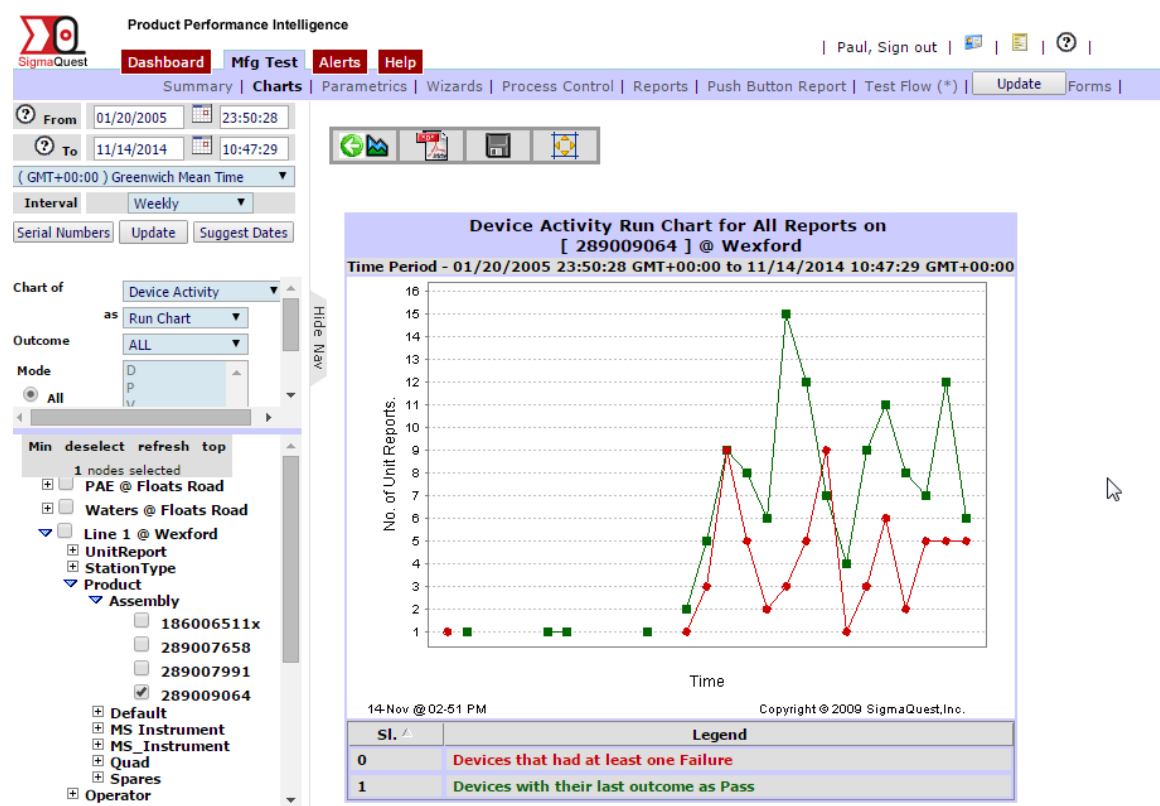
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Click on the “Save Template” button



Give the report a small name – There is a limit to the number of characters.

Give the report a description.

Click on the save and schedule option.

**SQ SigmaQuest-Save Template - Google Chrome**

tu-server-app/savegentemplate.do?showSubmitAndSchedule=true&

Name:  
Housing Activity

Description:  
QDa Detector Housing Activity

Waters: [ Waters ] Add Remove

Cancel Save Save & Schedule

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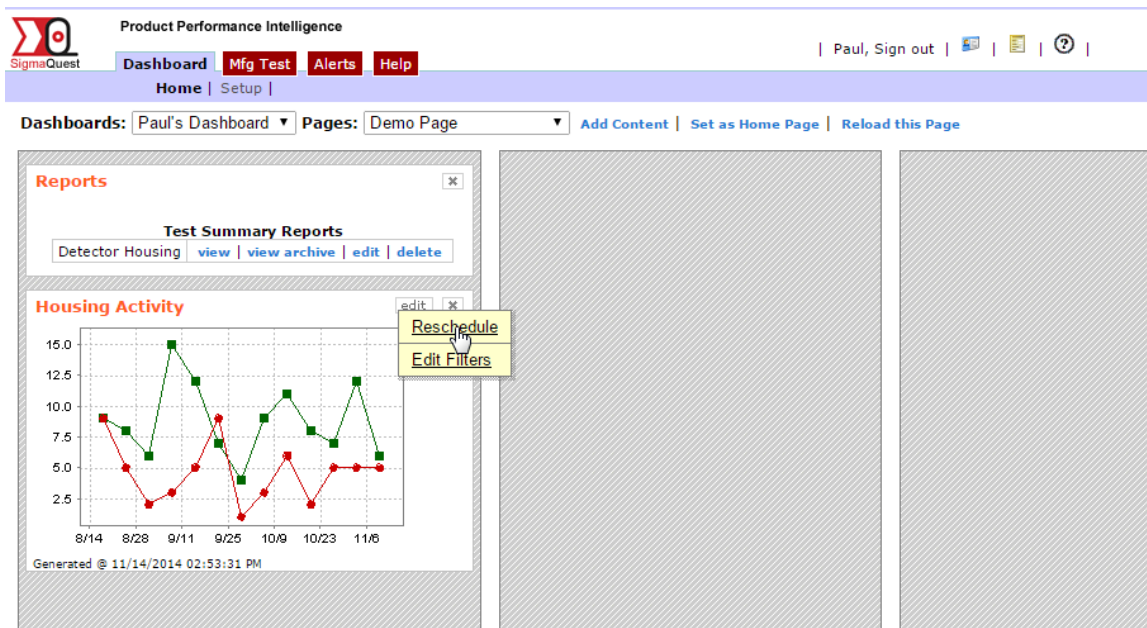
Set when the report is generated. In this example, a report will be generated daily at midnight.

Set the time period over which the report's data will be gathered. In this example, a rolling period of 90 days. (a quarter)

Set in which dashboard page the report will be posted.

Click the OK button to schedule the report.

The new report can be rescheduled by clicking the edit button, and "reschedule"



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In this example, the time period has been increased to 180 days and the report has been moved to column 2

SigmaQuest | Scheduler - Google Chrome

tu-server-app/SchedulerPopupView.do?forward=rescheduleChart&guid=2764919A-0010-E8C8

Last time chart was generated :  
Next time that report will be generated : 11/17/2014 00:00 GMT

Title :  
Housing Activity

Generate report :  
Daily  
at : 12 AM (Midnight)  
on :  
☒ Monday ☒ Tuesday ☒ Wednesday ☒ Thursday ☒ Friday ☒ Saturday ☒ Sunday  
TimeZone : ( GMT+00:00 ) Greenwich Mean Time

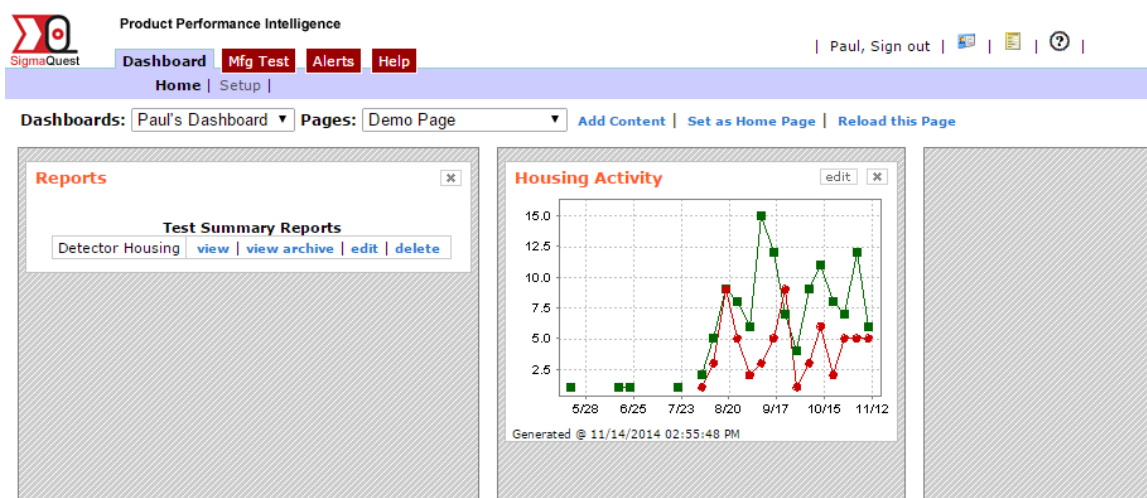
Time period:  
Last 180 days

Dashboard : Paul's Dashboard  
Page : Demo Page  
Column : 2

☒ Enabled ☐ Disabled

Ok Cancel

The rescheduled and moved Housing Activity



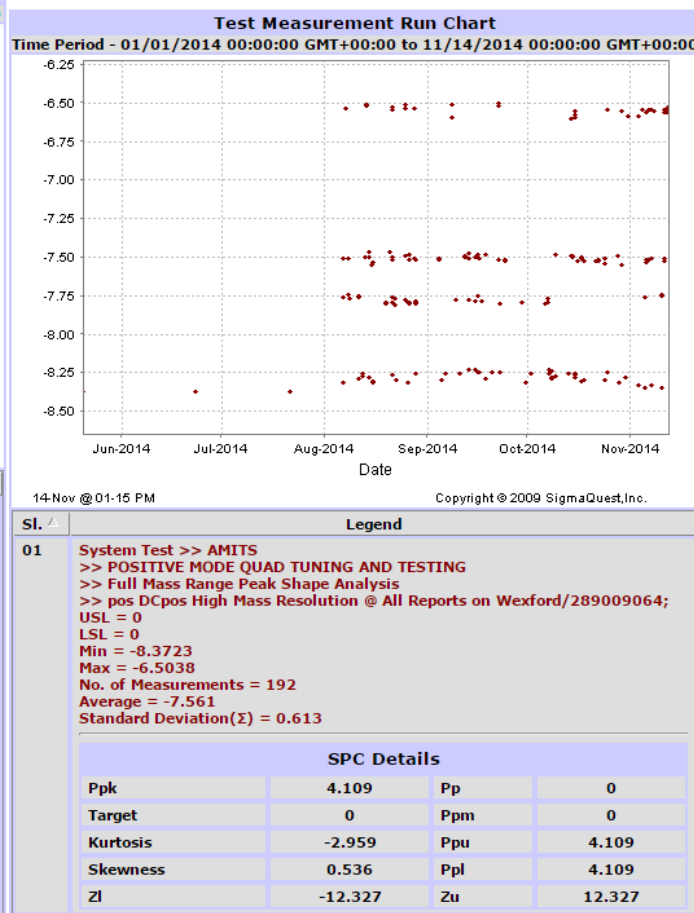
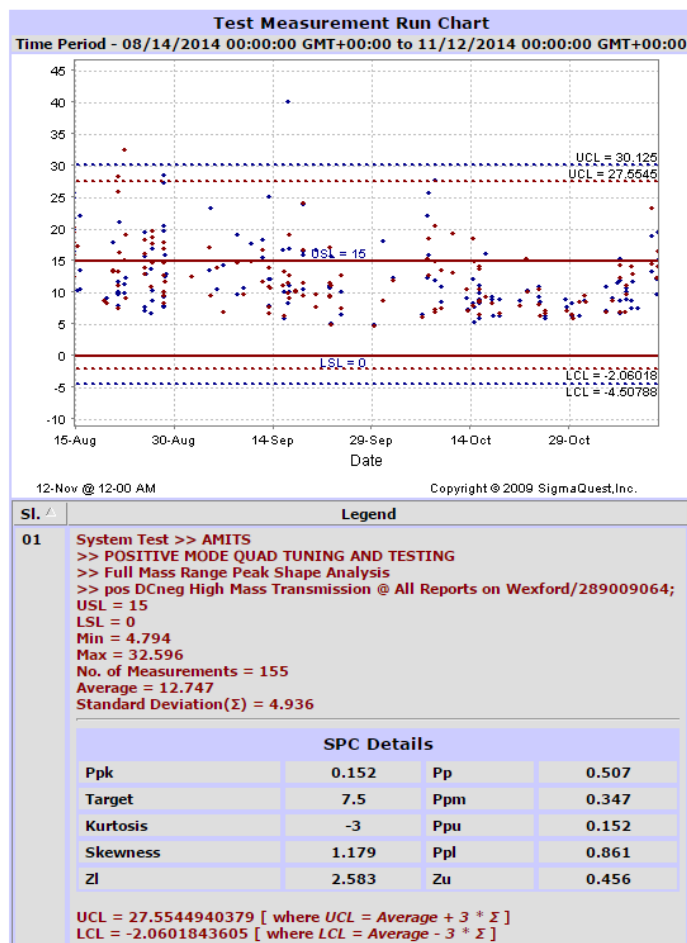
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## 18.3.4. Test Measurement Run Charts



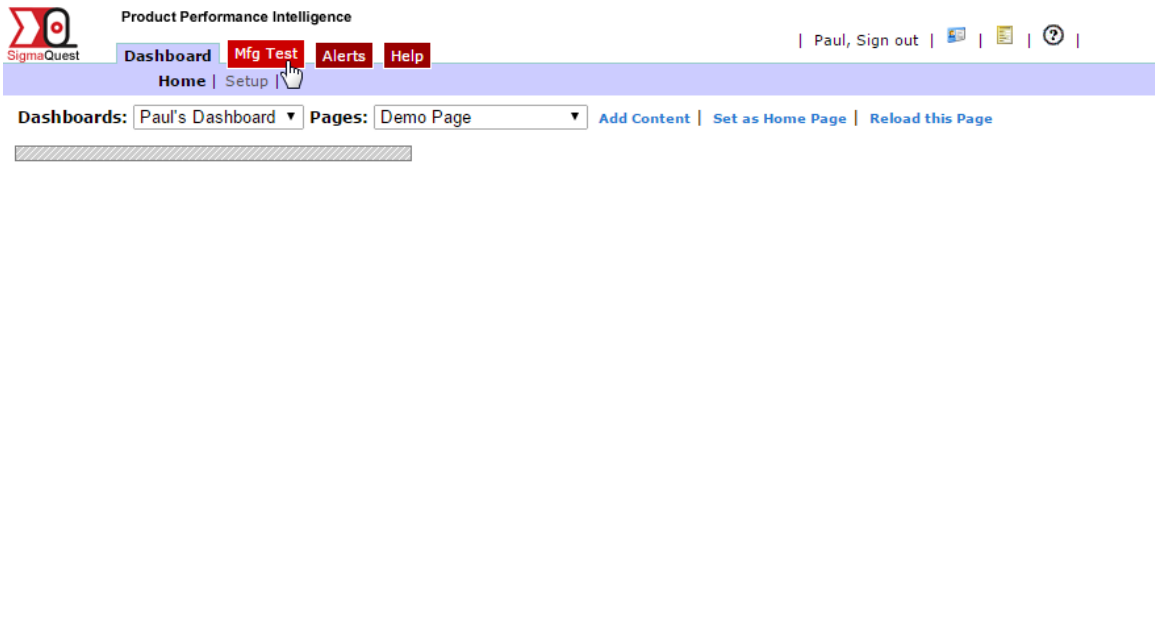
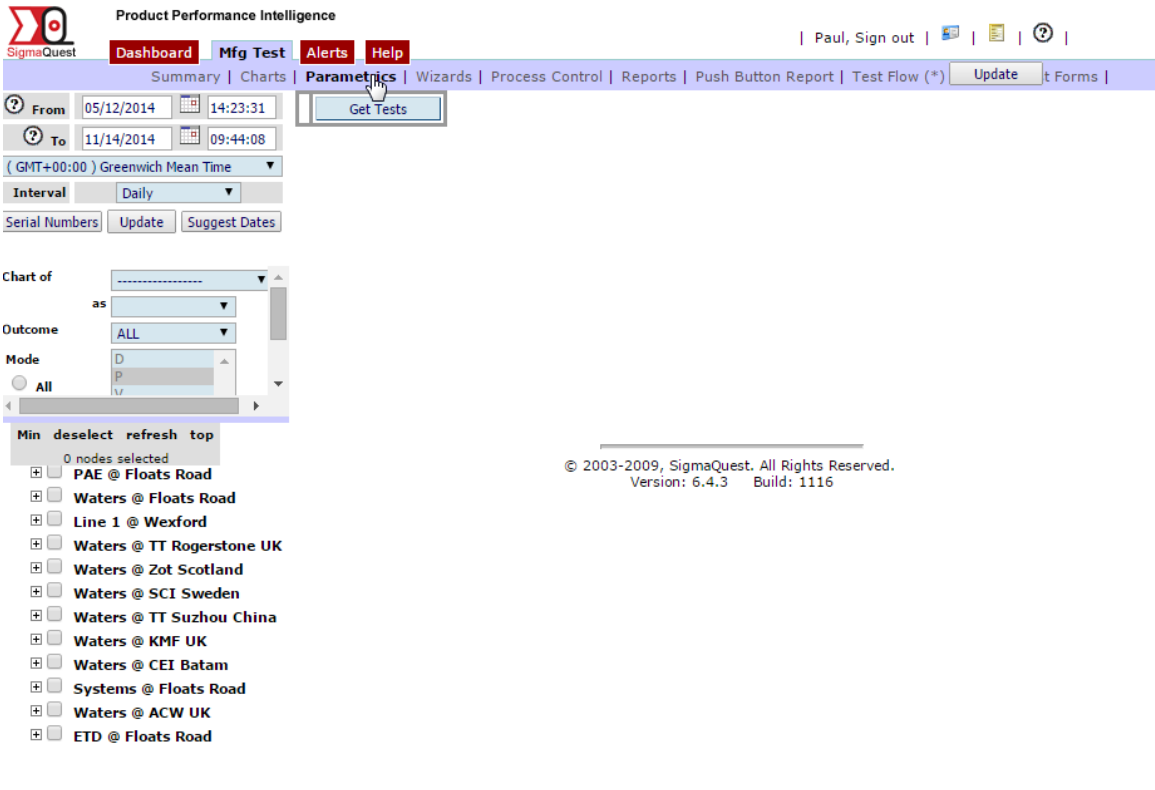
Test Measurement run charts are a method of observing trends in individual test results. For example, there was a period of good value high mass transmission in October 2014 – This might be due to sample, and is worth investigating. Another example is there are four distinct groups for high mass resolution settings – this maybe showing the that individual test rigs (RF generators and DCC boards) have more effect on defining tuning values than the analyser and quad assembly.

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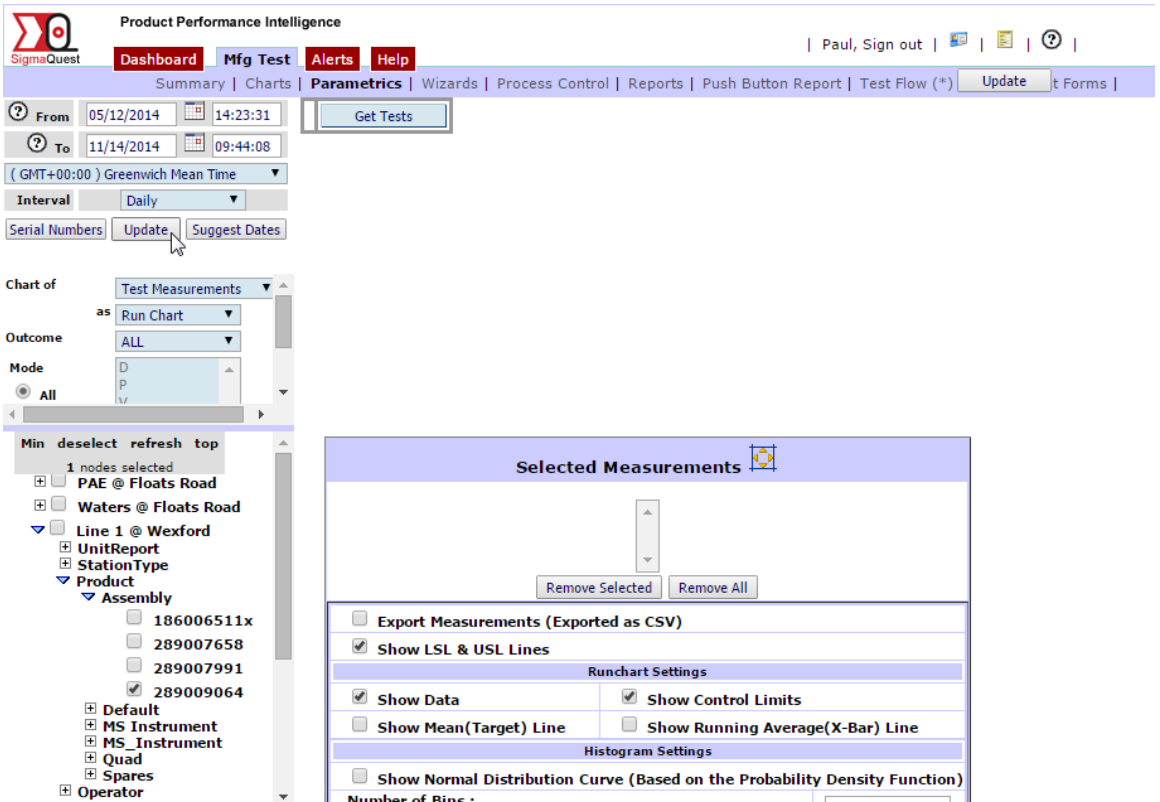
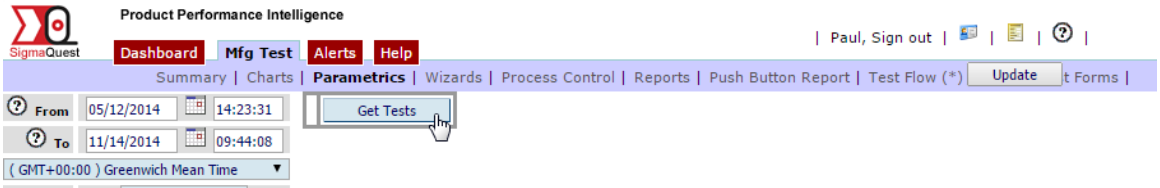
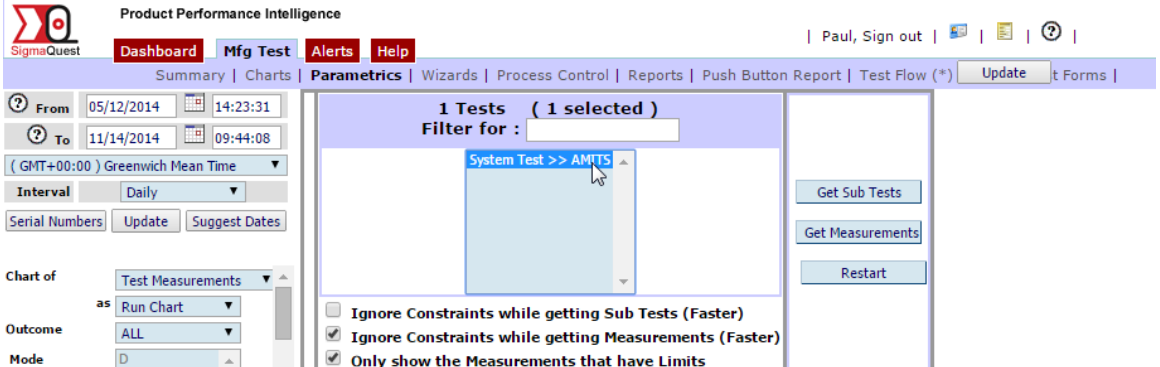
|                                                                                                           |                                                                                      |
|-----------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| <p>Example: Detector Housing Test Activity</p> <p>Log on to SigmaQuest and click on the MFG TEST tab.</p> |    |
| <p>Click "Parametrics"</p>                                                                                |  |

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|                                                                                                                                                                                                                                                          |                                                                                      |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| <p>Select:</p> <p>Interval “daily”</p> <p>Chart of: “Test Measurements”</p> <p>As “Run Chart”</p> <p>Outcome = “All”</p> <p>Mode = “All”</p> <p>Line 1 @ Wexford / Product / Assembly / 289009064</p> <p>Click “Suggest Dates”</p> <p>Click “Update”</p> |   |
| <p>Click the “Get Tests” button</p>                                                                                                                                                                                                                      |  |
| <p>Click on the “System Test” option</p>                                                                                                                                                                                                                 |  |

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Click on “Get Sub Tests” to open the test sections.

The screenshot displays the SigmaQuest Product Performance Intelligence web application. The interface includes a top navigation bar with tabs for Dashboard, Mfg Test, Alerts, and Help. The Mfg Test tab is active, showing a summary of test results. On the left, there is a sidebar with a tree view of test sections, including 'PAE @ Floats Road', 'Waters @ Floats Road', and 'Line 1 @ Wexford'. The main area shows a list of tests, with 'System Test >> AMITS' selected. Below the list, there are checkboxes for 'Ignore Constraints while getting Sub Tests (Faster)', 'Ignore Constraints while getting Measurements (Faster)', and 'Only show the Measurements that have Limits'. On the right, there are buttons for 'Get Sub Tests', 'Get Measurements', and 'Restart'. The bottom section shows 'Selected Measurements' with options to 'Remove Selected' or 'Remove All', and a table of measurements with columns for 'Show Data', 'Show Control Limits', and 'Show Running Average(X-Bar) Line'.

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Repeat the “Get Sub Test” option to view the tests within the test section.

For example: By selecting “positive mode quad tuning and testing” and then “get sub tests”.

This will open all the tests within the positive mode quad tuning and testing test section.

