MKAT Runner User Manual

MKAT Software

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MODIFICATIONS

Revision	Date	Modified by	Changes / ECR
1.000	05/May/2016	APK	First revision
1.200	14/Oct/2016	JP	Separate documents for runner and editor
1.300	18/Nov/2016	JP	Added customisation section
1.400	06/06/2017	APK	Updated screen shots for front screen and updated to reflect new options etc.
1.500	07/03/2018	JP	Added information about report logos
1.600	06/08/2018	CdVM /GD	Manual update
1.700	09/10/2018	CdVM	Updated for version 10.9.0
1.800	29801/2019	DW	Updated for version 10.10.1
1.900	04/03/2019	CdVM	Updates for version 10.11.0/1
02	03/12/2019	DW	Applied new template layout, document numbering and 10.13 features
03	17/12/2019	SE	Proofread and minor editing / additions
04	01/03/2020	CdVM	Updated to version 10.13
05	17/09/2020	DW	RTS & 10.14 updates
06	07/01/2021	CdVM	Added Plugins section and Custom Reports
07	07/03/2022	JE	10.17 changes
08	11/03/2022	CdVM	10.17.3 updates
09	06/05/2022	DW	10.18 Updates
10	05/05/2023	JP	10.22 updates – continuity scanning “Next” button
11	09/05/2023	SW	Add information on Generic Devices

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1 SOFTWARE SYSTEM REQUIREMENTS

Note: the following is the recommended specifications that should be suitable in most cases, but the ideal specification will depend on individual system characteristics and configuration.

Processor: i7

RAM: 16Gb min.

HHD: 160 GB min.

Operating system: Windows 10 (64 bit)

Note: MK recommend using the latest service packs and updates provided by Microsoft. Due to the pace at which new software technologies become available, support for such technologies is provided to the end user by means of a service pack. MK endeavour to utilise technologies available that will improve performance and stability in our software. When upgrading or installing the latest version of software, ensure your operating system has been recently updated to mitigate any compatibility issues that may arise as a result of an underlying change.

2 General Information

2.1 Before You Begin

2.1.1 Familiarisation

Before using the MK AT test system, it is strongly advised that you read all of the manuals provided and ensure that you are familiar with the concepts in operating this form of automatic test equipment

2.2 About This Manual

This manual is designed in such a way that a first-time user of the MK AT system will, by following this manual be taken through the MK AT software in a logical manner. Those users more familiar with the MK AT may wish only to use this manual for reference.

2.3 MK AT Operating Concepts

The MK AT software operates on the following concepts :

a) The user manufactures a piece of equipment (UUT), which is tested by conventional means and known to be to the required quality standard.

b) The MK AT 'learns' about the UUT characteristics by being programmed by the user. The MK AT can automatically learn the UUT connections, they can be programmed manually, or they can be imported from an external source

c) New build items of the same design can now be tested by the MK AT by being compared against the information acquired in B) above. The operator simply selects the item with the same part number (or some equivalent parameter) from the index.

The test referred to in c) above consists of one or more of the following stages.

1) Continuity comparison on the connections of the UUT on the index against the UUT being tested. *Referred to as the positive test or continuity test*

2) A check through the UUT to ensure that no connections exist, which were not present in the UUT on the index. *Referred to as the negative test or shorts test.*

3) Assuming the successful completion of 1) and 2) above, a high voltage insulation test can be performed. This test takes each point in turn to a specified high voltage whilst all other points are connected together. The resistance is then measured and compared against a threshold.

As an alternative to or as well as option 3) above, a high voltage hi-pot test can be performed if required which subjects the UUT to a specified high voltage and compares the leakage current against a threshold.

For