The screenshot shows the SigmaQuest Product Performance Intelligence interface. The top navigation bar includes 'Dashboard', 'Mfg Test', 'Alerts', and 'Help'. The main content area is titled '5 Tests (1 selected)' and shows a list of tests: 'System Test >> AMITS >> DETECTOR TESTING', 'System Test >> AMITS >> FINISH', 'System Test >> AMITS >> MANUFACTURING PRE-TEST', 'System Test >> AMITS >> NEGATIVE MODE QUAD TUNING AND TESTING', and 'System Test >> AMITS >> POSITIVE MODE QUAD TUNING AND TESTING'. The 'Get Sub Tests' button is highlighted. Below the list, there are checkboxes for 'Ignore Constraints while getting Sub Tests (Faster)', 'Ignore Constraints while getting Measurements (Faster)', and 'Only show the Measurements that have Limits'. The right sidebar contains buttons for 'Select All', 'Clear Selected', 'Get Sub Tests', 'Get Measurements', 'Back', and 'Restart'.

Once down to the test level, individual measurements can be extracted.

For example: Select Full Mass Range Peak Shape Analysis.

And click “Get Measurements”

The screenshot shows the SigmaQuest Product Performance Intelligence interface. The top navigation bar includes 'Dashboard', 'Mfg Test', 'Alerts', and 'Help'. The main content area is titled '12 Tests' and shows a list of tests: 'System Test >> AMITS >> POSITIVE MODE QUAD TUNING AND TESTING >> Full Mass Range Peak Shape Analysis', 'System Test >> AMITS >> POSITIVE MODE QUAD TUNING AND TESTING >> High Mass Ion Energy', 'System Test >> AMITS >> POSITIVE MODE QUAD TUNING AND TESTING >> High Mass Position', 'System Test >> AMITS >> POSITIVE MODE QUAD TUNING AND TESTING >> High Mass Resolution', 'System Test >> AMITS >> POSITIVE MODE QUAD TUNING AND TESTING >> Linearity Tuning', 'System Test >> AMITS >> POSITIVE MODE QUAD TUNING AND TESTING >> Low Mass Ion Energy', 'System Test >> AMITS >> POSITIVE MODE QUAD TUNING AND TESTING >> Low Mass Position', and 'System Test >> AMITS >> POSITIVE MODE QUAD TUNING AND TESTING >> Low Mass Resolution'. The 'Get Measurements' button is highlighted. Below the list, there are checkboxes for 'Ignore Constraints while getting Sub Tests (Faster)', 'Ignore Constraints while getting Measurements (Faster)', and 'Only show the Measurements that have Limits'. The right sidebar contains buttons for 'Select All', 'Clear Selected', 'Get Measurements', 'Back', and 'Restart'.

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Every measurement exported within the SigmaData table is available for analysis.

For example:

Pos DC pos High Mass Transmission

And

Pos DC neg High Mass Transmission

Select each one and click on the “Add Selected” button.

93 Measurements ( 1 selected )  
Filter for :

System Test >> AMITS >> POSITIVE MODE QUAD TUNING AND TESTING >> Full Mass Range Peak Shape Analysis >> pos DCneg High Mass Resolution  
**System Test >> AMITS >> POSITIVE MODE QUAD TUNING AND TESTING >> Full Mass Range Peak Shape Analysis >> pos DCneg High Mass Transmission**  
 System Test >> AMITS >> POSITIVE MODE QUAD TUNING AND TESTING >> Full Mass Range Peak Shape Analysis >> pos DCneg Ion Energy  
 System Test >> AMITS >> POSITIVE MODE QUAD TUNING AND TESTING >> Full Mass Range Peak Shape Analysis >> pos DCneg Low Mass Position  
 System Test >> AMITS >> POSITIVE MODE QUAD TUNING AND TESTING >> Full Mass Range Peak Shape Analysis >> pos DCneg Low Mass Resolution  
 System Test >> AMITS >> POSITIVE MODE QUAD TUNING AND TESTING >> Full Mass Range Peak Shape Analysis >> pos DCneg Peak 1 Asymmetry  
 System Test >> AMITS >> POSITIVE MODE QUAD TUNING AND TESTING >> Full Mass Range Peak Shape Analysis >> pos DCneg Peak 1 FWHM  
 System Test >> AMITS >> POSITIVE MODE QUAD TUNING AND TESTING >> Full Mass Range Peak Shape Analysis >> pos DCneg Peak 1 Impurity

☐ Validate if the Measurement exists before adding it to the Bottom List.

Select All  
Clear Selected  
Add Selected  
Add All  
Back  
Restart

Selected Measurements

System Test >> AMITS >> POSITIVE MODE QUAD TUNING AND TESTING >> Full Mass Range Peak Shape Analysis >> pos DCpos High Mass Transmission

Remove Selected Remove All

☒ Export Measurements (Exported as CSV)  
☒ Show LSL & USL Lines

Runchart Settings

☒ Show Data ☒ Show Control Limits  
☐ Show Mean(Target) Line ☐ Show Running Average(X-Bar) Line

Histogram Settings

☒ Show Normal Distribution Curve (Based on the Probability Density Function)  
 Number of Bins :   
 (If blank, calculated as Square Root # of Measurements) :

The last step is to select graph options.

For example, a button to make export of the data into csv possible,

Show the lower and upper specification limits.

Show the Control Limits (Average +/- 3 standard deviations)

Selected Measurements

System Test >> AMITS >> POSITIVE MODE QUAD TUNING AND TESTING >> Full Mass Range Peak Shape Analysis >> pos DCpos High Mass Transmission  
 System Test >> AMITS >> POSITIVE MODE QUAD TUNING AND TESTING >> Full Mass Range Peak Shape Analysis >> pos DCneg High Mass Transmission

Remove Selected Remove All

☒ Export Measurements (Exported as CSV)  
☒ Show LSL & USL Lines

Runchart Settings

☒ Show Data ☒ Show Control Limits  
☐ Show Mean(Target) Line ☐ Show Running Average(X-Bar) Line

Histogram Settings

☒ Show Normal Distribution Curve (Based on the Probability Density Function)  
 Number of Bins :   
 (If blank, calculated as Square Root # of Measurements) :

Data Selection Criteria

Lower Data Inclusion Limit [ LDIL ]   
 Upper Data Inclusion Limit [ UDIL ]   
☒ Ignore Data outside Inclusion Limit

What if ?

LSL  USL

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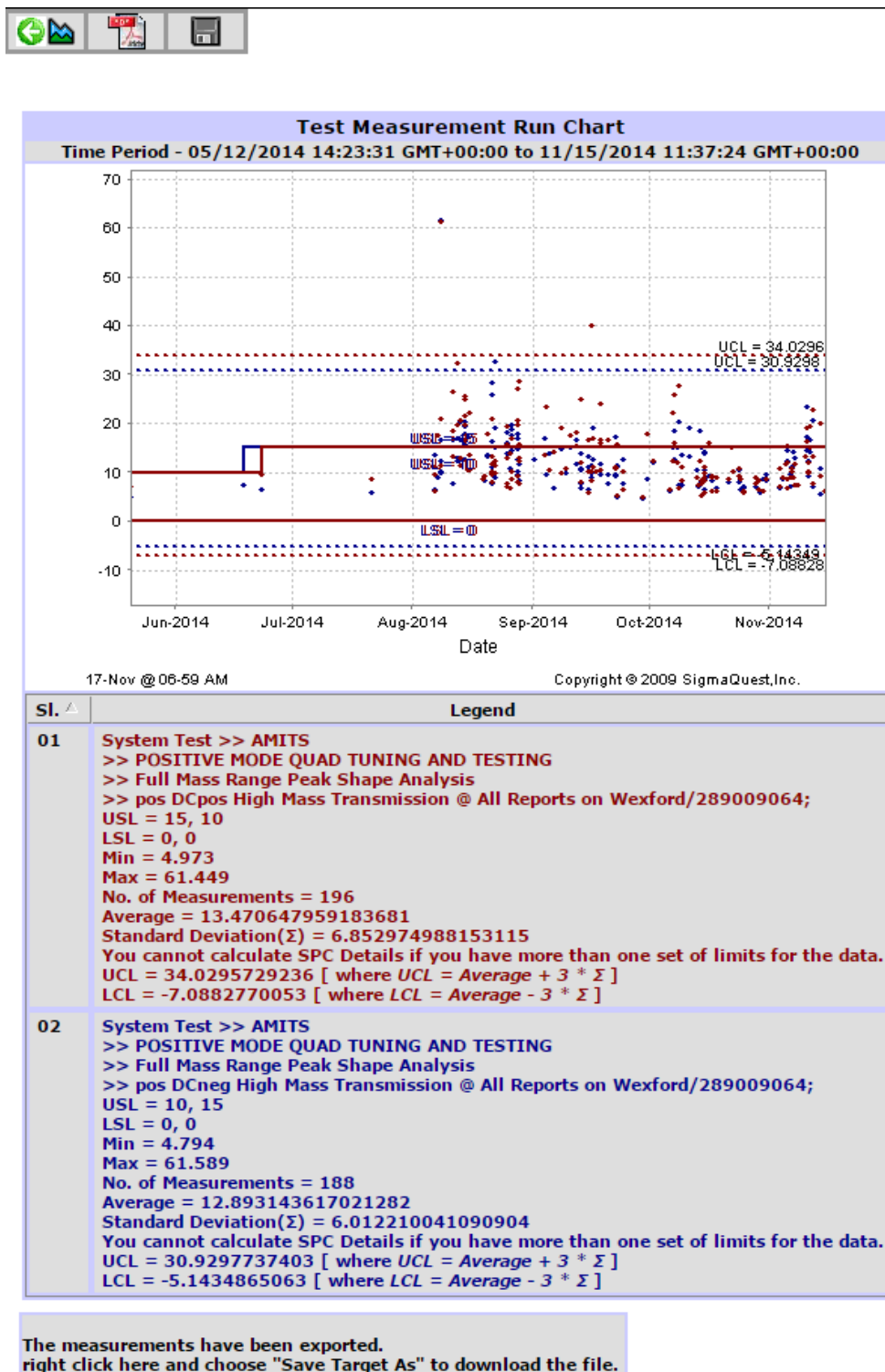
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Once ready, click on the update button to generate the new chart.

This may take a minute to extract the data and render.

As shown earlier, it is possible to save this plot as a template, and schedule it within the dashboard.



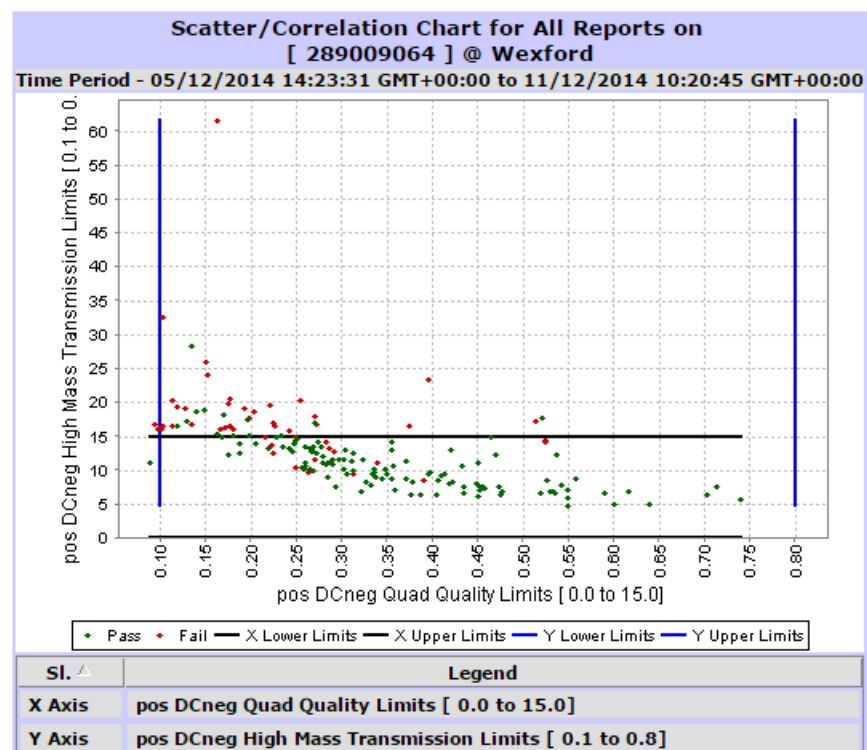
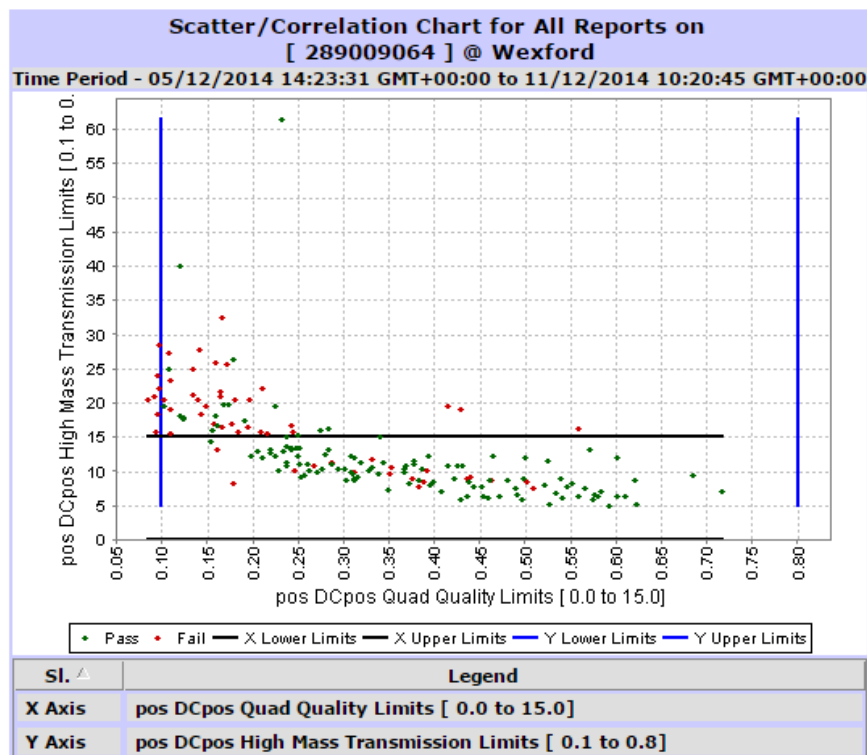
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### 18.3.5. Scatter / Correlation Charts



Scatter / Correlation charts can be used to confirm any relationships between test measurements.

Waters Confidential

Template47755\_1

It is the responsibility of the user to verify they are using the current released version.  
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Creating Scatter / Correlation charts uses the same steps at the Test Measurements “Run Chart” chart above.

The difference is with the chart type. There are three kinds of chart available, Run Chart, Histogram, and Scatter / Correlation.

Two measurements need to be selected to use this chart option.

The screenshot displays the SigmaQuest Product Performance Intelligence web application. The top navigation bar includes 'Dashboard', 'Mfg Test', 'Alerts', and 'Help'. Below this, a secondary bar shows 'Summary', 'Charts', 'Parametrics', and 'Wizar'. The main interface features a date and time selection section with 'From' (05/12/2014 14:23:31) and 'To' (11/15/2014 11:37:24) fields, a time zone dropdown set to '( GMT+00:00 ) Greenwich Mean Time', and an 'Interval' dropdown set to 'Daily'. A 'Get Tests' button is visible. Below these are buttons for 'Serial Numbers', 'Update', and 'Suggest Dates'. The 'Chart of' dropdown is set to 'Test Measurements', and a dropdown menu is open showing options: 'Run Chart' (selected), 'Run Chart', 'Histogram', and 'Scatter / Correlation'. The 'Outcome' and 'Mode' sections are partially visible at the bottom.

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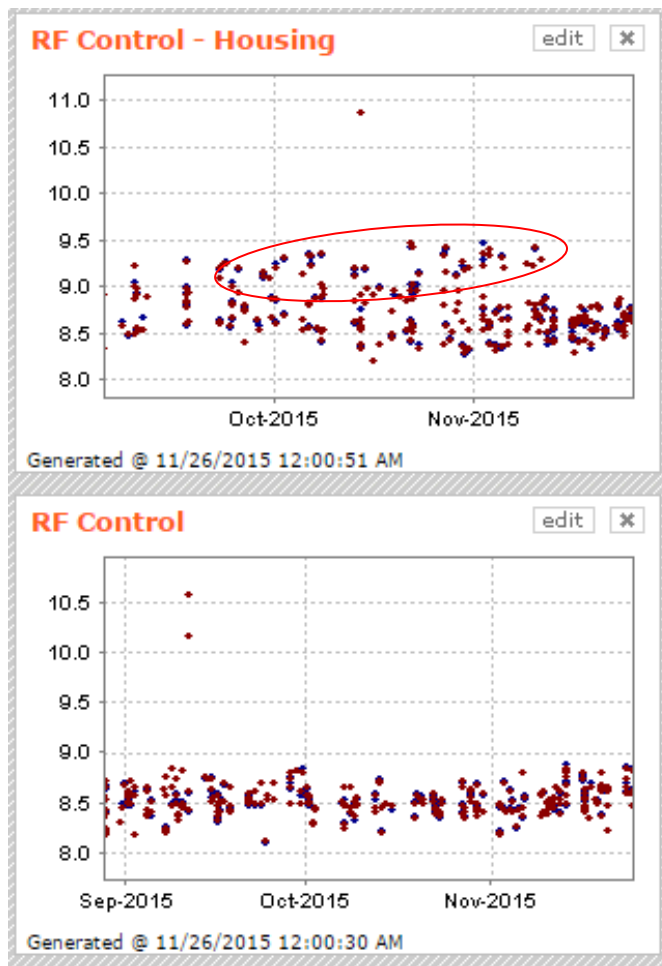
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**18.4. Using Sigmaquest proactively to prevent failure – RF control example**

In early November 2015, RF control was just starting to fail quads during the screening process. But the RF control values were fine in production. This implied the issue was quad screening rig related.



max limit for RF control – 9.4

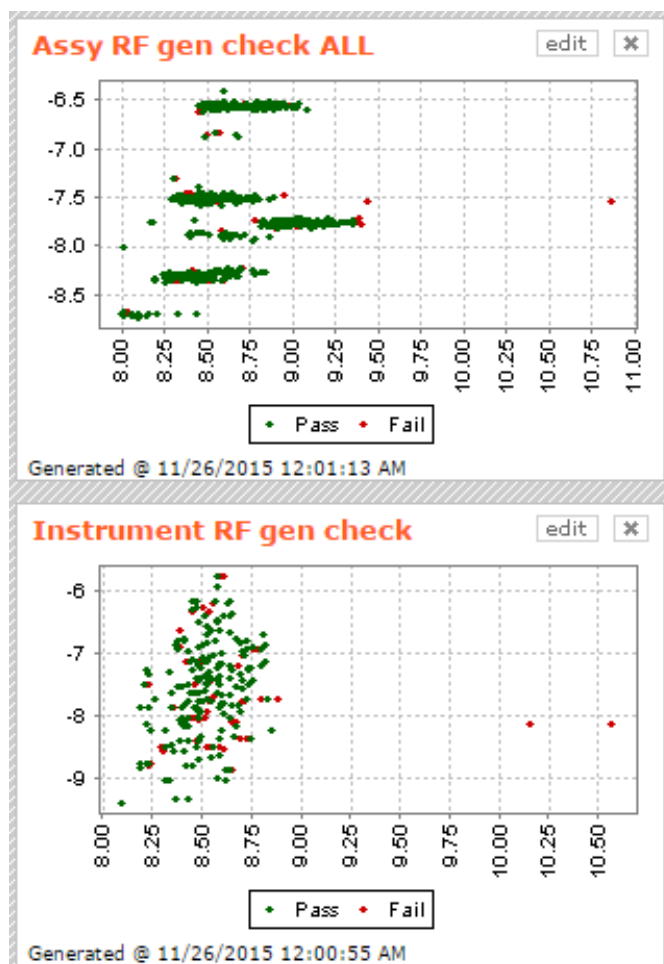
The High mass resolution slider value is unique to the electronics of the rig, not the quad. It was therefore possible to create a scatter diagram of high mass resolution slider vs RF control to see if the RF control problem was on all the rigs, or limited to a specific rig.

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It showed only one rig was now reaching the failure limit of 9.5. The data implied rig 4 was this group.

RF control is a measure of how much work is required to achieve alignment at high mass.

The mini fit pins on the cables are only rated to 50x fittings.

The RF generator relies on banana style sockets for its connection to the instrument.

It is estimated that there has been well over 2000 fittings divided between the four rigs so far.

The RF generator was the most likely candidate and the easiest to replace. Once replaced, the RF control value went from 9.4 to 8.7.

This is an example of how SigmaQuest was used to pre-diagnose a failure mode before it started to have a severe impact on production.

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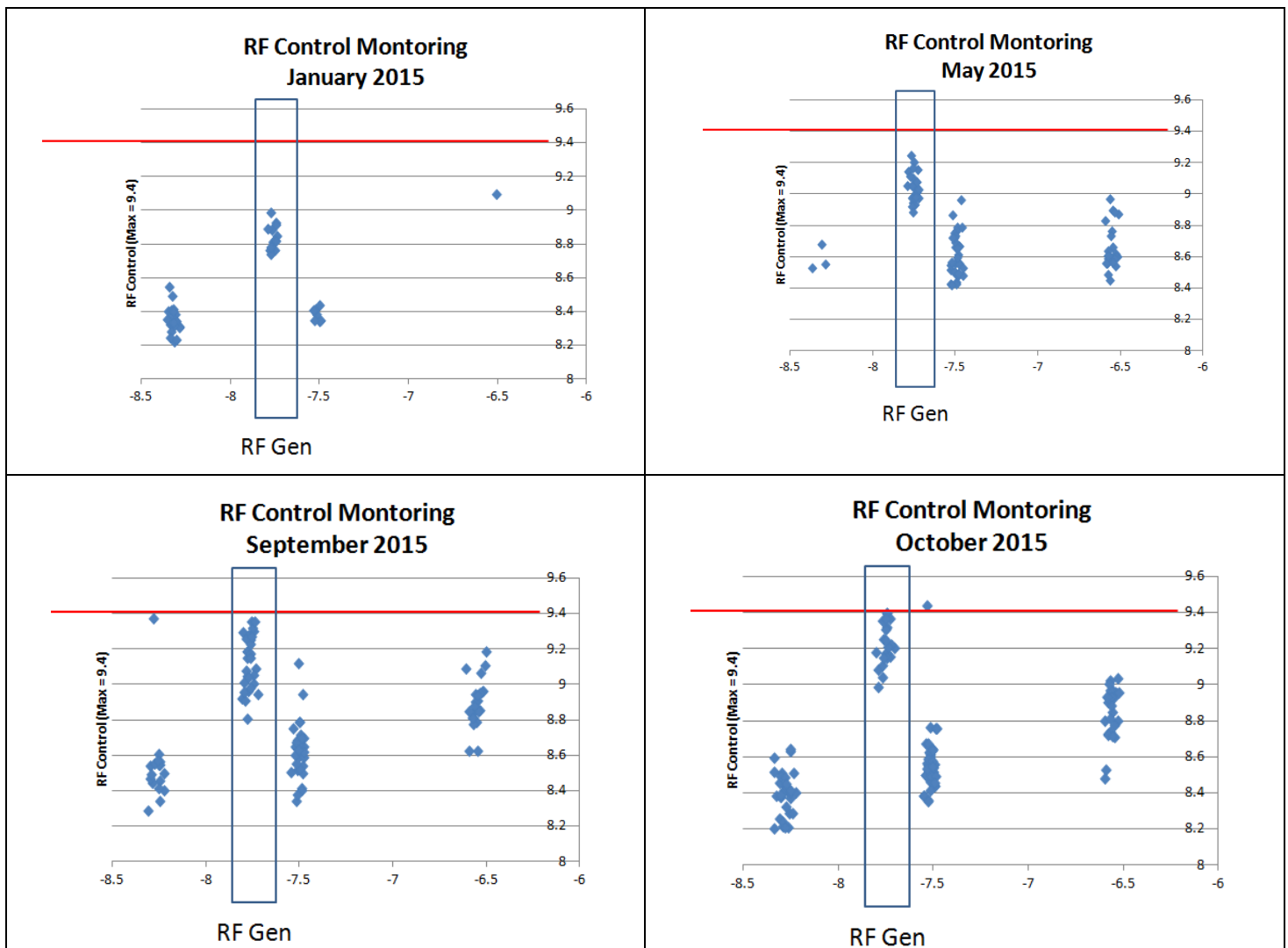
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**Predicting any further failures?**

Further analysis was performed on the data to see if there was any trend over time. This was done to see if we could predict when the other rigs may need their RF generators changing.

This showed that only one rig had an RF control value that crept to higher values over time. The others remained mainly static. The Wexford team has been performing running repairs on the cables due to the pins splaying over time. This may explain why the rig with a HM resolution setting of 6.5 did creep towards higher RF control values up until October, but then crept back in November.

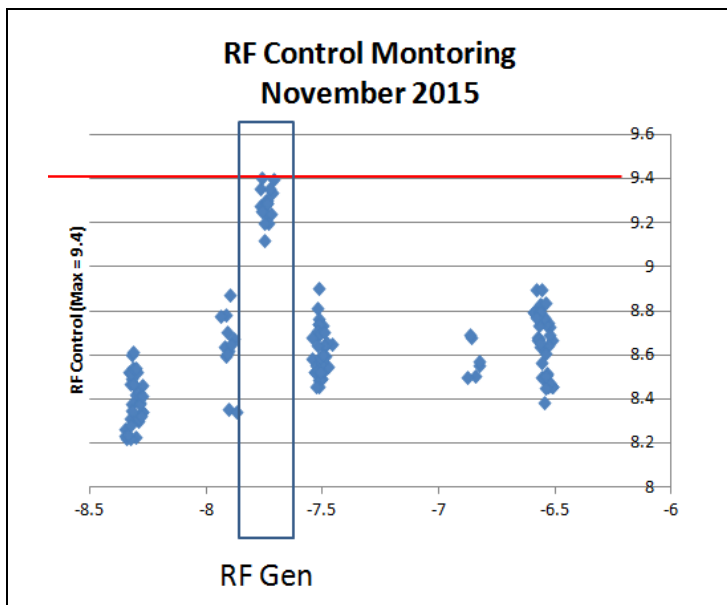


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The new group in the November 2015 chart with a high mass resolution value of -7.8 are probably from rig 4 with the new RF generator.

RF Control for each rig will now be monitored by PAE and fed back to the Wexford team.

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## **19. RESTART AND CONTINUING TEST SEQUENCES AFTER A FAILURE**

AMITS V1.0, and 1.01 allowed a user to continue from the point of failure, or to completely restart the test sequence.

This proved inconvenient if, for example, the failure was due to an unstable 515 pump during a tuning step test.

To reduce the amount of time required to rerun AMITS, a number of enhancements were made to the original "Continue" test option. These are listed as rework options within the TSP – Acquity QDa – Automated Manufacturing Test Procedure (46202), and in the flow charts below:

AMITS V3.1 added extra functionality in the shape of RCA tests. These stand alone tests allow engineers to confirm that they have fixed an issue for specific tests, before recommitting AMITS to complete the instrument test sequence. For example: Internal Calibration intensity. AMITS v4.1 adds the option for a time delay if the status checker is used.

### **19.1. Flowchart 1 - Diagnosis and Rework Procedure**

**To Be Used:** This flowchart must be referred to once AMITS has stopped testing the instrument due to a cancellation, test failure or server failure.

**Purpose:** To guide the engineer to the correct 'Restart' or 'Continue' flowchart based on the rework actions performed on an instrument to fix the potential cause of a failed test.

### **19.2. Flowchart 2 – Continue Test Procedure – Shared Initial Steps**

**To Be Used:** This flowchart must be referred to if Flowchart 1 guides the engineer to the 'Continue Test Procedures'.

**Purpose:** To confirm the issue has been fixed by using Masslynx. And, if the issue has been fixed, confirm the 'Test Run Details' are correct.

### **19.3. Flowchart 3 – Continue Test Procedure – LOG ERROR**

**To Be Used:** This flowchart must be referred to if the failure type was a LOG ERROR. This failure occurs when AMITS can not save the latest test results onto the AMITS server. This is defined as a test failure, as there is no saved evidence that the test has passed.

**Purpose:** To guide the engineer in how to continue the test procedure once a connection with the server has been reestablished.

### **19.4. Flowchart 4 – Continue Test Procedure – STANDARD CONTINUE**

**To Be Used:** This flowchart refers to the original 'Continue' option.

**Purpose:** To guide the engineer in when to perform a simple repeat of a failed test.

### **19.5. Flowchart 5 – Continue Test Procedure – 515 PUMP ERROR**

**To Be Used:** This flowchart must be referred to if the failure type was due to a 515 pump error. This includes those tests that have failed due to corrupted tuning during earlier tests.

For example, if the 515 pump suffers from an air bubble or a sample top up during the failed test, or during a long tuning test such as linearity or detector gain.

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**Purpose:** To guide the engineer in how to restart AMITS from the start of a test section, instead of repeating the failed test.

**19.6. Flowchart 6 – Continue Test Procedure – POSITIVE FULL MASS RANGE PEAK SHAPE ANALYSIS FAIL**

**To Be Used:** This flowchart must be referred to if the failure type was due to the tuning used for the Positive Full Mass Range Peak Shape Analysis test. This includes those tests that have failed later in the test sequence that rely on the positive slow scan tuning settings.

**Purpose:** To guide the engineer in how to restart AMITS from the Positive Full Mass Range Peak Shape Analysis test.

Restarting from this point gives the engineer two options. Retest using AMITS derived tuning settings, and Retest using tune page settings.

**Full Mass Range Peak Shape Analysis**

Select tuning parameters

Only the following parameters may be modified:

- DC Polarity
- Low Mass Resolution
- High Mass Resolution
- Low Mass Position
- High Mass Position
- Low Mass Setup
- High Mass Setup
- Linearity

Parameters to use: From AMITS

From AMITS

From Target Registry

Continue Stop

If AMITS has set tuning values based on unstable 515 pump flow, all that maybe necessary is a simple change in linearity and / or resolution settings. If this is confirmed using MassLynx, then AMITS can be directed to use the saved tune page values.

There are limits to this facility.

If a DC polarity is manually selected that has previously failed Quad Quality or Pre-Filter tests, then AMITS will automatically fail the test for trying to use a failed DC.

The ion energy values are set by AMITS, so AMITS will not import the tune page values for these parameters.

If these limits prevent the engineer from passing the Positive Full Mass Range Peak Shape Analysis test, but the shapes can be made acceptable on the tune page, then the Positive Mode Quad Tuning and Testing test section needs to be restarted. (See Flowchart 5)

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**19.7. Flowchart 7 – Continue Test Procedure – NEGATIVE FULL MASS RANGE PEAK SHAPE ANALYSIS FAIL**

**To Be Used:** This flowchart must be referred to if the failure type was due to the tuning used for the Negative Full Mass Range Peak Shape Analysis test. This includes those tests that have failed later in the test sequence that rely on the negative slow scan tuning settings.

**Purpose:** To guide the engineer in how to restart AMITS from the Negative Full Mass Range Peak Shape Analysis test.

Restarting from this point gives the engineer two options. Retest using AMITS derived tuning settings, and Retest using tune page settings.

If AMITS has set tuning values based on unstable 515 pump flow, all that maybe necessary is a simple change in linearity and / or resolution settings. If this is confirmed using MassLynx, then AMITS can be directed to use the saved tune page values.

There are limits to this facility.

If a DC polarity is manually selected that has previously failed Quad Quality or Pre-Filter tests, then AMITS will automatically fail the test for trying to use a failed DC.

The ion energy values are set by AMITS, so AMITS will not import the tune page values for these parameters.

The Resolution Setup values, the position values and the Linearity are set in ESI positive mode only.

If these limits prevent the engineer from passing the Negative Full Mass Range Peak Shape Analysis test, but the shapes can be made acceptable on the tune page, then the Negative Mode Quad Tuning and Testing test section needs to be restarted (See Flowchart 5), or even the Positive Full Mass Range Peak Shape Analysis test with manually set Resolution Setup values and the position values (See Flowchart 6).

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**19.8. Flowchart 8 – Failing Fast Scan Procedure – POSITIVE FAST SCAN DIAGNOSIS AND REWORK PROCEDURE**

**To Be Used:** AMITS V3.1 now tunes Positive Fast Scan much more efficiently than V2.0 . Consequently, if AMITS V3.1 fails fast scan peak shape, the quad is mostly likely unable of achieving a pass. However, if the failure was due to the sample running, or nitrogen failure, for example, some restart capability is still required.

This flowchart must be referred to if the failure was with the positive mode fast scan peak shape analysis test. This may include those tests that have failed later in the test sequence that rely on the positive fast scan tuning settings.

**Purpose:** To guide the engineer in how to restart AMITS from the Positive Fast Scan Peak Shape Analysis test.

Restarting from this point gives the engineer two options. Retest using AMITS derived tuning settings, and Retest using tune page settings.

If AMITS has set tuning values based on unstable 515 pump flow, all that maybe necessary is a simple change in the DYNAMIC tuning settings. If this is confirmed using MassLynx, then AMITS can be directed to use the saved tune page values.

There are limits to this facility.

If the manual dynamic tuning values cannot achieve a fast scan pass, then the fault maybe due to the quad, or the slow scan tuning settings. If the slow and fast scan shapes can be made acceptable on the tune page, then the Continue Test Procedure – POSITIVE FULL MASS RANGE PEAK SHAPE ANALYSIS FAIL procedure may need to be followed (See Flowchart 6)

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**19.9. Flowchart 9 – Failing Fast Scan Procedure – NEGATIVE FAST SCAN DIAGNOSIS AND REWORK PROCEDURE**

**To Be Used:** This flowchart must be referred to if the failure was with the negative mode fast scan peak shape analysis test. This may include those tests that have failed later in the test sequence that rely on the negative fast scan tuning settings.

**Purpose:** To guide the engineer in how to restart AMITS from the Negative Fast Scan Peak Shape Analysis test.

Restarting from this point gives the engineer two options. Retest using AMITS derived tuning settings, and Retest using tune page settings.

If AMITS has set tuning values based on unstable 515 pump flow, all that maybe necessary is a simple change in the DYNAMIC tuning settings. If this is confirmed using MassLynx, then AMITS can be directed to use the saved tune page values.

There are limits to this facility.

The DYNAMIC Resolution Setup values, position values, and the linearity are set in ESI positive mode only

If the manual dynamic tuning values cannot achieve a fast scan pass, then the fault maybe due to the quad, or the slow scan tuning settings. If the slow and fast scan shapes can be made acceptable on the tune page, then the Continue Test Procedure – POSITIVE (or NEGATIVE) FULL MASS RANGE PEAK SHAPE ANALYSIS FAIL procedure may need to be followed (See Flowchart 6 and 7)

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**19.10. Flowchart 10 – Restart the Test Sequence**

**To Be Used:** This flowchart must be referred to if the rework action:

Exposes the Quad or can introduce a charging fault. The charging test is only performed within the Manufacturing Pretest section.

If the Main Control PCB is disconnected or replaced. The safety interlocks, align RF generator, critical voltage, and heater tests are only performed within the Manufacturing Pretest section.

If the RF Generator is replaced. See disconnecting the Main Control PCB above, and the align RF generator test is only performed within the Manufacturing Pretest section.

If the Power Supply Unit is replaced. See disconnecting the Main Control PCB above, and the critical voltage tests are only performed within the Manufacturing Pretest section.

**Purpose:** To guide the engineer in how to restart AMITS from the beginning.

**19.11. Flowchart 11 – Resolution Health Check**

**To Be Used:** This flowchart must be referred to if the Resolution Health Check fails and implies retuning is required.:

**Purpose:** To guide the engineer in which restart option to use, or to reject a quad due to failing the Resolution Health Check..

**19.12. Flowchart 12 – DC Change Only Slow Scan Restart.**

**To Be Used:** This flowchart must be referred to if final beam reveals selecting an alternative available DC polarity in slow scan positive and negative quad tuning would be enough to allow the instrument to pass final beam and health checks.

**Purpose:** To guide the engineer in which DC polarity restart option to use.

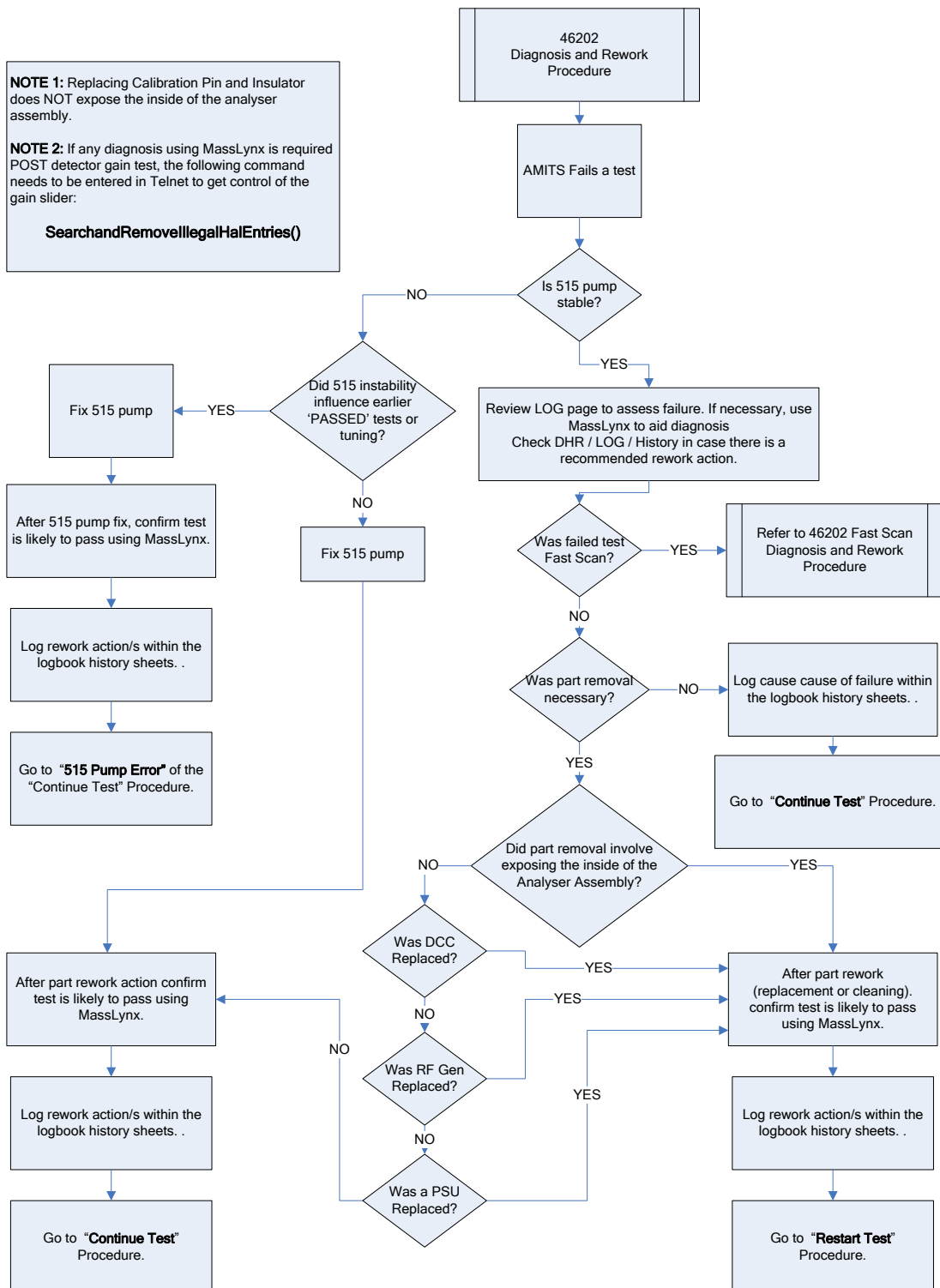
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**19.13. RESTART AND CONTINUE FLOWCHARTS**



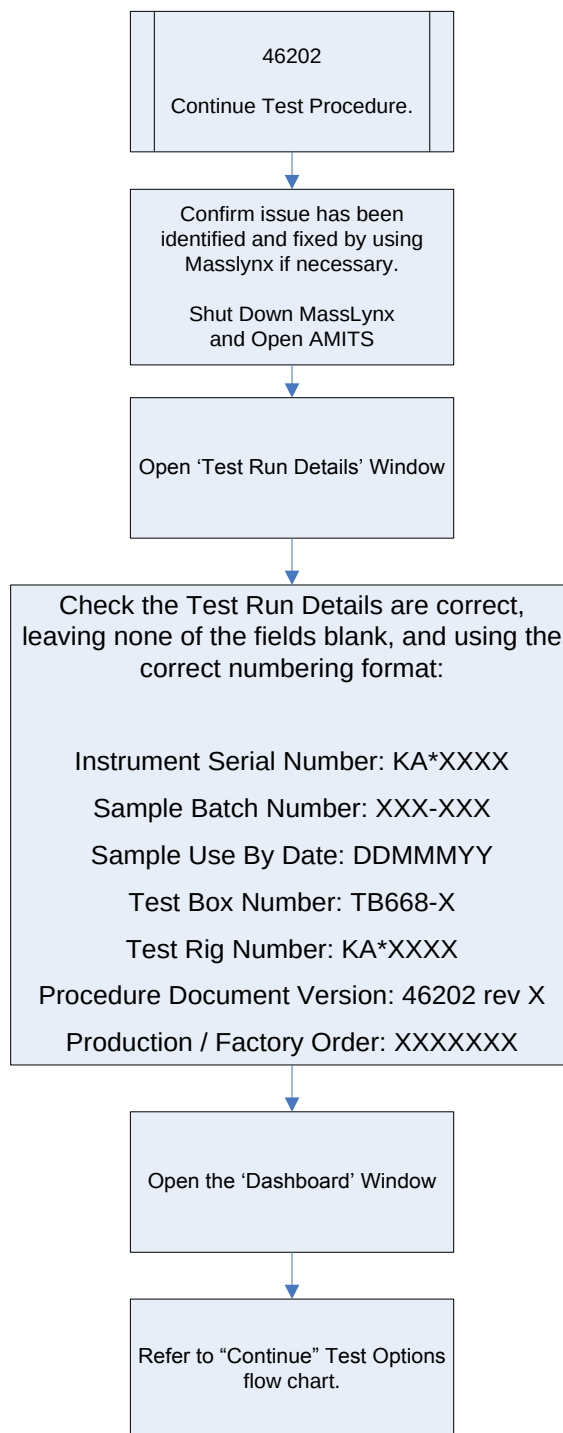
Flowchart 1 - Diagnosis and Rework Procedure

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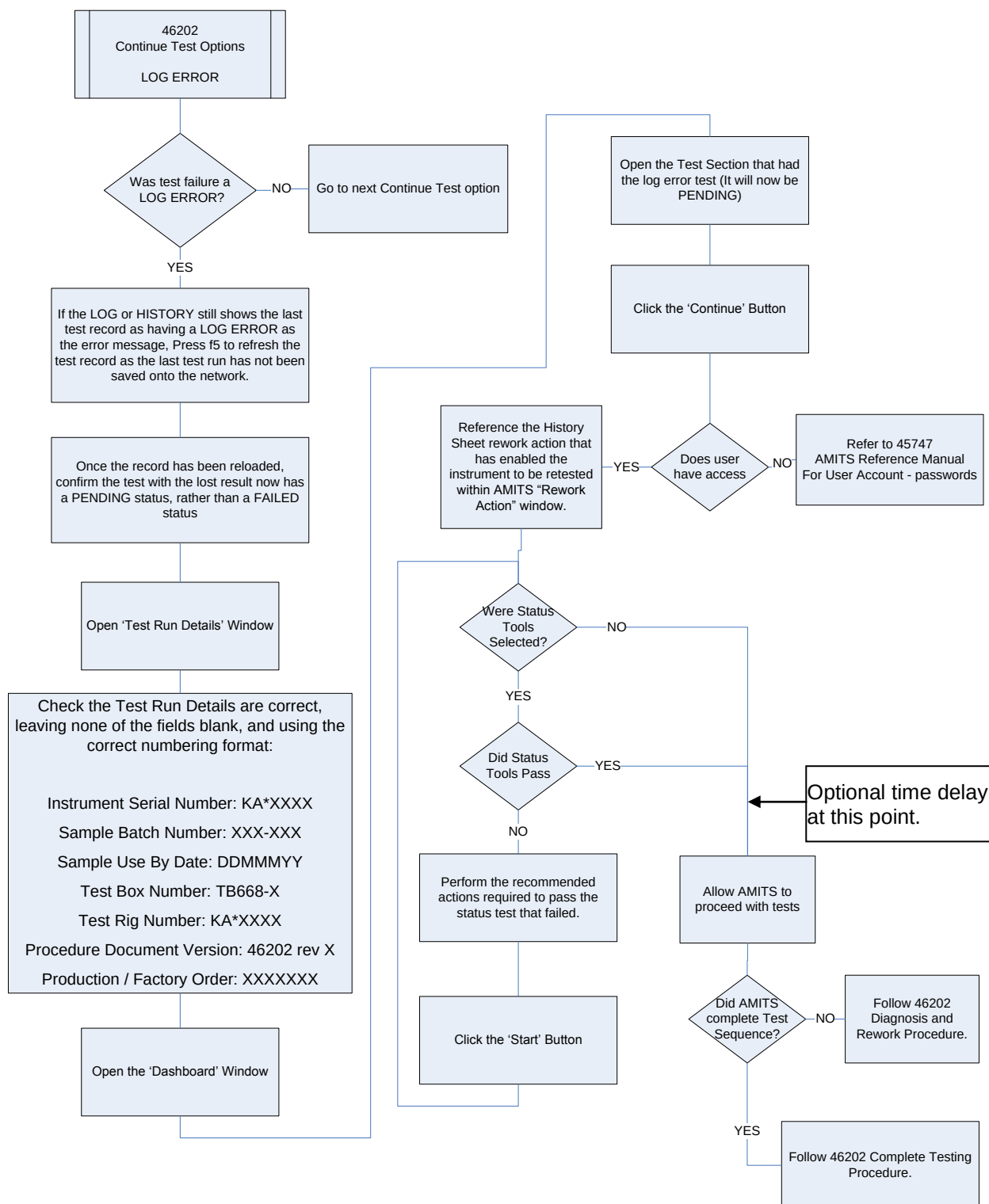
Flowchart 2 - Continue Test Procedure – Shared Initial Steps

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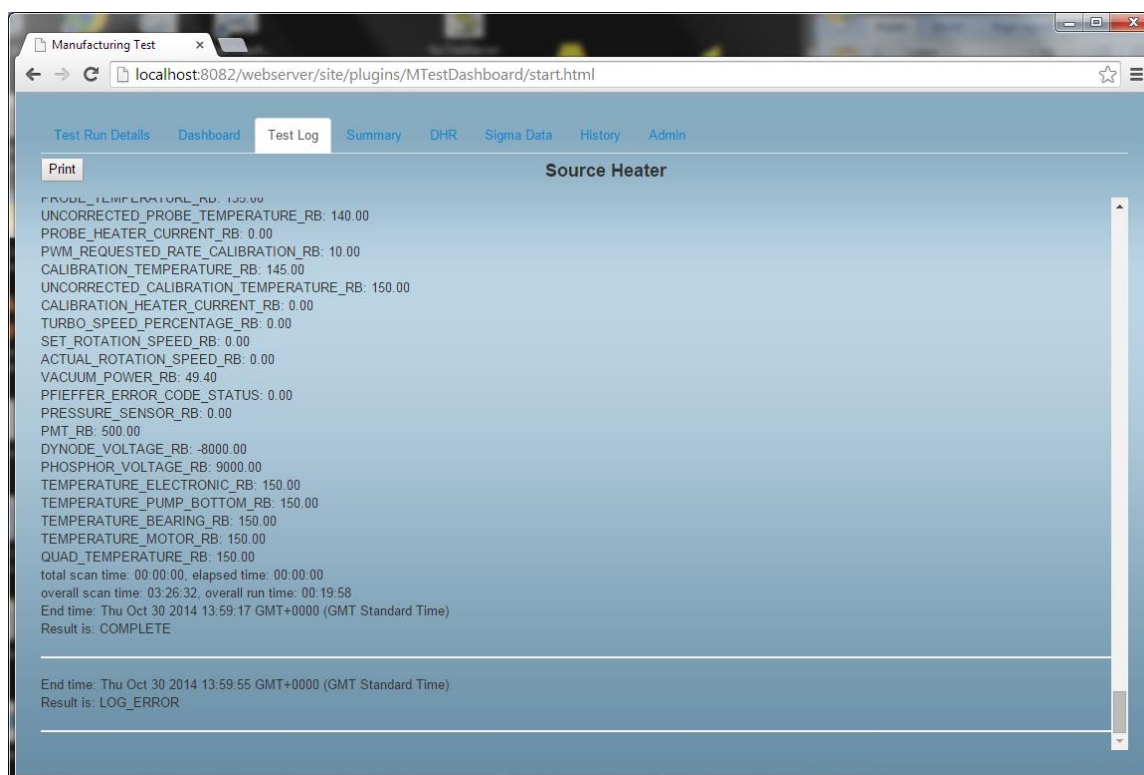
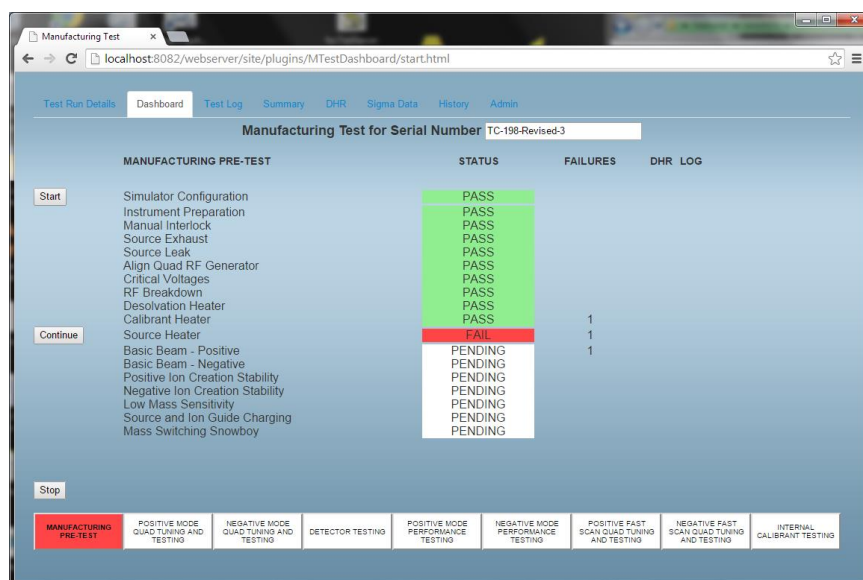
Flowchart 3 – Continue Test Procedure – LOG ERROR

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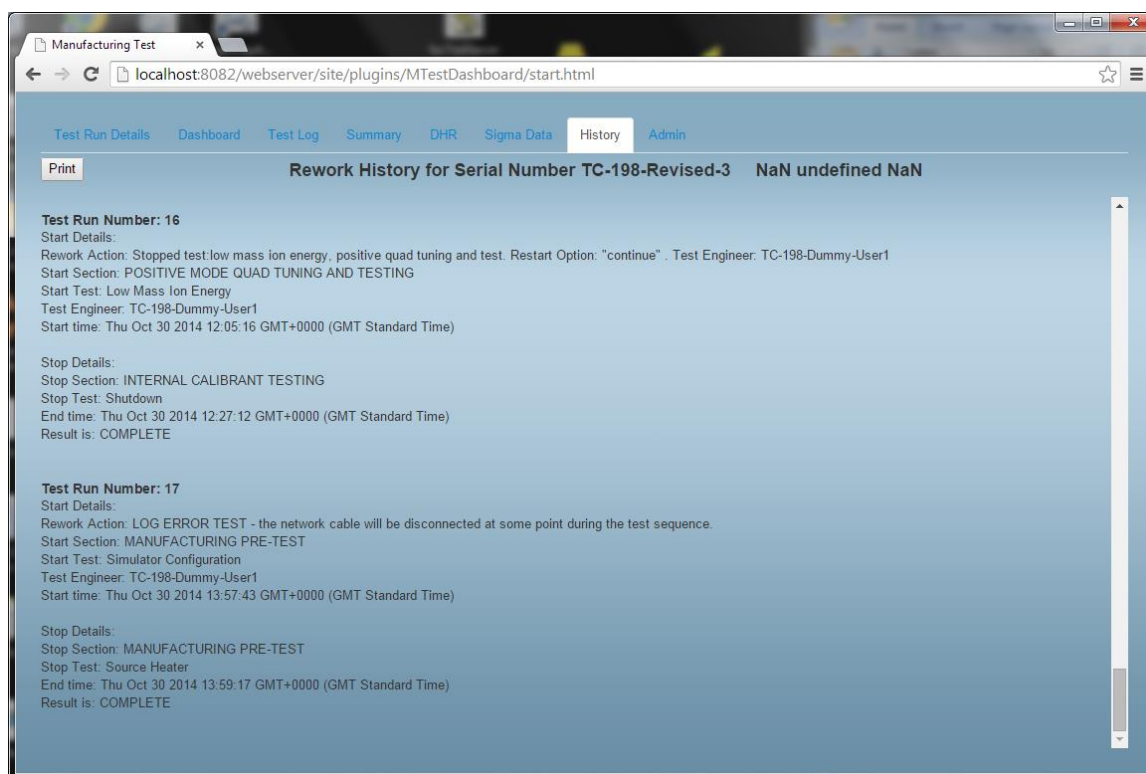
LOG ERROR Example: The source heater test was displayed as failed on the Dashboard. When the LOG for the failed test was opened, the following text could be seen at the bottom of the LOG: "Result is: LOG\_ERROR"

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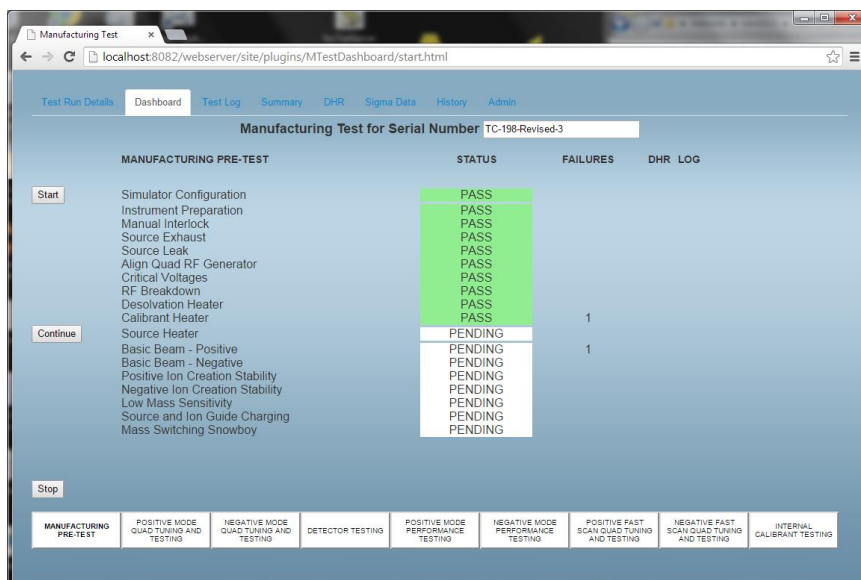
When the HISTORY for the instrument was opened, the following text could be seen within the “Stop Details” of the last run performed: “Stop Test: Source Heater” This was the test that was failed due to the LOG ERROR. The “Result is: COMPLETE”. This message is normally displayed when the test sequence has reached the “Shutdown” test at the very end of the test sequence.

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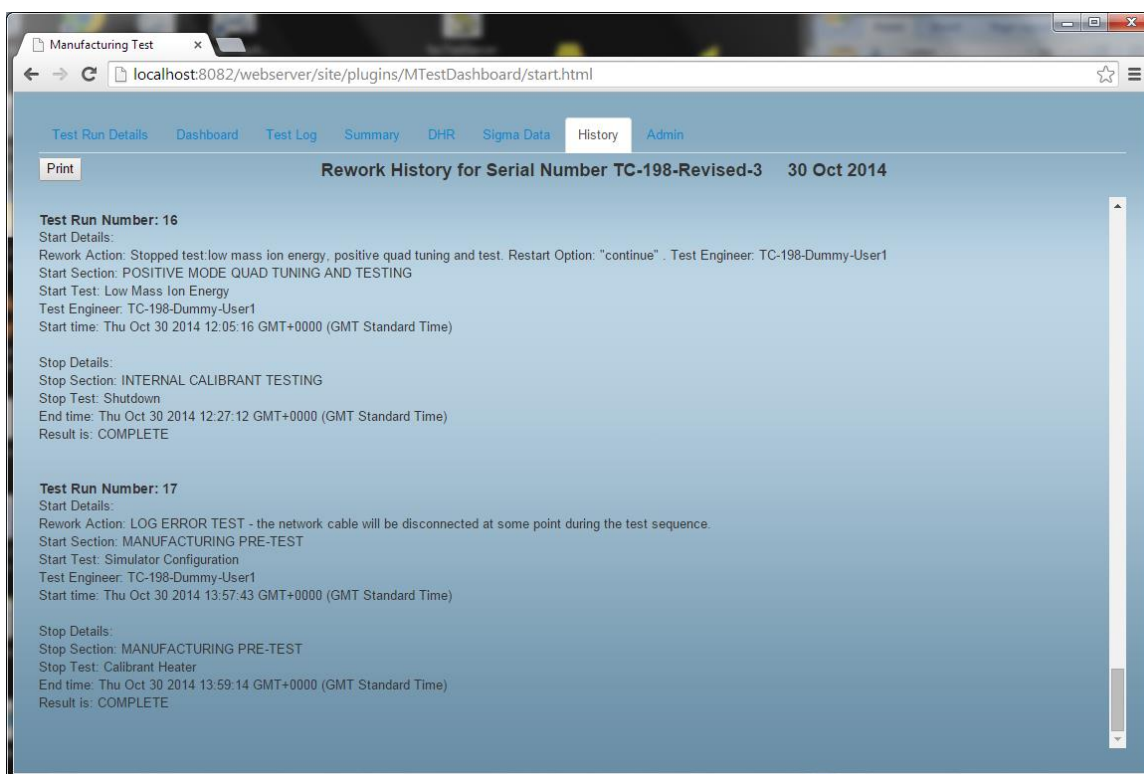
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AFTER the AMITS page has been refreshed, and the Test Run Details have been reentered, the source heater test can be seen as PENDING within the dashboard. This is correct, as the refreshed record does not have a saved copy of the source heater test. So as far as AMITS is concerned, it has not yet been run.



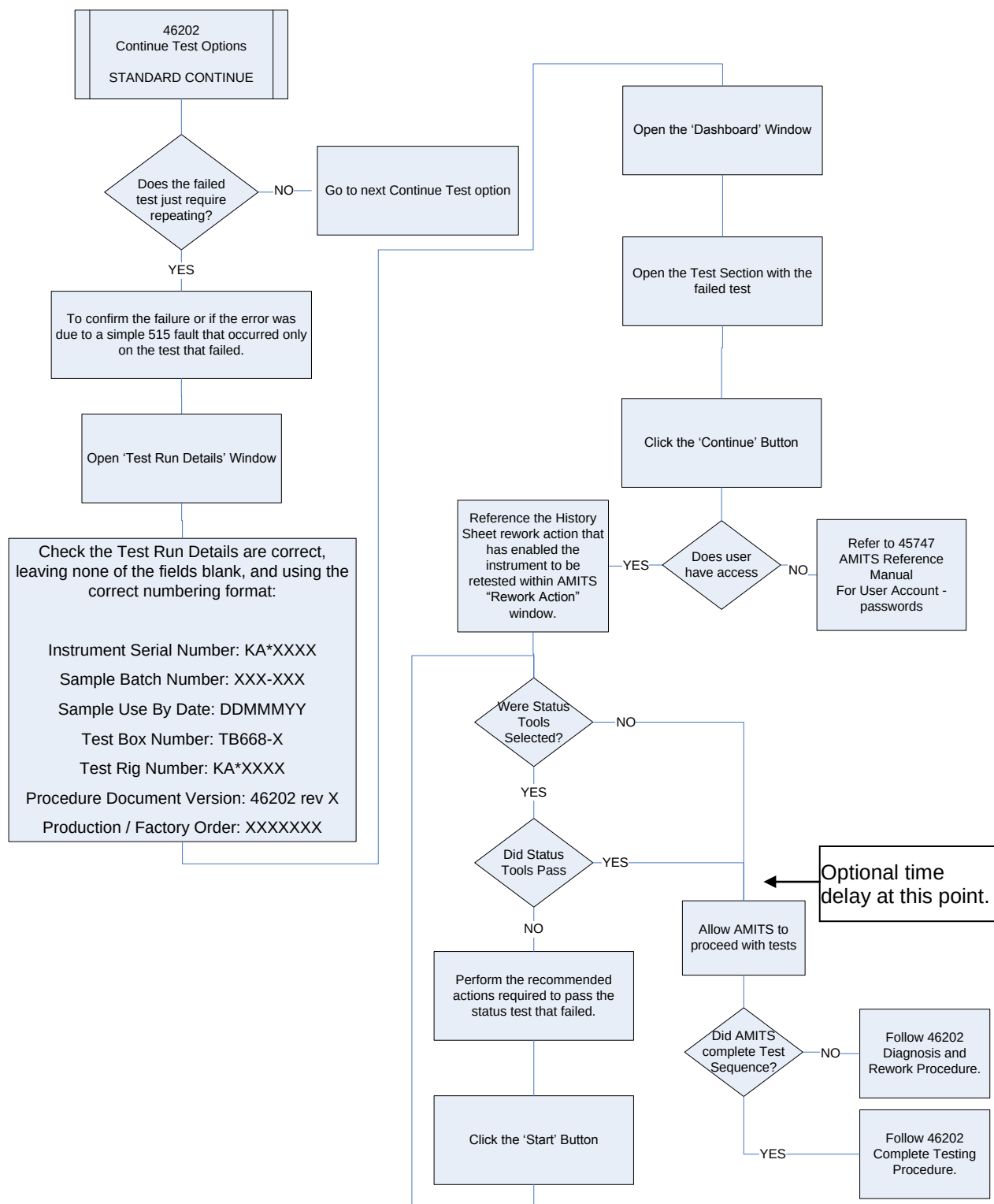
When the REWORK HISTORY is opened, it shows the Stopped test was the Calibrant Heater test. This is correct as the last **saved** test was the Calibrant Heater – and as it had not stopped due to a failure, the result is COMPLETE.

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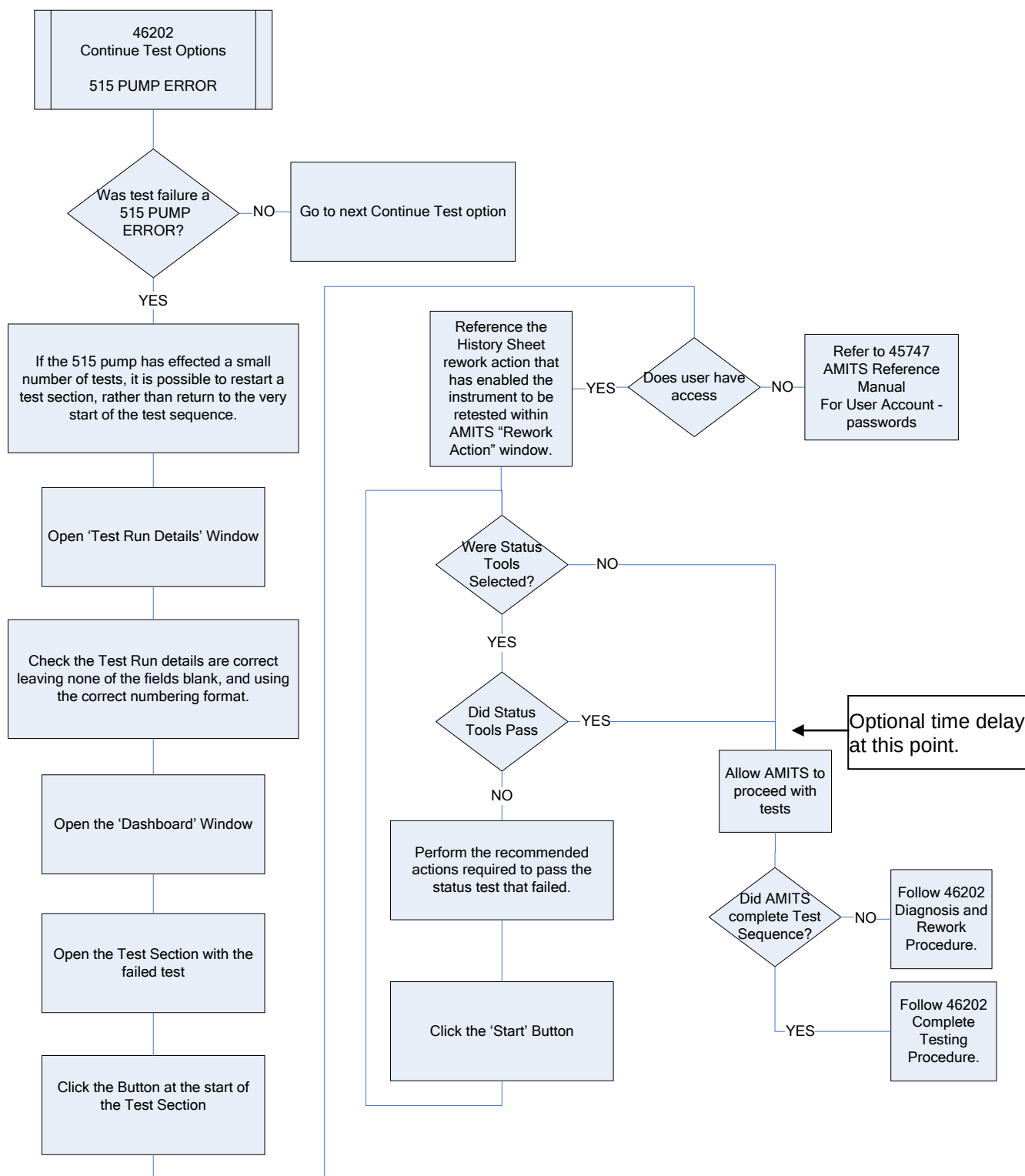
Flowchart 4 – Continue Test Procedure – STANDARD CONTINUE

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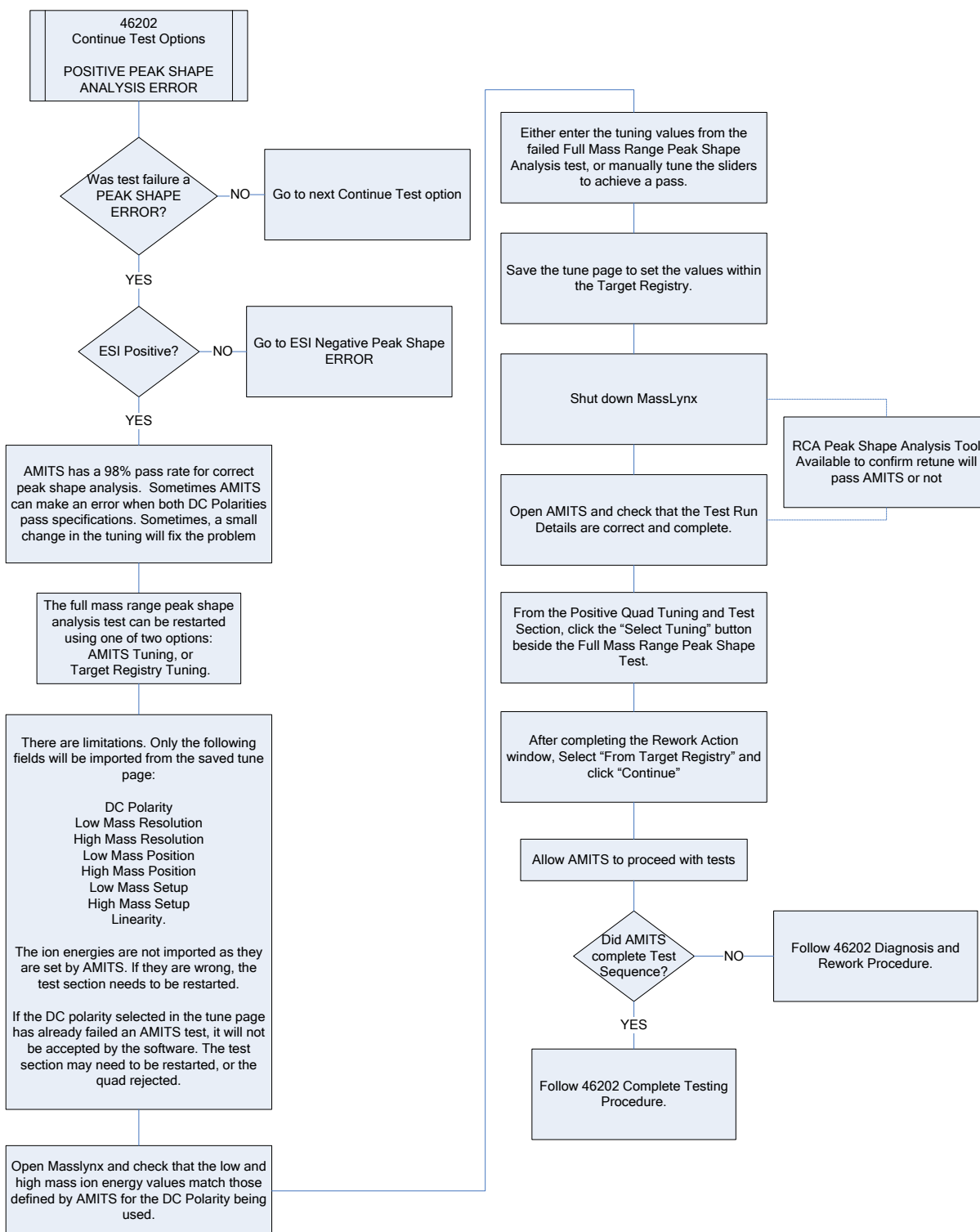
Flowchart 5 – Continue Test Procedure – 515 PUMP ERROR

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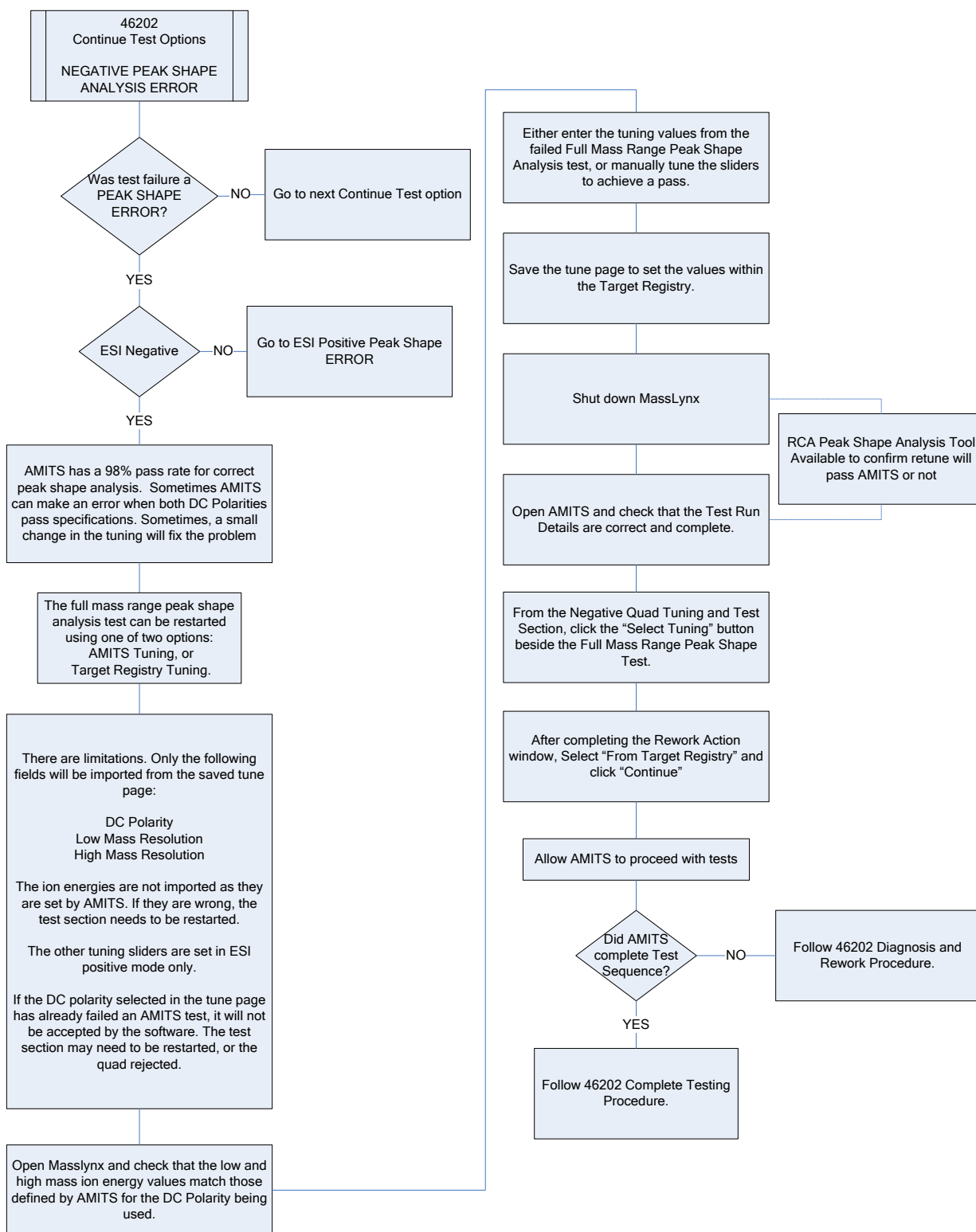
Flowchart 6 – Continue Test Procedure – POSITIVE FULL MASS RANGE PEAK SHAPE ANALYSIS FAIL

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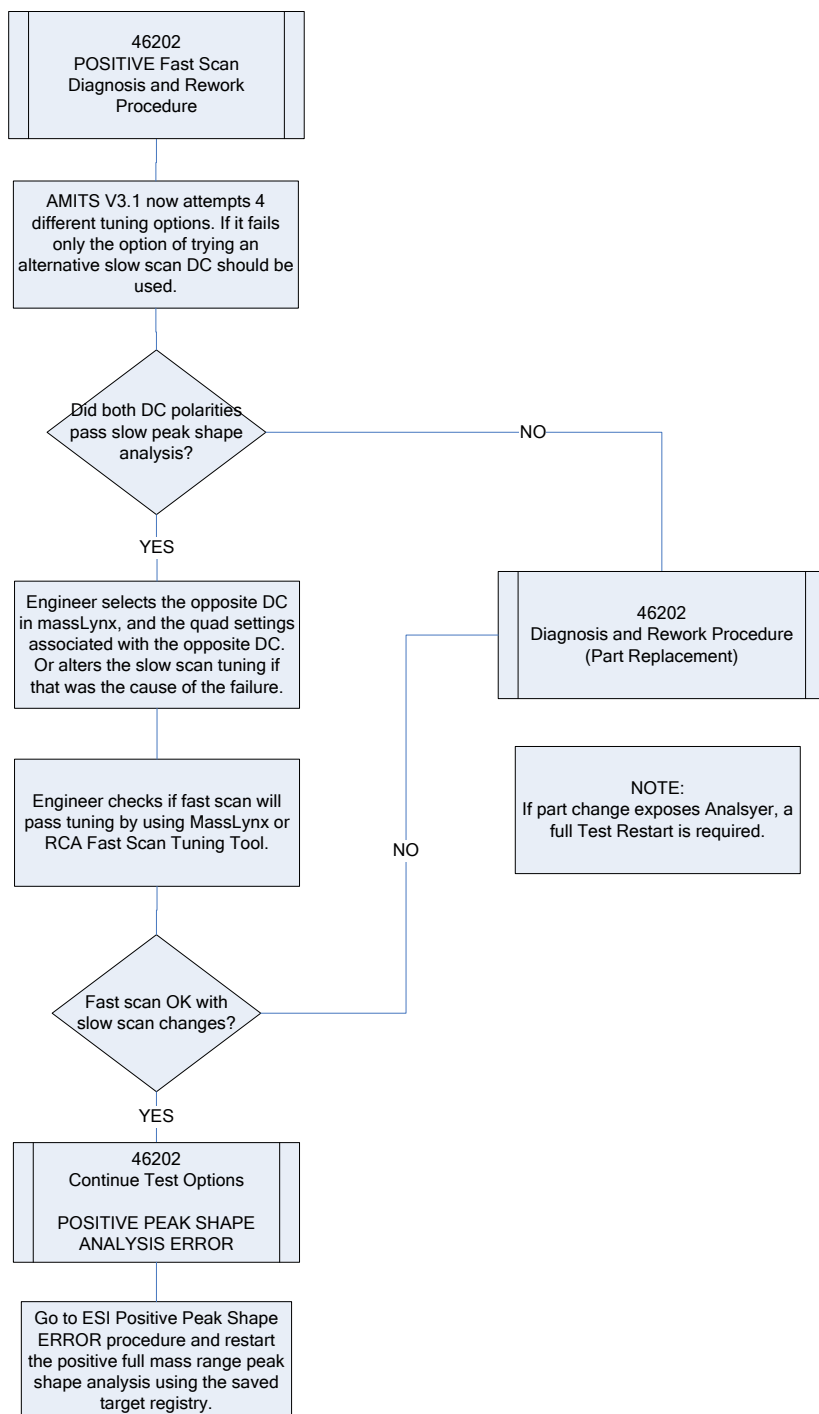
Flowchart 7 – Continue Test Procedure – NEGATIVE FULL MASS RANGE PEAK SHAPE ANALYSIS FAIL

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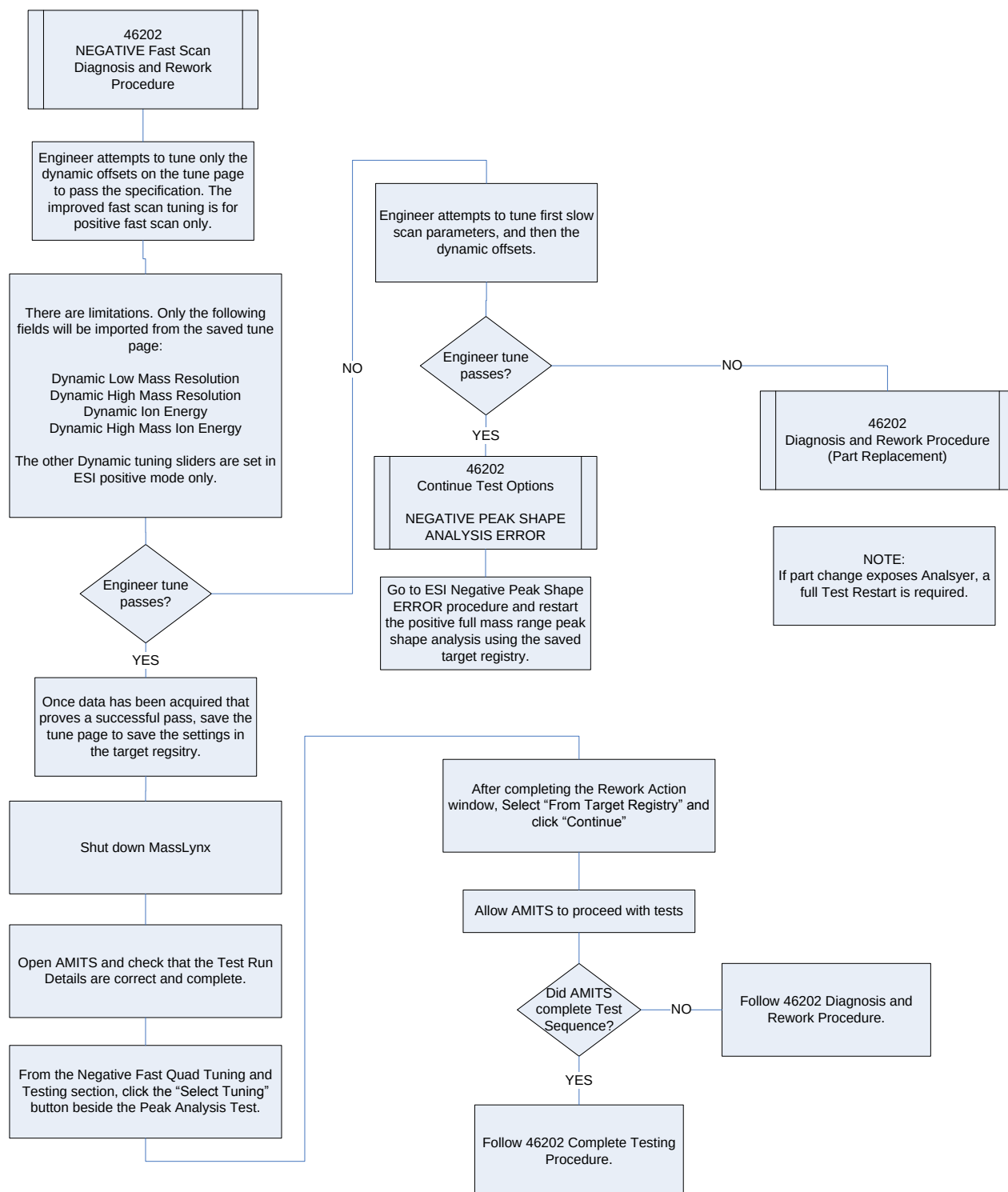
Flowchart 8 – Failing Fast Scan Procedure – POSITIVE FAST SCAN DIAGNOSIS AND REWORK PROCEDURE

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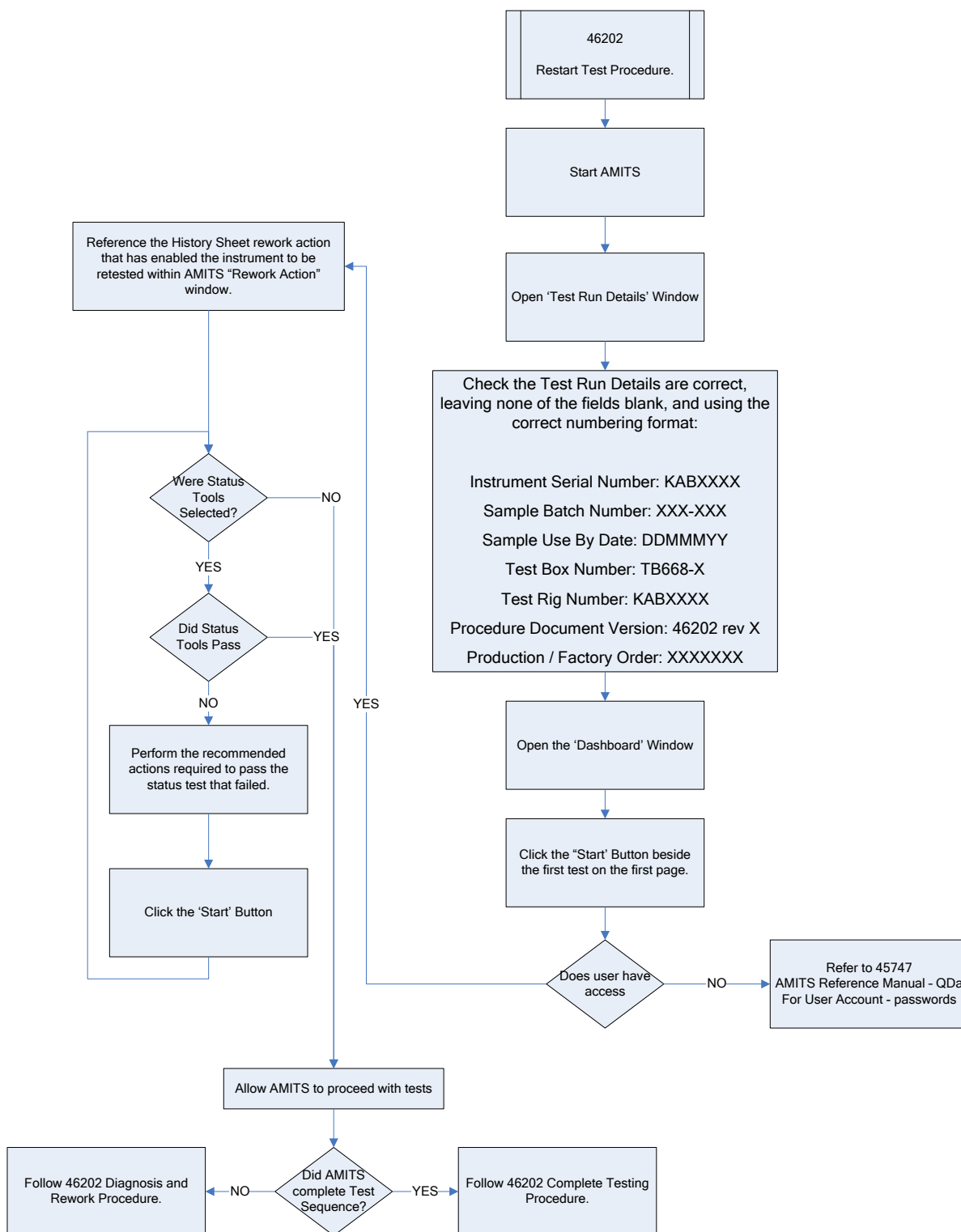
**Flowchart 9 – Failing Fast Scan Procedure – NEGATIVE FAST SCAN DIAGNOSIS AND REWORK PROCEDURE**

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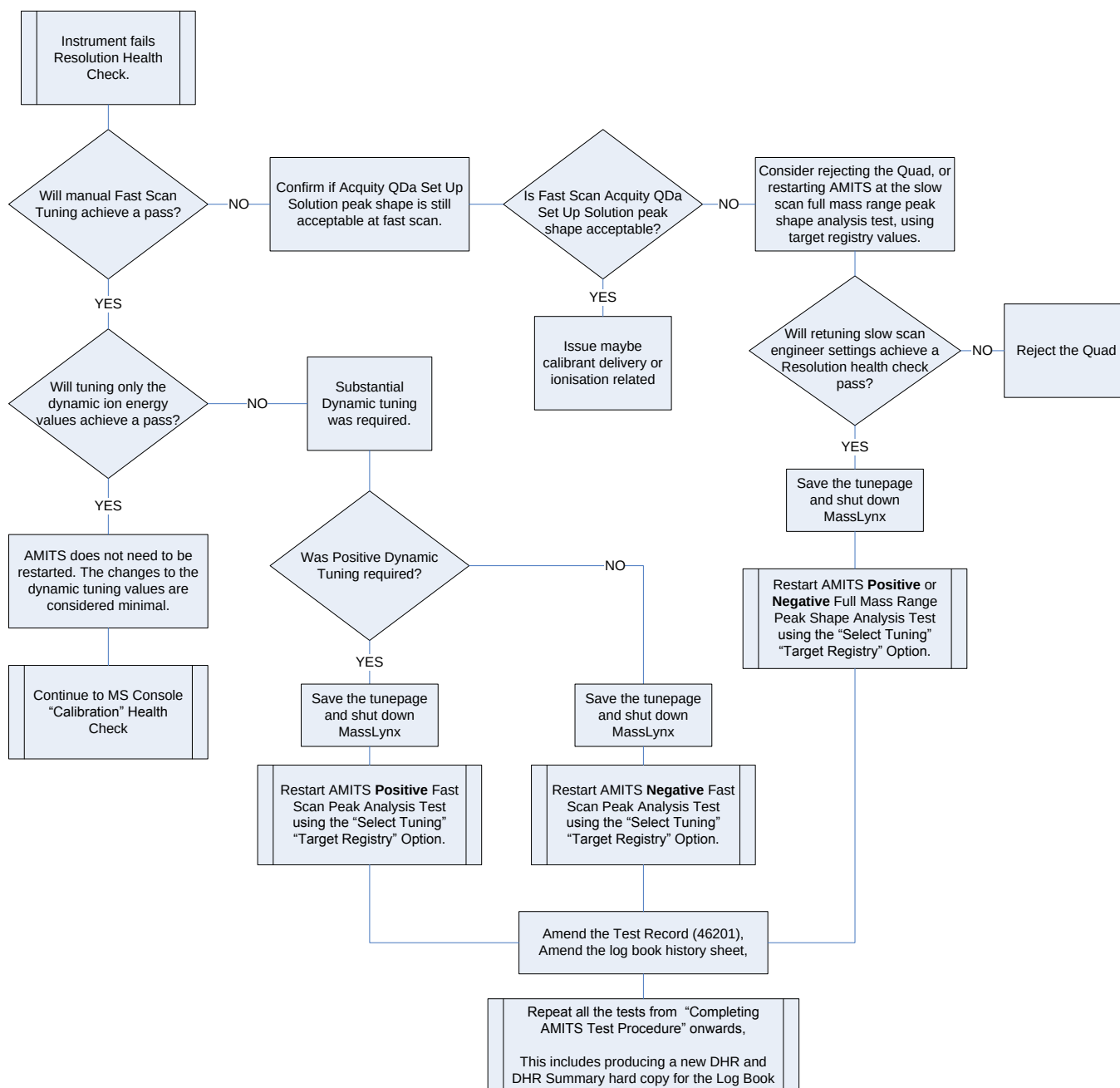
Flowchart 10 – Restart the Test Sequence

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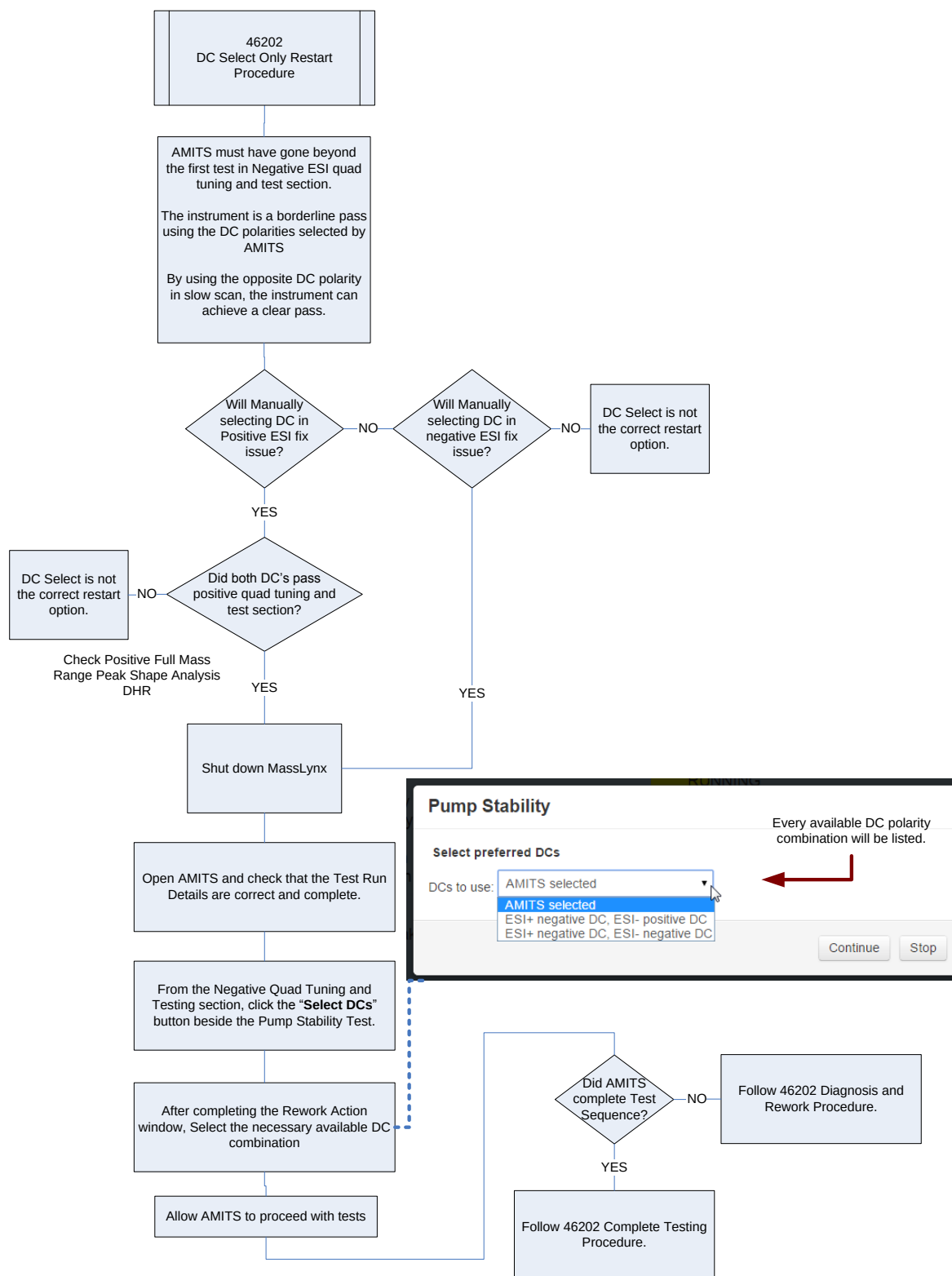
**Flowchart 11 – Resolution Check Check**

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Flowchart 12 – DC Select Only Slow Scan Restart.

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## 20. REWORK HISTORY LOG

Due to the AMITS V2.0 added functionality with respect to restart and continuing test options, it became essential that a chronological log of all the test runs could be created from the test logs. The log is designed to capture where a test run begins, and where it stops.

This tool is not for the DHR logbook, but rather for root cause analysis when looking into the test history of a part.

### 20.1. Opening the Rework History

At any point in the test sequence it is possible to open a snap shot of the current test run history. Click the “History” option on the top tool bar. This will populate and open the rework history log.

The screenshot shows the 'History' tab in the Acquity QDa software. The title bar reads 'Rework History for Serial Number KAB0423K 8 Sep 2014'. Below the title bar, there is a 'Print' button. The main content area lists three test runs:

- Test Run Number: 1**  
Start Details:  
Start Section: MANUFACTURING PRE-TEST  
Start Test: Kestrel Configuration  
Test Engineer: UKSYTNHA  
Start time: Fri Sep 05 2014 15:37:05 GMT+0100 (GMT Daylight Time)  
  
Stop Details:  
Stop Section: INTERNAL CALIBRANT TESTING  
Stop Test: Internal Calibrant Benchmark  
Error message is: Failed specification  
End time: Fri Sep 05 2014 22:54:21 GMT+0100 (GMT Daylight Time)  
Result is: ERROR
- Test Run Number: 2**  
Start Details:  
Rework Action: Cleaned Peek and Pin  
Start Section: INTERNAL CALIBRANT TESTING  
Start Test: Internal Calibrant Benchmark  
Test Engineer: UKSYTNHA  
Start time: Mon Sep 08 2014 13:18:05 GMT+0100 (GMT Daylight Time)  
  
Stop Details:  
Stop Section: INTERNAL CALIBRANT TESTING  
Stop Test: Internal Calibrant Benchmark  
Error message is: Failed specification  
End time: Mon Sep 08 2014 13:29:38 GMT+0100 (GMT Daylight Time)  
Result is: ERROR
- Test Run Number: 3**  
Start Details:

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## 20.2. Rework History Log Structure

The Rework History is broken into the following sections:

|                   |                                                                                                                                                                                                                                        |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Run Number   | This number is quoted within every DHR and LOG                                                                                                                                                                                         |
| Start Details -   | The following details are collected regarding where the test run was started:                                                                                                                                                          |
| Rework Action –   | Only displayed If the run number is 2 or more. A rework action must have been logged to describe what was done to fix the cause of the previous test run's failure or stoppage.                                                        |
| Start Section –   | The test section in which the run was started                                                                                                                                                                                          |
| Start Test –      | The test in which the run was started.                                                                                                                                                                                                 |
| Test Engineer –   | The engineer who started the test run                                                                                                                                                                                                  |
| Start Time –      | Time and date details regarding when the test run was started.                                                                                                                                                                         |
| Stop Details: -   | The following details are collected regarding where the test run was stopped                                                                                                                                                           |
| Start Section –   | The test section in which the run was stopped                                                                                                                                                                                          |
| Start Test –      | The test in which the run was stopped.                                                                                                                                                                                                 |
| Error Message is: | All failures and stoppages have an automated error message associated with them. These are listed within the appendix of this document.                                                                                                |
| End Time –        | Time and date details regarding when the test run was stopped.                                                                                                                                                                         |
| Result is:        | Error if the test run was stopped or failed. Complete if the test run completed the test normally. This can be displayed before the last test, if there was a LOG ERROR, and the actual test that failed was not stored on the server. |

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**20.3. Rework History Example**

| 12/11/2014                                                                                                                                                                                                                                                                         | History KAB0423K |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| <b>Rework History for Serial Number KAB0423K 8 Sep 2014</b>                                                                                                                                                                                                                        |                  |
| <b>Test Run Number: 1</b>                                                                                                                                                                                                                                                          |                  |
| Start Details:<br>Start Section: MANUFACTURING PRE-TEST<br>Start Test: Kestrel Configuration<br>Test Engineer: UKSYTNHA<br>Start time: Fri Sep 05 2014 15:37:05 GMT+0100 (GMT Daylight Time)                                                                                       |                  |
| Stop Details:<br>Stop Section: INTERNAL CALIBRANT TESTING<br>Stop Test: Internal Calibrant Benchmark<br>Error message is: Failed specification<br>End time: Fri Sep 05 2014 22:54:21 GMT+0100 (GMT Daylight Time)<br>Result is: ERROR                                              |                  |
| <b>Test Run Number: 2</b>                                                                                                                                                                                                                                                          |                  |
| Start Details:<br>Rework Action: Cleaned Peek and Pin<br>Start Section: INTERNAL CALIBRANT TESTING<br>Start Test: Internal Calibrant Benchmark<br>Test Engineer: UKSYTNHA<br>Start time: Mon Sep 08 2014 13:18:05 GMT+0100 (GMT Daylight Time)                                     |                  |
| Stop Details:<br>Stop Section: INTERNAL CALIBRANT TESTING<br>Stop Test: Internal Calibrant Benchmark<br>Error message is: Failed specification<br>End time: Mon Sep 08 2014 13:29:38 GMT+0100 (GMT Daylight Time)<br>Result is: ERROR                                              |                  |
| <b>Test Run Number: 3</b>                                                                                                                                                                                                                                                          |                  |
| Start Details:<br>Rework Action: verified on tune page, is at least 4 times specification<br>Start Section: INTERNAL CALIBRANT TESTING<br>Start Test: Internal Calibrant Benchmark<br>Test Engineer: UKSYTNHA<br>Start time: Mon Sep 08 2014 13:42:37 GMT+0100 (GMT Daylight Time) |                  |
| Stop Details:<br>Stop Section: INTERNAL CALIBRANT TESTING<br>Stop Test: Shutdown<br>End time: Mon Sep 08 2014 13:54:27 GMT+0100 (GMT Daylight Time)                                                                                                                                |                  |

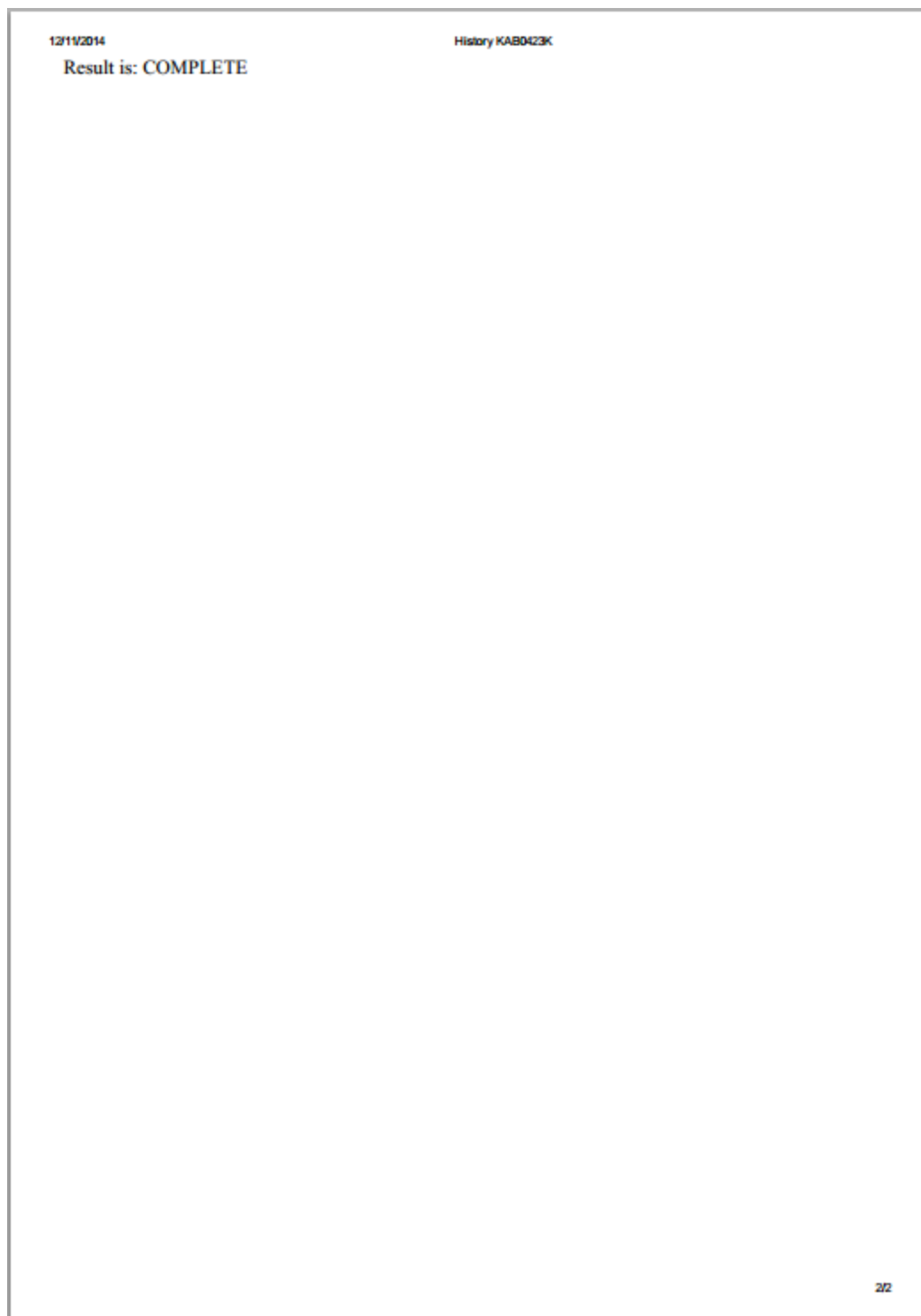
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### 21. RCA TOOLS

The RCA tests are selected from the Product Type list.

The screenshot shows the 'Manufacturing Test Run Details' form. The 'Product Type' dropdown menu is open, displaying a list of RCA tools. The options are: QDa\_RCA\_Charging (selected), QDa\_RCA\_Detector, QDa\_RCA\_Fast\_Tuning, QDa\_RCA\_Heater, QDa\_RCA\_Internal\_Cal, QDa\_RCA\_Low\_Mass\_Sensitivity, QDa\_RCA\_Peak\_Shape, QDa\_RCA\_Performance, and QDa\_RCA\_Slow\_Tuning. Below the dropdown are empty input fields for Serial Number, Acquity QDa Setup Solution Batch Number, Acquity QDa Setup Solution Use By Date, Test Box Number, Test Rig Number, Procedure Document Version, and Production / Factory Order.

Some of the RCA tools require tuned values within the target registry before they will run successfully.

The RCA sequences do not stop when a specification fails. Instead, the dashboard highlights the text "PASS" in WHITE, and carries on.

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| FINISH                | STATUS | FAILURES | DHR LOG |
|-----------------------|--------|----------|---------|
| Pump Stability        | PASS   | 1        |         |
| Final Beam - Positive | PASS   |          |         |
| Final Beam - Negative | PASS   |          |         |
| Shutdown              | PASS   |          |         |

This give the RCA engineer as much information as possible regarding the part being tested.

The failure information is collected within the DHR and LOG records of the failed test.

Because of this “no-stop” feature, the History and Summary records can not be used to find details of the failure.

The No Stop functionality overrides the logic that selects DC polarity. The last DC polarity that was tested is used for the next test.

Therefore, RCA runs are limited in their usefulness from a slow scan tuning and peak shape analysis point of view, unless the tests pass.

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**21.1. Charging Test**

**Purpose**

Tunes the instrument generator.

Checks the critical voltage tests to make sure the instrument is stable enough to perform the charging test.

Checks that there is sample present, and that the instrument is capable of seeing sample in DC positive and DC negative modes.

Tunes the 74Da and 1135Da peak widths and peak positions to populate the tuned target registry settings.

Confirms the 515 pump is stable enough to perform tests, and that the spray (probe) is stable enough to perform tests.

Runs the charging test.

**Product Type Name:**

QDa\_RCA\_Charging

**Prerequisites:**

None.

**Tests Run:**

MANUFACTURING PRE-TEST

Kestrel Configuration

No Stopping Mode

Instrument Preparation

Align Quad RF Generator

Critical Voltages

Basic Beam - Positive

Basic Beam - Negative

Initial Tune

Positive Ion Creation Stability

Negative Ion Creation Stability

Source and Ion Guide Charging

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**21.2. Heater Tests**

**Purpose**

Tunes the instrument generator.

Checks the critical voltage tests to make sure the instrument is stable enough to perform the heater test.

Runs the Desolvation heater test to check the heater can achieve 600C without reaching the limit of the heater's available power range. Checks that the heater can maintain this temperature.

Runs the Calibrant heater test to check the heater can achieve 150C without reaching the limit of the heater's available power range. Checks that the heater can maintain this temperature.

Runs the Source heater test to check the heater can achieve 120C without reaching the limit of the heater's available power range. Checks that the heater can maintain this temperature.

**Product Type Name:**

QDa\_RCA\_Heater

**Prerequisites:**

None.

**Tests Run:**

MANUFACTURING PRE-TEST

Kestrel Configuration

No Stopping Mode

Instrument Preparation

Align Quad RF Generator

Critical Voltages

Desolvation Heater

Calibrant Heater

Source Heater

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**21.3. Detector Tests**

**Purpose**

Tunes the instrument generator.

Checks the critical voltage tests to make sure the instrument is stable enough to perform the charging test.

Tunes the 74Da and 1135Da peak widths and peak positions to populate the tuned target registry settings.

Confirms the 515 pump is stable enough to perform tests, and that the spray (probe) is stable enough to perform tests.

Tunes the low mass ion energy in positive and negative ionisation modes to prevent excessive peak shape deformity.

Performs all the detector gain tests, and detector noise tests.

**Product Type Name:**

QDa\_RCA\_Detector

**Prerequisites:**

None.

**Tests Run:**

MANUFACTURING PRE-TEST

Kestrel Configuration

No Stopping Mode

Instrument Preparation

Align Quad RF Generator

Critical Voltages

Initial Tune

POSITIVE MODE QUAD TUNING AND TESTING

Pump Stability

Low Mass Ion Energy

NEGATIVE MODE QUAD TUNING AND TESTING

Low Mass Ion Energy

DETECTOR TESTING

Pump Stability

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Detector Gain - Positive  
Detector Gain - Negative  
Detector Noise - Positive  
Detector Noise - Negative  
Detector Burn

#### **21.4. Performance Tests**

##### **Purpose**

Uses the target registry values for the align frequency, slow scan tuning values, and the detector gain values.  
Checks the critical voltage tests to make sure the instrument is stable enough to perform the test.  
Confirms the 515 pump is stable enough to perform tests, and that the spray (probe) is stable enough to perform tests.  
Runs the Positive / Negative switching test.  
Runs the positive and negative absolute and benchmarking sensitivity tests.

##### **Product Type Name:**

QDa\_RCA\_Performance

##### **Prerequisites:**

The RF generator must be aligned, and the slow scan tune page must already be tuned, including the detector gain values.

##### **Tests Run:**

MANUFACTURING PRE-TEST STATUS

Kestrel Configuration

No Stopping Mode

Instrument Preparation

Use Target Reg Tune Settings

Critical Voltages

POSITIVE MODE PERFORMANCE TESTING

Pump Stability

Positive / Negative Switching

Benchmark Full Mass Sensitivity

Absolute Sensitivity

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NEGATIVE MODE PERFORMANCE TESTING

Pump Stability

Benchmark Full Mass Sensitivity

Absolute Sensitivity

**21.5. Independent Slow Scan tuning and Peak Shape Analysis**

**Purpose**

Tunes the instrument generator.

Checks the critical voltage tests to make sure the instrument is stable enough to perform the charging test.

Tunes the 74Da and 1135Da peak widths and peak positions to populate the tuned target registry settings.

Confirms the 515 pump is stable enough to perform tests, and that the spray (probe) is stable enough to perform tests.

Performs all the positive and negative slow scan tuning and peak shape analysis tests.

WARNING: Due to the “No Stop” functionality of RCA tests, the normal DC polarity selection rules will not function correctly. The DC polarity selected for ESI negative mode will not be based on peak shape.

**Product Type Name:**

QDa\_RCA\_Slow\_Tuning

**Prerequisites:**

None.

**Tests Run:**

MANUFACTURING PRE-TEST STATUS

Kestrel Configuration

No Stopping Mode

Instrument Preparation

Align Quad RF Generator

Critical Voltages

Initial Tune

POSITIVE MODE QUAD TUNING AND TESTING

Pump Stability

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Low Mass Ion Energy  
High Mass Ion Energy  
Quad Quality  
Resolution Tune  
Low Mass Position  
High Mass Position  
Prefilter  
Full Mass Range Peak Shape Analysis

**NEGATIVE MODE QUAD TUNING AND TESTING**

Pump Stability  
Low Mass Ion Energy  
High Mass Ion Energy  
Quad Quality  
Low Mass Resolution  
High Mass Resolution  
Linearity Tuning  
Full Mass Range Peak Shape Analysis  
Mass Accuracy

**21.6. Independent Fast Scan tuning and Peak Shape Analysis**

**Purpose**

Uses the target registry values for the align frequency, slow scan tuning values, and the detector gain values.  
Checks the critical voltage tests to make sure the instrument is stable enough to perform the test.  
Confirms the 515 pump is stable enough to perform tests, and that the spray (probe) is stable enough to perform tests.  
Runs the positive and negative fast scan tuning test sequences.

**Product Type Name:**

QDa\_RCA\_Fast\_Tuning

**Prerequisites:**

Slow scan tuning and detector gain tuning values must be within the target registry for this test sequence to run correctly.

**Tests Run:**

---

Waters Confidential

Template47755\_1

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**MANUFACTURING PRE-TEST STATUS**

Kestrel Configuration

No Stopping Mode

Instrument Preparation

Use Target Reg Tune Settings

Critical Voltages

**POSITIVE FAST SCAN QUAD TUNING AND TESTING**

Pump Stability

High Mass Ion Energy

Resolution Tune

Low Mass Position

High Mass Position

Peak Analysis

**NEGATIVE FAST SCAN QUAD TUNING AND TESTING**

Pump Stability

High Mass Ion Energy

Low Mass Resolution

Linearity Tuning

Peak Analysis

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**21.7. Final Beam Tests**

**Purpose**

Uses the target registry values for the align frequency, slow scan tuning values, fast scan tuning values, and the detector gain values.

Confirms the 515 pump is stable enough to perform tests, and that the spray (probe) is stable enough to perform tests.

Runs the positive and negative final beam tests to check peak shape, position and intensity.

**Product Type Name:**

QDa\_RCA\_Peak\_Shape

**Prerequisites:**

Slow scan tuning and detector gain tuning values must be within the target registry for this test sequence to run correctly.

**Tests Run:**

MANUFACTURING PRE-TEST STATUS

Start

No Stopping Mode

Instrument Preparation

Use Target Reg Tune Settings

FINISH

Pump Stability

Final Beam - Positive

Final Beam - Negative

Shutdown

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**21.8. Internal Calibration Tests**

**Purpose**

Uses the target registry values for the align frequency, slow scan tuning values, fast scan tuning values, and the detector gain values.

Runs the internal calibrant benchmarking test to check positive and negative slow scan peak width and intensity, and fast scan peak width. AMITS also acquires the full mass spectrum in each mode so that the engineer can confirm if any contamination or suppression is taking place.

**Product Type Name:**

QDa\_RCA\_Internal\_Cal

**Prerequisites:**

Slow scan tuning and detector gain tuning values must be within the target registry for this test sequence to run correctly. Fast scan tuning is optional if the fast scan peak width is not being assessed.

**Tests Run:**

MANUFACTURING PRE-TEST

Kestrel Configuration

No Stopping Mode

Instrument Preparation

Use Target Reg Tune Settings

FINISH

Internal Calibrant Benchmark

Shutdown

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**21.9. Low mass sensitivity Test**

**Purpose**

A quick test to confirm if the low mass sensitivity test will pass or fail.

**Product Type Name:**

QDa\_RCA\_Low\_Mass\_Sensitivity

**Prerequisites:**

None.

**Tests Run:**

MANUFACTURING PRE-TEST

Kestrel Configuration

No Stopping Mode

Instrument Preparation

Low Mass Sensitivity

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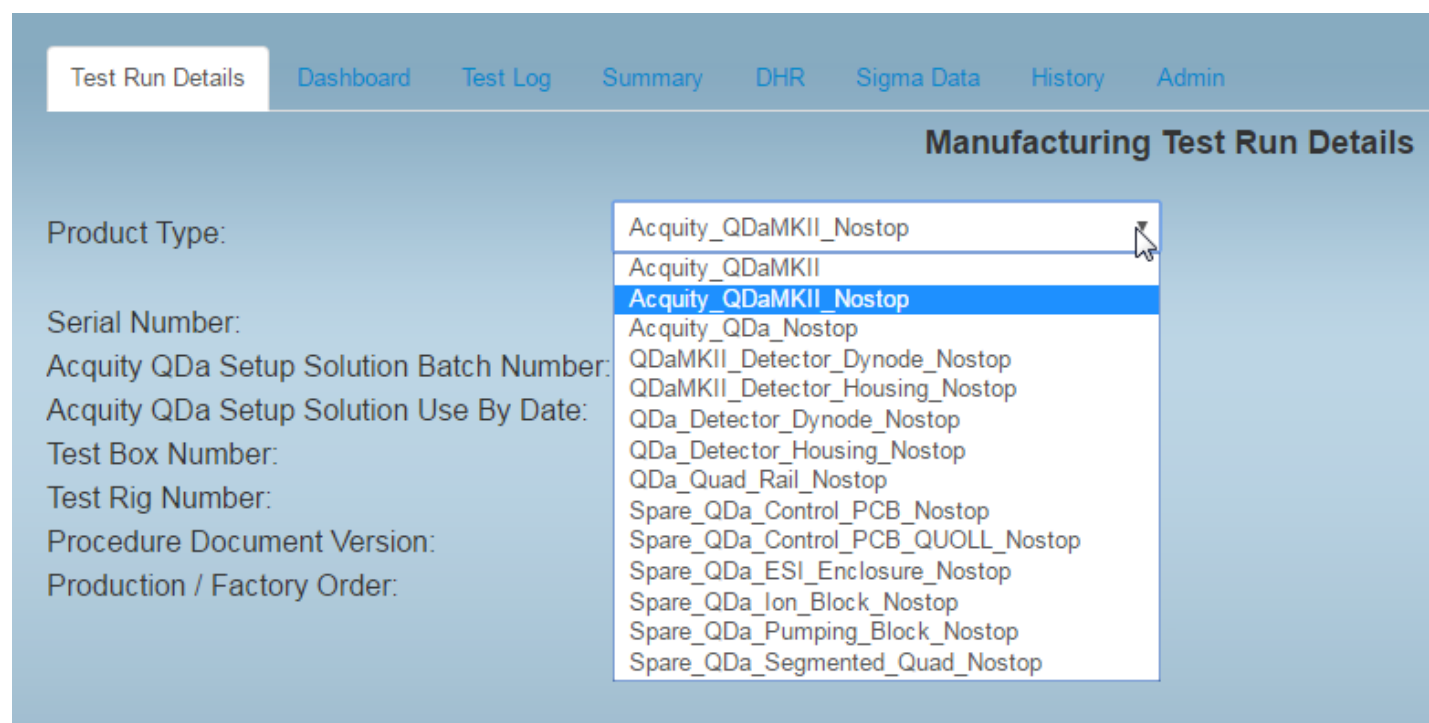
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### 22. “NO STOP” TESTS

The “No Stop” tests are selected from the Product Type list.



The screenshot shows the 'Manufacturing Test Run Details' form. The 'Product Type' dropdown menu is open, displaying a list of test types. The selected option is 'Acquity\_QDaMKII\_Nostop'.

| Product Type                       |
|------------------------------------|
| Acquity_QDaMKII_Nostop             |
| Acquity_QDaMKII                    |
| Acquity_QDaMKII_Nostop             |
| Acquity_QDa_Nostop                 |
| QDaMKII_Detector_Dynode_Nostop     |
| QDaMKII_Detector_Housing_Nostop    |
| QDa_Detector_Dynode_Nostop         |
| QDa_Detector_Housing_Nostop        |
| QDa_Quad_Rail_Nostop               |
| Spare_QDa_Control_PCB_Nostop       |
| Spare_QDa_Control_PCB_QUOLL_Nostop |
| Spare_QDa_ESI_Enclosure_Nostop     |
| Spare_QDa_Ion_Block_Nostop         |
| Spare_QDa_Pumping_Block_Nostop     |
| Spare_QDa_Segmented_Quad_Nostop    |

The No Stop tests are named the same as the normal Instrument, Assembly or Spare tests, but have “\_Nostop” added to the end of the product type name.

The “no stop” sequences do not stop when a specification fails. Instead, the dashboard highlights the text “PASS” in WHITE, and carries on.

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| FINISH                       | STATUS                | FAILURES | DHR LOG |
|------------------------------|-----------------------|----------|---------|
| <a href="#">Restart Here</a> | Pump Stability        | PASS     | 1       |
|                              | Final Beam - Positive | PASS     |         |
|                              | Final Beam - Negative | PASS     |         |
|                              | Shutdown              | PASS     |         |

[Stop](#)
 State: Unknown
 API Gas: Unknown

[MANUFACTURING PRE-TEST](#)
[FINISH](#)

This give the RCA engineer as much information as possible regarding the part being tested.

The failure information is collected within the DHR and LOG records of the failed test.

Because of this “no-stop” feature, the History and Summary records can not be used to find details of the failure.

The No Stop functionality overrides the logic that selects DC polarity. The last DC polarity that was tested is used for the next test.

Therefore, “no stop” runs are limited in their usefulness from a slow scan tuning and peak shape analysis point of view, unless the tests pass.

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## 23. STATUS TOOL

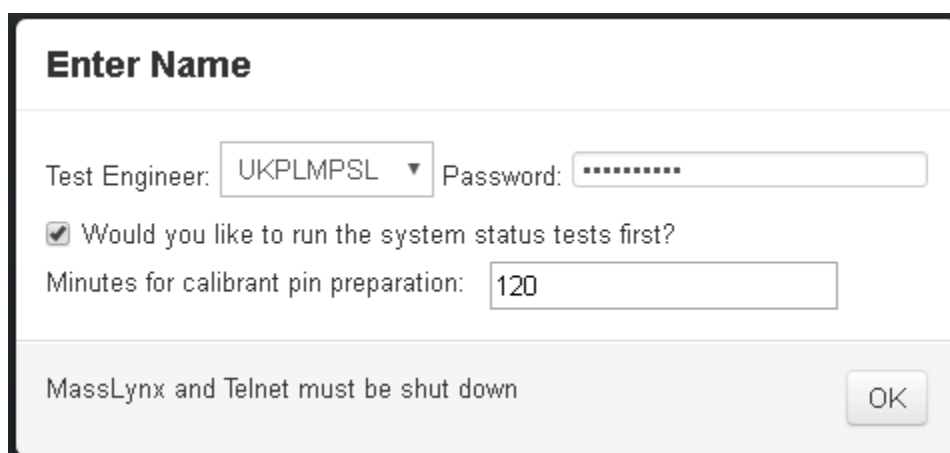
The Status Tool and some of the AMITS tests have error responses contain the most likely failure causes for that test, and a proposed fix to try.

These are configurable by PAE. When a new cause of failure has been verified, PAE can update the error message to include the new information.

This will make testing much more efficient when training new engineers, or updating engineers who have not used AMITS for a long time.

It is highly recommended that before running the status tool, Masslynx is closed down. Then the StopMassLynxProcesses batch file is run to completely shut down any residual processes. And finally, a soft reboot is applied to the instrument to ensure the instrument is not waiting for a MassLynx command.

### 23.1. Minutes for Calibrant Pin Preparation



**Enter Name**

Test Engineer: UKPLMP SL Password: .....

☒ Would you like to run the system status tests first?

Minutes for calibrant pin preparation: 120

MassLynx and Telnet must be shut down OK

Start pop-up window – with new “minutes for calibrant pin preparation” option.

When Start is selected, or any of the restart options, the pop-up window displayed now includes space for “minutes for calibrant pin preparation”. If left blank, AMITS will start as soon as the status checks have completed. If any time is entered, as a number of minutes, AMITS will not start until the time delay has been completed.

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### Status Checks

|                                            |       |
|--------------------------------------------|-------|
| Checking AMITS Availability                | READY |
| Health Monitor Configuration               | READY |
| Test Server                                | READY |
| MassLynx                                   | READY |
| DHCP Server                                | READY |
| Waters File Service                        | READY |
| Ping Instrument                            | READY |
| Connecting to Instrument                   | READY |
| Startup Configuration                      | READY |
| Status of Source Pressure Test             | READY |
| Vacuum                                     | READY |
| Critical Voltages                          | READY |
| API Gas                                    | READY |
| Running Calibrant Pin Preparation 01:57:53 |       |

Print

Stop

Status Checker window, with the time delay applied.

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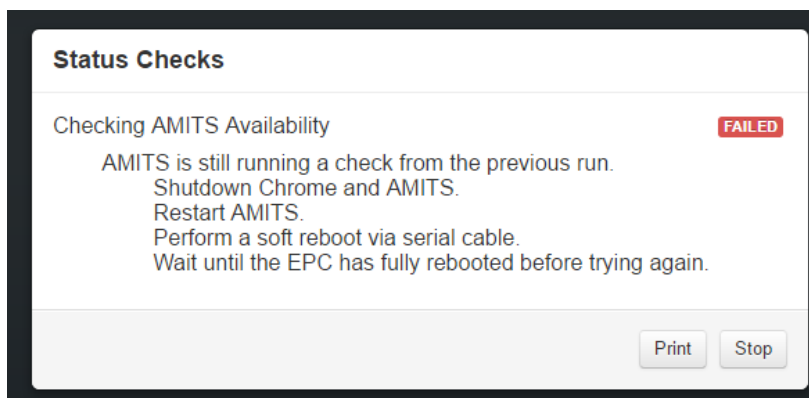
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**23.2. Status Tools – Checking AMITS Availability**

**Purpose**

Checks that AMITS is not “busy” waiting for a response from the instrument, when the instrument is in a fault state.

**Error Message**



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### 23.3. Status Tools – Health Monitor Configuration

#### Purpose

Checks that the test procedures have been followed, and that the health monitor configuration has been set up to support AMITS testing.



The screenshot shows a window titled "Health Monitor Configuration". Inside, there is a section labeled "Checks" with a list of 34 items, each preceded by a checkbox. The items are as follows:

- ☒ Power Down In Progress
- ☒ FPGA FailSafe Check
- ☒ Turbo Timeout
- ☒ Turbo Startup
- ☒ Instrument Overheat
- ☒ Low Turbo Speed
- ☒ Startup Prerequisites Check
- ☒ QDa Startup Routine
- ☒ Critical Readback Check Failed
- ☒ Front Panel Door Open
- ☒ Source Pressure Test API Gas Trip
- ☒ Source Pressure Test Exhaust Trip
- ☒ Source Pressure Test Leak Trip
- ☒ High Exhaust Pressure Trip
- ☒ Critical Readback Check
- ☒ High Turbo Power
- ☐ Internal Calibrant Beam Check Failed
- ☐ Alternative Calibrant Beam Check Failed
- ☒ Resolution Check
- ☒ Calibration Check
- ☒ Operate
- ☒ Exhaust Problem Warning
- ☒ Source Pressure Monitoring Leak Warning
- ☒ Source Pressure Test In Progress
- ☒ Source Temperature Settling Failure
- ☒ Source Temperature Settling
- ☒ API Nitrogen Gas Failure
- ☒ Probe Temperature Settling Failure
- ☒ Probe Temperature Settling
- ☒ Calibration Temperature Settling Failure
- ☒ Low Turbo Power
- ☐ Resolution Setup Failed
- ☐ Resolution Setup Required
- ☐ Resolution Expired
- ☐ Recalibration Failed
- ☐ Recalibration Required
- ☐ Calibration Expired
- ☒ Source Pressure Test Override
- ☐ Service Due
- ☐ Stop Flow

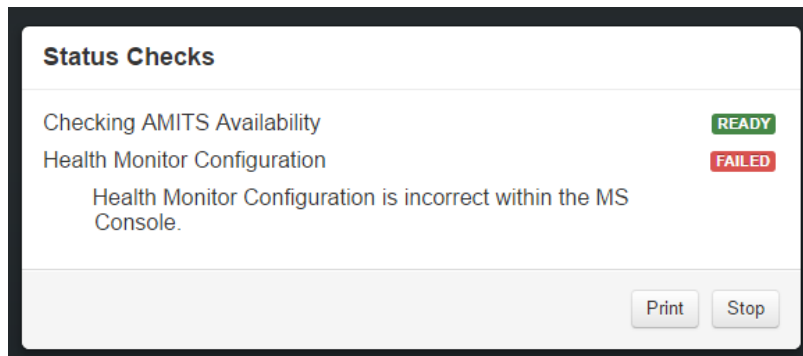
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**Error Message**

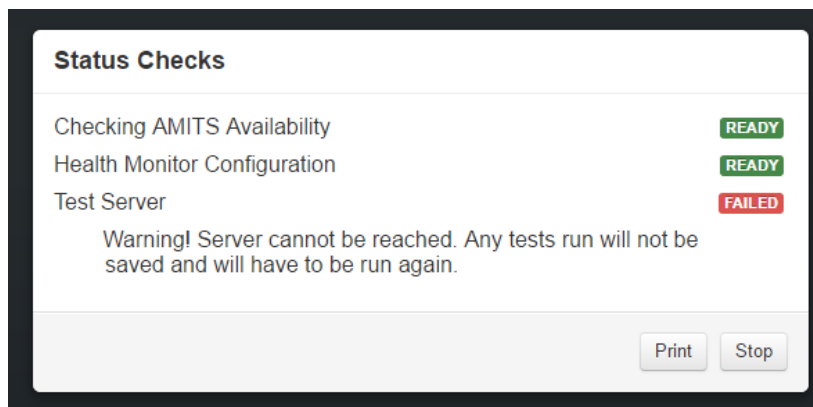


**23.4. Status Tools – Test Server**

**Purpose**

Checks that the external LAN connection is functioning. This checks that it is possible to save a test record on a location external to the host PC.

**Error Message**



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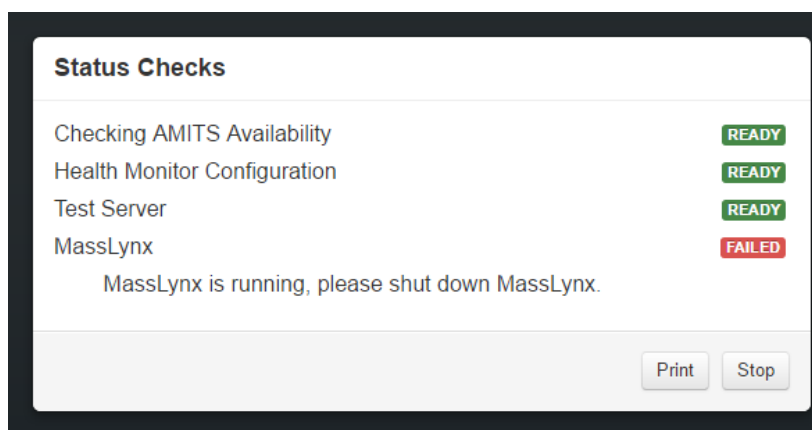
### 23.5. Status Tools – Masslynx

#### Purpose

Checks that MassLynx has been closed down. MassLynx competes for instrument access with AMITS and must be shut down before AMITS acquires data.

It is highly recommended that before running AMITS, Masslynx is closed down. Then the StopMassLynxProcesses batch file is run to completely shut down any residual processes. And finally, a soft reboot is applied to the instrument to ensure the instrument is not waiting for a MassLynx command.

#### Error Message



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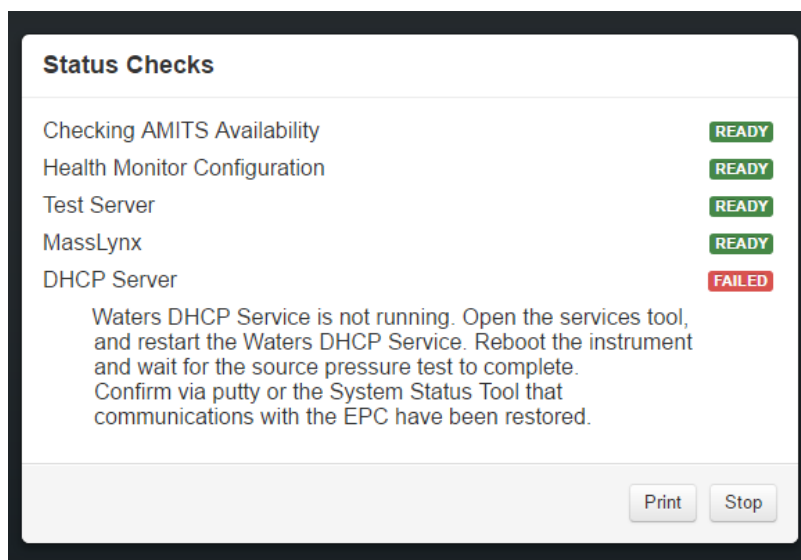
### 23.6. Status Tools – DHCP Server

#### Purpose

The instrument communicates with the host PC through IP addresses. If the Waters DHCP service is not running, there will be a communications error when AMITS runs.

DHCP can be closed down by Windows processes or updates.

#### Error Message



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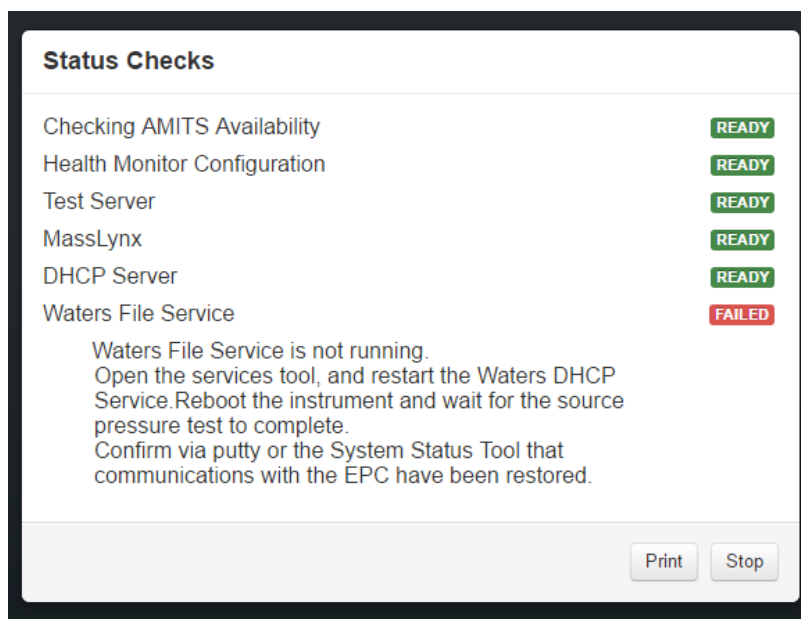
### 23.7. Status Tools – Waters File Service

#### Purpose

The instrument updates internal VXWORKS files through Waters Files Service. If the Waters File Service is not running, there maybe VXWORK file errors that can corrupt how the instrument runs.

Waters File Services can be closed down by Windows processes or updates.

#### Error Message



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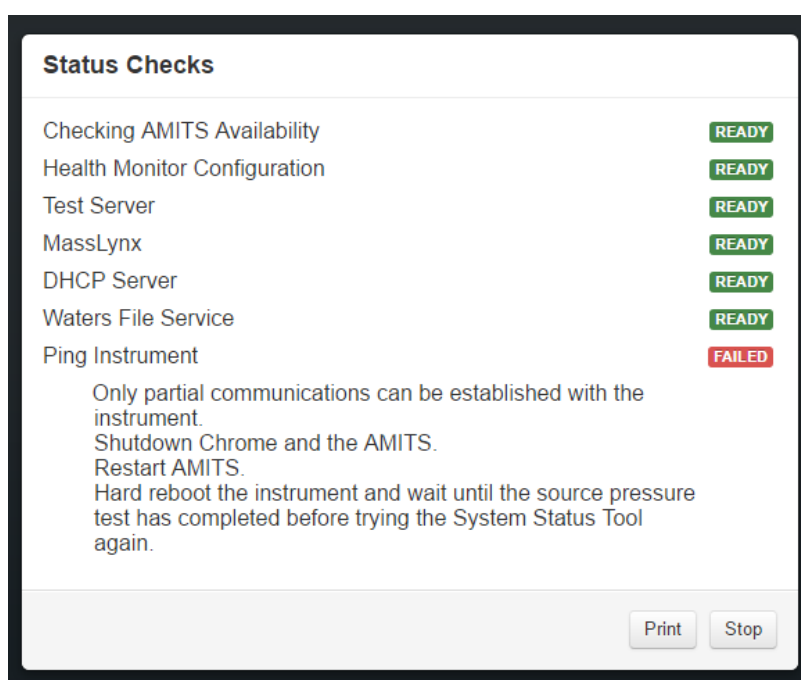
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### 23.8. Status Tools – Ping Instrument

#### Purpose

Checks that the AMITS test will not fail due to a “Timed Out” error from waiting for the instrument to respond to a ping command. This maybe a IP configuration error, or a communication error, such as the cable between the host pc and the instrument not being attached.

#### Error Message



### **23.9. Status Tools – Connecting to instrument**

#### **Purpose**

Establishes a link to the instrument in readiness for delivering rio commands. Similar to setting up a putty link.

#### **Error Message**

Check the cable connections between the host PC and the instrument.

If OK, hard reboot the instrument and wait until the source pressure test has completed before trying the System Status Tool again.

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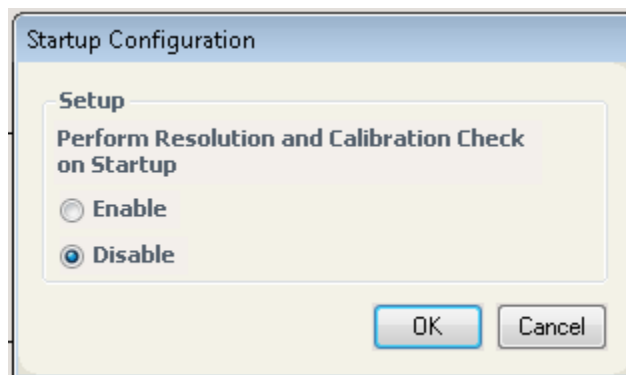
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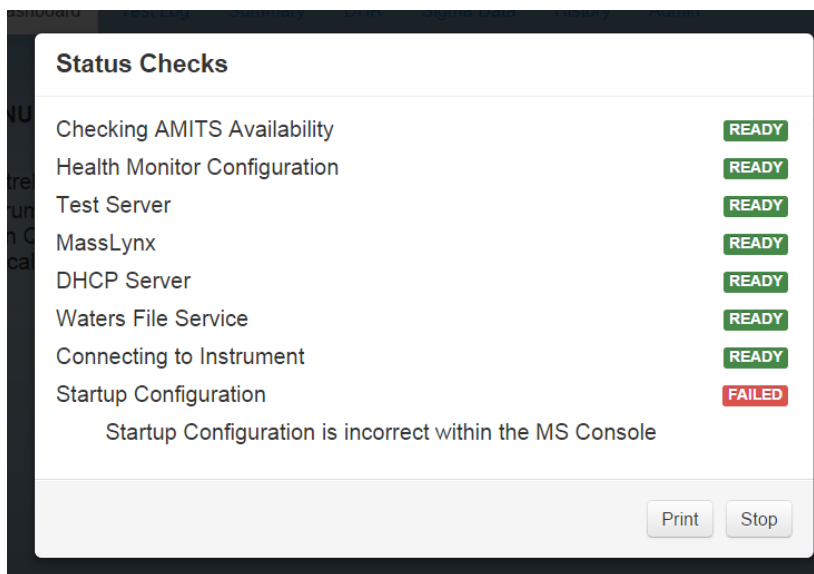
## 23.10. Status Tools – Start Up Configuration

### Purpose

Checks that the test procedures have been followed, and that the health monitor Start Up configuration has been set up to support AMITS testing.



### Error Message



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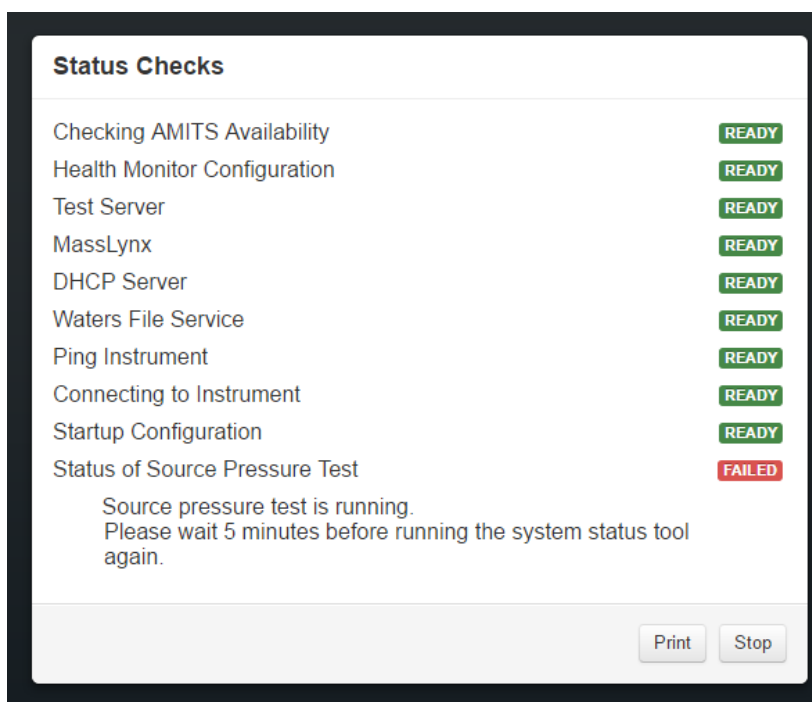
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**23.11. Status Tools – Status of Source Pressure Test**

**Purpose**

Confirms that the source pressure test is not currently running.

**Error Message**



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### 23.12. Status Tools – Vacuum

#### Purpose

Confirms that the instrument is not still pumping down.

#### Error Message

Status Checks

|                                |        |
|--------------------------------|--------|
| Checking AMITS Availability    | READY  |
| Health Monitor Configuration   | READY  |
| Test Server                    | READY  |
| MassLynx                       | READY  |
| DHCP Server                    | READY  |
| Waters File Service            | READY  |
| Ping Instrument                | READY  |
| Connecting to Instrument       | READY  |
| Startup Configuration          | READY  |
| Status of Source Pressure Test | READY  |
| Vacuum                         | FAILED |

Instrument has not pumped down.  
Wait 5 minutes.  
If the source pressure test has not run by then, check for  
source vacuum leaks and that the backing pump is running.

Print
Stop

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### 23.13. Status Tools – Critical Voltages

#### Purpose

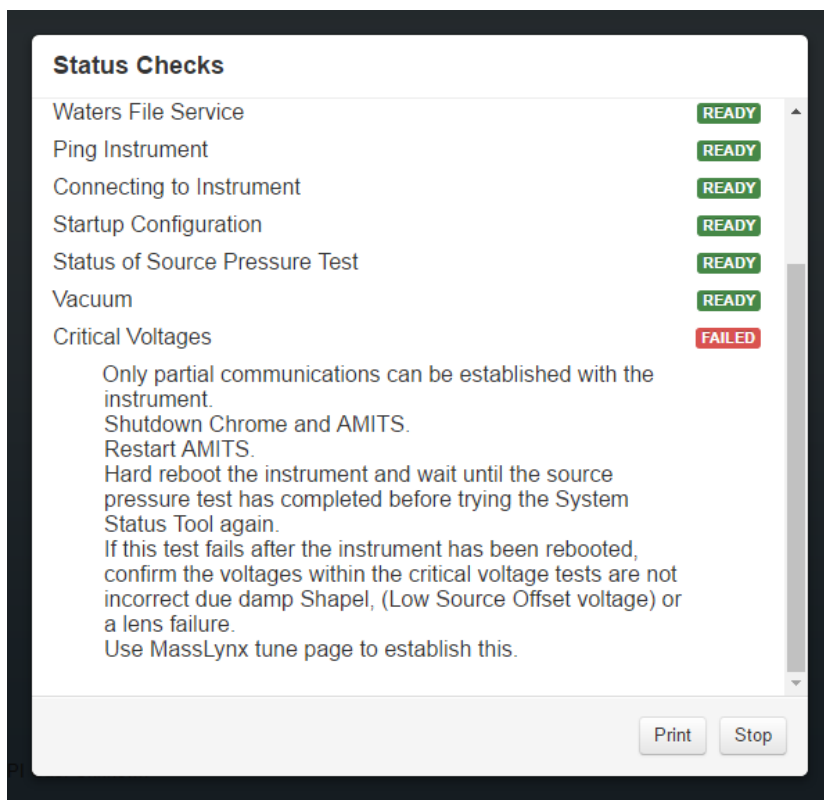
Checks that AMITS can deliver commands and the instrument responds to the commands in a timely manner. Also checks if there is a critical voltage test failure that requires investigation in MassLynx .

The critical voltage status test requests the instrument is rebooted. If the critical voltage status tool fails after a reboot, then the instrument has a legitimate critical voltage failure that needs to be fixed.

This can be diagnosed by checking the instrument in MassLynx. Or, if the RCA tools are required, deactivating the Status Tool to capture the Critical Voltage Test result in AMITS for inspection.

It is highly recommended that before running the status tool, Masslynx is closed down. Then the StopMassLynxProcesses batch file is run to completely shut down any residual processes. And finally, a soft reboot is applied to the instrument to ensure the instrument is not waiting for a MassLynx command.

#### Error Message



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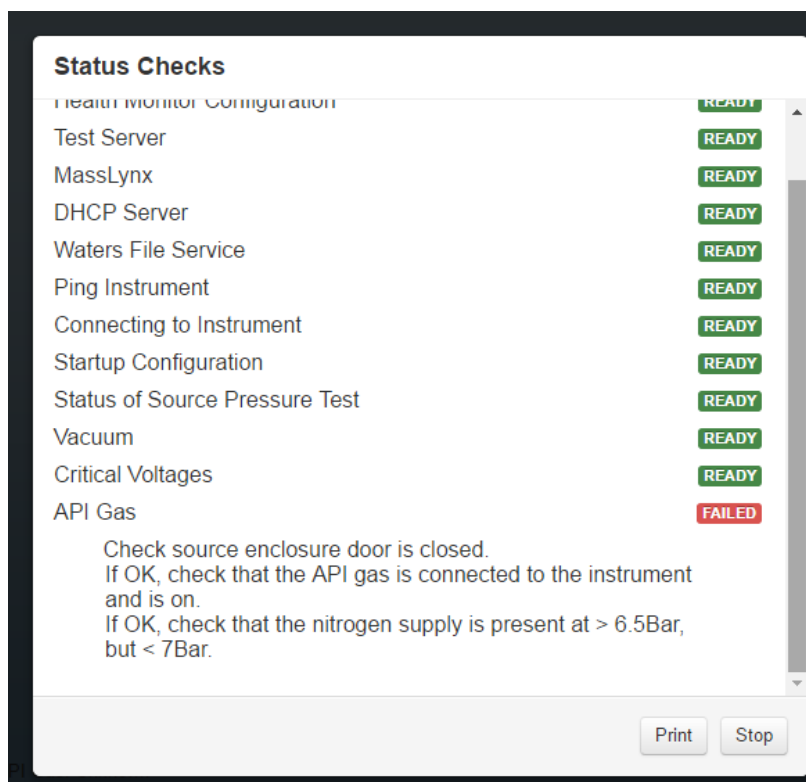
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### 23.14. Status Tools – API Gas

#### Purpose

This tests that API gas is flowing over the desolvation heater. It can also pick up if the pressure is too high. (>7 Bar).

#### Error Message



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## **24. SELECTING PRODUCT TYPES**

The number of available product types has increased from 14 to 40.

To prevent confusion to the test engineer, the list displayed in the Test Run Details page will be limited to the Product Types applicable to the test area during the AMITS installation.

For example:

Test Floor –

The ACQUITY QDa MKII Instrument Test and the related RCA tools

Clean Room –

The Assembly Tests and related RCA tools.

RCA Wilmslow, RCA Clean Room-

The ACQUITY QDa MKII Instrument Test, RCA tools and No Stop tools.

However, the engineers can change the list whenever they want by selecting the tests they want to access from the Admin Page.

- Open the Admin page.
- Scroll through the “Available Product Types” and select the options required by clicking the check box beside the option.
- Refresh the Chrome page by pressing F5 or clicking the reload  button.

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The screenshot displays the 'Administration' tab of the Acquity QDa software interface. At the top, a navigation bar includes links for 'Test Run Details', 'Dashboard', 'Test Log', 'Summary', 'DHR', 'Sigma Data', 'History', and 'Admin'. The 'Admin' tab is currently selected. Below the navigation bar, the 'Administration' section is titled. It contains the following fields:

- Software Version: Acquity QDa MKII AMITS V3.1 Build: 47
- Admin Password: [Text Input Field]
- Test Engineer: [Dropdown Menu]
- New Engineer: [Text Input Field]
- Old/Admin Password: [Text Input Field]
- New Password: [Text Input Field]
- New Password: [Text Input Field]

Below these fields is a 'Create/Update User' button. Further down, the 'Available Product Types' section is shown, featuring a list of checkboxes for various product types. A mouse cursor is pointing at the 'QDaMKII\_Detector\_Dynode\_Nostop' checkbox, which is currently checked. The list includes:

- ☐ Acquity\_QDa
- ☒ Acquity\_QDaMKII
- ☐ Acquity\_QDaMKII\_Nostop
- ☐ Acquity\_QDa\_Nostop
- ☒ QDaMKII\_Detector\_Dynode
- ☒ QDaMKII\_Detector\_Dynode\_Nostop
- ☒ QDaMKII\_Detector\_Housing
- ☐ QDaMKII\_Detector\_Housing\_Nostop
- ☐ QDa\_Detector\_Dynode
- ☐ QDa\_Detector\_Dynode\_Nostop
- ☐ QDa\_Detector\_Housing
- ☐ QDa\_Detector\_Housing\_Nostop
- ☒ QDa\_Quad\_Rail
- ☐ QDa\_Quad\_Rail\_Nostop
- ☐ QDa\_RCA\_Charging
- ☐ QDa\_RCA\_Detector
- ☐ QDa\_RCA\_Fast\_Tuning
- ☐ QDa\_RCA\_Heater
- ☐ QDa\_RCA\_Internal\_Cal
- ☐ QDa\_RCA\_Low\_Mass\_Sensitivity
- ☐ QDa\_RCA\_Peak\_Shape

Selecting product types.

## **25. APPENDICES**

### **25.1. Final Tuning Value Locations**

AMITS changes tuning settings as it progresses through the test sequence. Some tests require AMITS to completely untune the instrument.

It is important therefore to use the right test to extract tuning values from, especially if AMITS has stopped due to a failure.

If an instrument has completed test, the final tuning values can be easily extracted from the DHR Summary Sheets.  
(Refer to section 17.2 DHR Summary Sheet structure - Final Tune Settings)

If an instrument has not completed the test sequence, or if an assembly or spare part is being tested, the following tables list the MassLynx / Target Registry settings commonly used by engineers, and where to extract the finalized values of these settings from AMITS.

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**Positive ESI Quad Tuning Settings – Slow Scan**

AMITS tunes both DC polarities to find the DC with the largest Quad Quality, and / or passing peak shape.

It is important to extract the tuning values from the DC polarity AMITS has selected as the best choice.

| MassLynx Name        | Target Registry Name                                                                   | AMITS name                                                                                                 | AMITS Location For Extraction                                                                                                                                                                                                                                                                                                                                                                         |
|----------------------|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Nominal Rod Polarity | Engineers Settings:Positive Nominal Rod Polarity<br>1 = Negative DC<br>0 = Positive DC | pos Selected DC polarity<br>1 = Negative DC, use *** = neg values<br>0 = Positive DC, use *** = pos values | End of POSITIVE MODE QUAD TUNING AND TESTING<br>Full Mass Range Peak Shape Analysis DHR                                                                                                                                                                                                                                                                                                               |
| Low Mass Resolution  | HAL:CURRENT:ES_PLUS:Low Mass Resolution<br>Setting:LOW_MASS_RESOLUTION_SETTING         | pos DC*** User Low Mass Resolution                                                                         | POSITIVE MODE QUAD TUNING AND TESTING<br><br>Full Mass Range Peak Shape Analysis DHR, Settings section.<br><br><b>MUST</b> using the correct *** value based on the selected DC polarity.<br><br>Or if the testing fully completes:<br><br>POSITIVE FAST SCAN QUAD TUNING AND TESTING<br><br>Peak Analysis DHR, Settings section.<br><br>Only the correct DC values (*** = pos or neg) are displayed. |
| High Mass Resolution | HAL:CURRENT:ES_PLUS:High Mass Resolution<br>Setting:HIGH_MASS_RESOLUTION_SETTING       | pos DC*** User High Mass Resolution                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                       |
| Low Mass Ion Energy  | HAL:CURRENT:ES_PLUS:Low Mass Ion Energy<br>Setting:LOW_MASS_ION_ENERGY_SETTING         | pos DC*** Ion Energy                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                       |
| High Mass Ion Energy | HAL:CURRENT:ES_PLUS:High Mass Ion Energy<br>Setting:HIGH_MASS_ION_ENERGY_SETTING       | pos DC*** High Mass Ion Energy                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                       |
| Low Mass Position    | HAL:CURRENT:NO_PARAMMODE:Low Mass Position<br>Setting:LOW_MASS_POSITION_SETTING        | pos DC*** Low Mass Position                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                       |
| High Mass Position   | PARAMMODE:High Mass Position<br>Setting:HIGH_MASS_POSITION_SETTING                     | pos DC*** High Mass Position                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                       |
| Low Mass Setup       | HAL:CURRENT:NO_PARAMMODE:Low Mass Setup<br>Setting:LOW_MASS_SETUP_SETTING              | pos DC*** Low Mass Resolution                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                       |

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| MassLynx Name   | Target Registry Name                                                     | AMITS name                     | AMITS Location For Extraction |
|-----------------|--------------------------------------------------------------------------|--------------------------------|-------------------------------|
| High Mass Setup | HAL:CURRENT:NO_PARAMMODE:High Mass Setup Setting:HIGH_MASS_SETUP_SETTING | pos DC*** High Mass Resolution |                               |
| Linearity Gain  | HAL:CURRENT:NO_PARAMMODE:Linearity Gain Setting:LINEARITY_GAIN_SETTING   | pos DC*** Resolution Linearity |                               |

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**Device History Record for Instrument Serial Number KAA0297**
**17 Jan 2014**

**POSITIVE FAST SCAN QUAD TUNING AND TESTING**  
**Peak Analysis**

Status: PASS

Instrument Serial Number: KAA0297  
 Production / Factory Order: 3826705  
 Software Version: 726  
 Test Run Number: 8  
 Test Engineer: UKPLMPSL  
 Test Date: Fri Jan 17 2014 09:29:34 GMT+0000 (GMT Standard Time)  
 Sample Batch Number: M13-675  
 Sample Use By Date: 18 MAR 14  
 Test Box Number: TB668-C  
 Procedure Document Version: 46202-1

pos DCneg User Low Mass Resolution: 0.0000 sf: 5  
 pos DCneg Low Mass Resolution: 0.39306 sf: 5  
 pos DCneg Low Mass Position: 0.72381 sf: 5  
 pos DCneg User High Mass Resolution: 0.0000 sf: 5  
 pos DCneg High Mass Resolution: -6.5682 sf: 5  
 pos DCneg High Mass Position: 1.4160 sf: 5  
 pos DCneg Resolution Linearity: 79.404 sf: 5  
 pos DCneg Ion Energy: -1.2273 sf: 5  
 pos DCneg High Mass Ion Energy: 0.24856 sf: 5  
 pos DCneg Low Mass Resolution Offset: 0.55172 sf: 5  
 pos DCneg Low Mass Position Offset: -0.10915 sf: 5  
 pos DCneg High Mass Resolution Offset: 0.013504 sf: 5  
 pos DCneg High Mass Position Offset: -1.4367 sf: 5  
 pos DCneg Resolution Linearity Offset: -28.443 sf: 5  
 pos DCneg Ion Energy Offset: 0.0000 sf: 5  
 pos DCneg High Mass Ion Energy Offset: 0.52443 sf: 5

**Positive ESI Quad Tuning Settings – Slow Scan**

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**Negative ESI Quad Tuning Settings – Slow Scan**

AMITS uses the same selected DC polarity as positive ESI, unless the peak shape fails. Then AMITS will retune negative ESI using the opposite DC polarity.

It is important to extract the tuning values from the DC polarity AMITS has selected as the best choice. Remember that the position, setup and linearity values are defined in ESI positive mode, and shared by both ESI positive and ESI negative. AMITS automatically takes these values.

| MassLynx Name        | Target Registry Name                                                                   | AMITS name                                                                                                 | AMITS Location For Extraction                                                                                                                                                                                                                                                                                                                                                           |
|----------------------|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Nominal Rod Polarity | Engineers Settings:Negative Nominal Rod Polarity<br>1 = Negative DC<br>0 = Positive DC | neg Selected DC polarity<br>1 = Negative DC, use *** = neg values<br>0 = Positive DC, use *** = pos values | End of NEGATIVE MODE QUAD TUNING AND TESTING<br>Full Mass Range Peak Shape Analysis DHR                                                                                                                                                                                                                                                                                                 |
| Low Mass Resolution  | HAL:CURRENT:ES_MINUS:Low Mass Resolution<br>Setting:LOW_MASS_RESOLUTION_SETTING        | neg DC*** User Low Mass Resolution                                                                         | NEGATIVE MODE QUAD TUNING AND TESTING<br>Full Mass Range Peak Shape Analysis DHR, Settings section.<br><b>MUST</b> use the correct *** value based on the selected DC polarity.<br><br>Or if the testing fully completes:<br><br>NEGATIVE FAST SCAN QUAD TUNING AND TESTING<br>Peak Analysis DHR, Settings section.<br><br>Only the correct DC values (*** = pos or neg) are displayed. |
| High Mass Resolution | HAL:CURRENT:ES_MINUS:High Mass Resolution<br>Setting:HIG_MASS_RESOLUTION_SETTING       | neg DC*** User High Mass Resolution                                                                        |                                                                                                                                                                                                                                                                                                                                                                                         |
| Low Mass Ion Energy  | HAL:CURRENT:ES_MINUS:Low Mass Ion Energy<br>Setting:LOW_MASS_ION_ENERGY_SETTING        | neg DC*** Ion Energy                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                         |
| High Mass Ion Energy | HAL:CURRENT:ES_MINUS:High Mass Ion Energy<br>Setting:HIG_MASS_ION_ENERGY_SETTING       | neg DC*** High Mass Ion Energy                                                                             |                                                                                                                                                                                                                                                                                                                                                                                         |

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**17 Jan 2014**

**NEGATIVE FAST SCAN QUAD TUNING AND TESTING**  
**Peak Analysis**

Status: PASS

Instrument Serial Number: KAA0297  
 Production / Factory Order: 3826705  
 Software Version: 726  
 Test Run Number: 10  
 Test Engineer: ukapri  
 Test Date: Fri Jan 17 2014 12:19:53 GMT+0000 (GMT Standard Time)  
 Sample Batch Number: M13-675  
 Sample Use By Date: 18 MAR 14  
 Test Box Number: TB668-C  
 Procedure Document Version: 46202-1

neg DCneg User Low Mass Resolution: 0.10372 sf: 5  
 neg DCneg Low Mass Resolution: 0.39306 sf: 5  
 neg DCneg Low Mass Position: 0.72381 sf: 5  
 neg DCneg User High Mass Resolution: -0.023665 sf: 5  
 neg DCneg High Mass Resolution: -6.5682 sf: 5  
 neg DCneg High Mass Position: 1.4160 sf: 5  
 neg DCneg Resolution Linearity: 79.404 sf: 5  
 neg DCneg Ion Energy: -0.053914 sf: 5  
 neg DCneg High Mass Ion Energy: 0.058724 sf: 5  
 neg DCneg Low Mass Resolution Offset: 0.57514 sf: 5  
 neg DCneg Low Mass Position Offset: -0.10915 sf: 5  
 neg DCneg High Mass Resolution Offset: 0.19571 sf: 5  
 neg DCneg High Mass Position Offset: -1.4367 sf: 5  
 neg DCneg Resolution Linearity Offset: -28.443 sf: 5  
 neg DCneg Ion Energy Offset: 0.0000 sf: 5  
 neg DCneg High Mass Ion Energy Offset: 0.52888 sf: 5

**Negative ESI Quad Tuning Settings – Slow Scan**

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**Positive ESI Quad Dynamic Offset Tuning Settings – Fast Scan**

AMITS uses the same DC polarity selected during the Slow Scan tuning.

| Dynamic Offset<br>MassLynx Name | Target Registry Name                                    | AMITS name                               | AMITS Location For Extraction                                                                                                                                        |
|---------------------------------|---------------------------------------------------------|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Low Mass Resolution             | Dynamic Offset<br>Positive:LOW_MASS_RESOLUTION_SETTING  | pos DC*** Low Mass Resolution<br>Offset  | POSITIVE FAST SCAN QUAD<br>TUNING AND TESTING<br><br>Peak Analysis DHR, Settings<br>section.<br><br>Only the correct DC values (***) =<br>pos or neg) are displayed. |
| High Mass Resolution            | Dynamic Offset<br>Positive:HIGH_MASS_RESOLUTION_SETTING | pos DC*** High Mass Resolution<br>Offset |                                                                                                                                                                      |
| Low Mass Ion Energy             | Dynamic Offset<br>Positive:LOW_MASS_ION_ENERGY_SETTING  | pos DC*** Ion Energy Offset              |                                                                                                                                                                      |
| High Mass Ion Energy            | Dynamic Offset<br>Positive:HIGH_MASS_ION_ENERGY_SETTING | pos DC*** High Mass Ion Energy<br>Offset |                                                                                                                                                                      |
| Low Mass Position               | Dynamic<br>Offset:LOW_MASS_POSITION_SETTING             | pos DC*** Low Mass Position Offset       |                                                                                                                                                                      |
| High Mass Position              | Dynamic<br>Offset:HIGH_MASS_POSITION_SETTING            | pos DC*** High Mass Position Offset      |                                                                                                                                                                      |
| Low Mass Setup                  | Dynamic Offset:LOW_MASS_SETUP_SETTING                   | NOT USED, left as 0                      |                                                                                                                                                                      |
| High Mass Setup                 | Dynamic<br>Offset:HIGH_MASS_SETUP_SETTING               | NOT USED, left as 0                      |                                                                                                                                                                      |
| Linearity Gain                  | Dynamic Offset:LINEARITY_GAIN_SETTING                   | pos DC*** Resolution Linearity Offset    |                                                                                                                                                                      |

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**POSITIVE FAST SCAN QUAD TUNING AND TESTING**  
**Peak Analysis**

Status: PASS

Instrument Serial Number: KAA0297  
Production / Factory Order: 3826705  
Software Version: 726  
Test Run Number: 8  
Test Engineer: UKPLMPSL  
Test Date: Fri Jan 17 2014 09:29:34 GMT+0000 (GMT Standard Time)  
Sample Batch Number: M13-675  
Sample Use By Date: 18 MAR 14  
Test Box Number: TB668-C  
Procedure Document Version: 46202-1

pos DCneg User Low Mass Resolution: 0.0000 sf: 5  
pos DCneg Low Mass Resolution: 0.39306 sf: 5  
pos DCneg Low Mass Position: 0.72381 sf: 5  
pos DCneg User High Mass Resolution: 0.0000 sf: 5  
pos DCneg High Mass Resolution: -6.5682 sf: 5  
pos DCneg High Mass Position: 1.4160 sf: 5  
pos DCneg Resolution Linearity: 79.404 sf: 5  
pos DCneg Ion Energy: -1.2273 sf: 5  
pos DCneg High Mass Ion Energy: 0.24856 sf: 5  
pos DCneg Low Mass Resolution Offset: 0.55172 sf: 5  
pos DCneg Low Mass Position Offset: -0.10915 sf: 5  
pos DCneg High Mass Resolution Offset: 0.013504 sf: 5  
pos DCneg High Mass Position Offset: -1.4367 sf: 5  
pos DCneg Resolution Linearity Offset: -28.443 sf: 5  
pos DCneg Ion Energy Offset: 0.0000 sf: 5  
pos DCneg High Mass Ion Energy Offset: 0.52443 sf: 5

**Positive ESI Quad Dynamic Offset Tuning Settings – Fast Scan**

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**Negative ESI Quad Dynamic Offset Tuning Settings – Fast Scan**

AMITS uses the same DC polarity selected during the Slow Scan tuning. Remember that the Dynamic position , setup and linearity values are defined in ESI positive mode, and shared by both ESI positive and ESI negative. AMITS automatically takes these values.

| Dynamic Offset<br>MassLynx Name | Target Registry Name                                    | AMITS name                               | AMITS Location For Extraction                                                                                                                                        |
|---------------------------------|---------------------------------------------------------|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Low Mass Resolution             | Dynamic Offset<br>Negative:LOW_MASS_RESOLUTION_SETTING  | neg DC*** Low Mass Resolution<br>Offset  | NEGATIVE FAST SCAN QUAD<br>TUNING AND TESTING<br><br>Peak Analysis DHR, Settings<br>section.<br><br>Only the correct DC values (***) =<br>pos or neg) are displayed. |
| High Mass Resolution            | Dynamic Offset<br>Negative:HIGH_MASS_RESOLUTION_SETTING | neg DC*** High Mass Resolution<br>Offset |                                                                                                                                                                      |
| Low Mass Ion Energy             | Dynamic Offset<br>Negative:LOW_MASS_ION_ENERGY_SETTING  | neg DC*** Ion Energy Offset              |                                                                                                                                                                      |
| High Mass Ion Energy            | Dynamic Offset<br>Negative:HIGH_MASS_ION_ENERGY_SETTING | neg DC*** High Mass Ion Energy<br>Offset |                                                                                                                                                                      |
| Low Mass Position               | Dynamic<br>Offset:LOW_MASS_POSITION_SETTING             | neg DC*** Low Mass Position Offset       |                                                                                                                                                                      |
| High Mass Position              | Dynamic<br>Offset:HIGH_MASS_POSITION_SETTING            | neg DC*** High Mass Position Offset      |                                                                                                                                                                      |
| Low Mass Setup                  | Dynamic Offset:LOW_MASS_SETUP_SETTING                   | NOT USED, left as 0                      |                                                                                                                                                                      |
| High Mass Setup                 | Dynamic Offset:HIGH_MASS_SETUP_SETTING                  | NOT USED, left as 0                      |                                                                                                                                                                      |
| Linearity Gain                  | Dynamic Offset:LINEARITY_GAIN_SETTING                   | neg DC*** Resolution Linearity Offset    |                                                                                                                                                                      |

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**Device History Record for Instrument Serial Number KAA0297**
**17 Jan 2014**

**NEGATIVE FAST SCAN QUAD TUNING AND TESTING**  
**Peak Analysis**

Status: PASS

Instrument Serial Number: KAA0297  
 Production / Factory Order: 3826705  
 Software Version: 726  
 Test Run Number: 10  
 Test Engineer: ukapri  
 Test Date: Fri Jan 17 2014 12:19:53 GMT+0000 (GMT Standard Time)  
 Sample Batch Number: M13-675  
 Sample Use By Date: 18 MAR 14  
 Test Box Number: TB668-C  
 Procedure Document Version: 46202-1

neg DCneg User Low Mass Resolution: 0.10372 sf: 5  
 neg DCneg Low Mass Resolution: 0.39306 sf: 5  
 neg DCneg Low Mass Position: 0.72381 sf: 5  
 neg DCneg User High Mass Resolution: -0.023665 sf: 5  
 neg DCneg High Mass Resolution: -6.5682 sf: 5  
 neg DCneg High Mass Position: 1.4160 sf: 5  
 neg DCneg Resolution Linearity: 79.404 sf: 5  
 neg DCneg Ion Energy: -0.053914 sf: 5  
 neg DCneg High Mass Ion Energy: 0.058724 sf: 5  
 neg DCneg Low Mass Resolution Offset: 0.57514 sf: 5  
 neg DCneg Low Mass Position Offset: -0.10915 sf: 5  
 neg DCneg High Mass Resolution Offset: 0.19571 sf: 5  
 neg DCneg High Mass Position Offset: -1.4367 sf: 5  
 neg DCneg Resolution Linearity Offset: -28.443 sf: 5  
 neg DCneg Ion Energy Offset: 0.0000 sf: 5  
 neg DCneg High Mass Ion Energy Offset: 0.52888 sf: 5

**Negative ESI Quad Dynamic Offset Tuning Settings – Fast Scan**

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**25.2. Error Codes**

When AMITS stops due to an error, specific statements are displayed within the LOG record of the test that experienced the error. Understanding these codes will help diagnose what caused the failure and how to correct the problem.

| Error Code | Explanation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| BUSY       | <p>This message comes up if AMITS is asked to perform a task when it is already performing a task, or waiting for a response from the instrument from a previous task.</p> <p>AMITS waits up to 10 minutes for any response from the instrument to an AMITS command. After that 10 minute wait, AMITS frees its self ready to perform a new task.</p> <p>Using the "Stop" button should clear any normal AMITS tasks, freeing it up for the next run attempt.</p> <p>But, if the test is interrupted by, for example,:</p> <ul style="list-style-type: none"> <li>• A host PC failure,</li> <li>• Communication with the instrument failure,</li> <li>• Communication interruption due to accidentally leaving Masslynx or Telnet running at the same time as AMITS.</li> <li>• The instrument is turned off before AMITS is told to stop running a test</li> <li>• Chrome closed down even though AMITS was performing a task.</li> </ul> <p>Then AMITS will start the 10 minute wait cycle.</p> <p>Closing Chrome, and then closing the Waters Service System Manager program will manually clear the 10 minute wait cycle.</p> |

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| Error Code | Explanation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| LOG ERROR  | <p>Failed to save the test LOG onto the test server.</p> <p>A specific set of actions are required to be followed if the test run has experienced a LOG ERROR. Refer to section 19 – Restart and Continuing test logic – LOG ERROR.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| ERROR      | <p>Standard test failure message. There is usually has a further explanation within the LOG called <b>Error Message:</b> such as:</p> <p><b>Failed specification</b> = result is outside of the lower and upper specification limits</p> <p><b>Test Failed</b> = Result does not have a single upper or lower limit, but failed. For example, peak shape analysis where a peak can be failed for a number of measured parameters.</p> <p><b>Waited 10 minutes for a scan.</b> = AMITS sent a command but did not receive a response for over ten minutes. After which, AMITS stops the test. (See BUSY if AMITS is asked to restart before the ten minute period is complete)</p> <p><b>Socket error</b> – lost communication to the instrument – for instance, if the LAN cable is disconnected, or the instrument is turned off.</p> <p><b>Serial number for instrument is incorrect</b> = The target registry version of the serial number stored on the instrument does not match the serial number entered within the AMITS test run details. If a test sequence starts from the very first test, a pop up will notify the user when the serial numbers does not match as asks if this is OK. If a test sequence is restarted any where else, it is assumed the same instrument is still attached, so if the serial numbers do not match, a mistake has been made.</p> <p><b>DesolvationTemperatureStatus has not been set to stable.</b> = IF starting a test sequence cold, AMITS will wait 595 seconds until the desolvation temperature has reached the correct temperature before starting the tuning. If the instrument fails to reach this temperature it usually means the instrument is in an interlock error state, such as API gas</p> |

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| Error Code | Explanation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|            | <p>error, or SPT error, or the source enclosure has not been fitted properly so a thermocouple error has occurred.</p> <p><b>SocketMessage::ReceiveBlock, failed to receive:</b></p> <p><b>SocketMessage::SendBlock, failed to send:</b> = If these messages are seen, a new window may also pop up containing the text: "Waters.Application.ScriptRunner.exe" has stopped running. This message will be displayed if the host PC can no longer communicate with the instrument. For instance, if the instrument is disconnected or powered off during the detector burn test.</p> <p><b>Failed to Connect Socket:</b> This message is displayed if AMITS can not establish communications with an instrument at the start of a test</p> <p><b>timed out waiting 10 minutes for a scan:</b> Appears at the start of a test – AMITS has sent the rio commands to start an acquisition, but has not received any data back from the instrument. Check to make sure the instrument is not running the SPT test or waiting for some other action to complete, such as pumping down.</p> <p><b>Quad quality not within specification:</b> = Quad quality is not within the lower and upper specification limits.</p> <p><b>HVActive has not been set to on:</b> = Seen when running the Manual Interlock test if the instrument is in a failed source pressure test status, or one of the other interlock tests has failed such as minimum turbo speed. Manually activate the source pressure test by opening and closing the source enclosure, and wait for the SPT to complete before attempting a rerun. If it does not rerun, investigate through MassLynx tune page.</p> <p><b>Instrument Preparation Related Errors:</b></p> <p>The Instrument Preparation test is split into two sections within the LOG file. Each section has the same run number within the instrument details, and the sections are separated by a white line.</p> <p>The first section's task is to clear all the DHCP addresses that have been used before this instrument. This is to prevent any failure caused by running out of IP addresses. AMITS does this by stopping the DHCP service, deleting</p> |

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| Error Code | Explanation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|            | <p>all the saved IP Addresses, then restarting the DHCP service.</p> <p>The second section's task is to confirm any serial number changes, acquire the vacuum power and the firmware version.</p> <p><b>Instrument Preparation Related Errors: Failed to stop acquisition in the first section:</b> Sometimes seen in the instrument preparation test. Could be due to due to an earlier AMITS fault, such as a log error, that is compounded by restarting without following the sequence described in Flowchart 3</p> <p><b>Instrument Preparation Related Errors: Freezing after trying to restart the DHCP service:</b> Host PC error.</p> |
| REWORK     | This message appears within a failed test, once the test sequence has been restarted on an earlier test or test section.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

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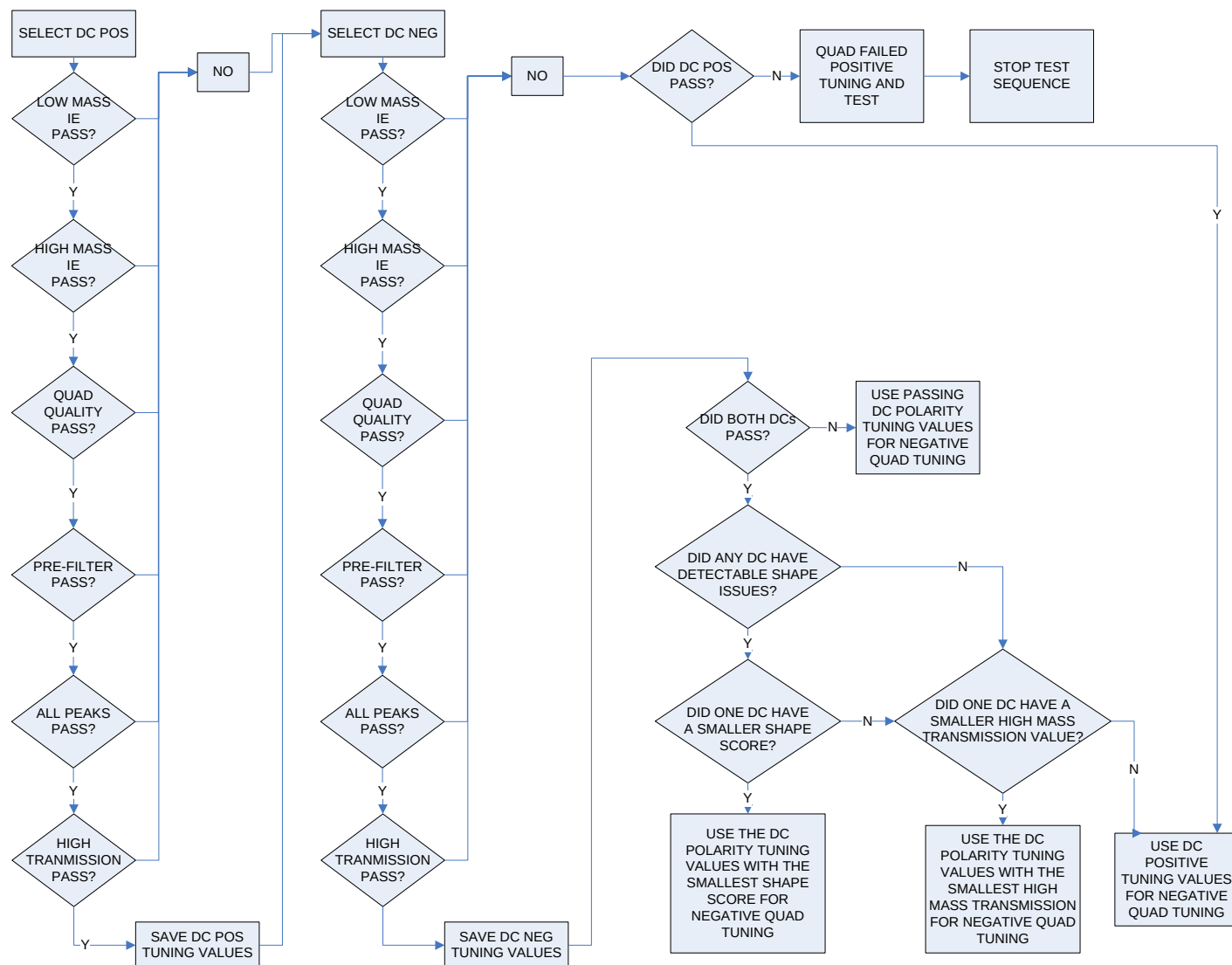
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### 25.3. Test Logic

AMITS tunes and tests an instrument using logic similar to a human. To help understand why a test fails, the error statements in the section above should be referred to.

This section contains some of the test logic depicted in a flow chart.

#### Positive Mode ESI DC Polarity Selection Logic.



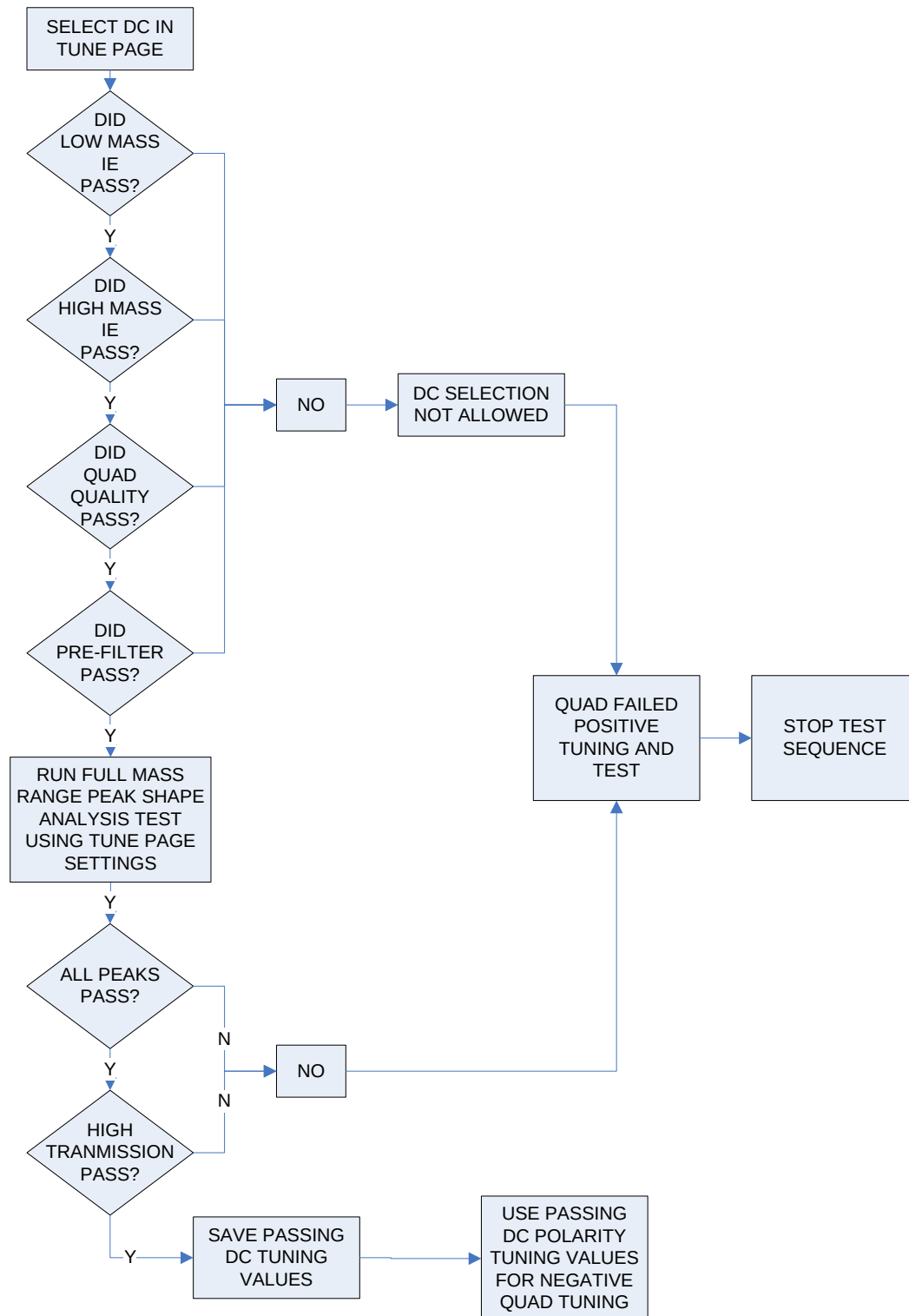
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**"Select Tuning" Option checks - Positive Mode ESI**



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**DOCUMENT HISTORY**

|                                                                                                                       |    |                    |             |                   |           |
|-----------------------------------------------------------------------------------------------------------------------|----|--------------------|-------------|-------------------|-----------|
| <b>VERSION:</b>                                                                                                       | 01 | <b>ORIGINATOR:</b> | Paul Slater | <b>Change ID:</b> | DAR 49199 |
| <b>COMMENTS:</b> New Document Created                                                                                 |    |                    |             |                   |           |
| <b>VERSION:</b>                                                                                                       | 02 | <b>ORIGINATOR:</b> | Paul Slater | <b>Change ID:</b> | DAR 52289 |
| <b>COMMENTS:</b> Amendments made for Acquity QDa AMITS Version 2.0. Training material added for SigmaQuest.           |    |                    |             |                   |           |
| <b>VERSION:</b>                                                                                                       | 03 | <b>ORIGINATOR:</b> | Paul Slater | <b>Change ID:</b> | N/A       |
| <b>COMMENTS:</b> Amendments made for Acquity QDa AMITS Version 3.1.<br>Document transferred to SAP.                   |    |                    |             |                   |           |
| <b>VERSION:</b>                                                                                                       | 04 | <b>ORIGINATOR:</b> | Paul Slater | <b>Change ID:</b> | N/A       |
| <b>COMMENTS:</b> Amendments made for Acquity QDa AMITS Version 4.1.<br>Status Checker includes a time delay function. |    |                    |             |                   |           |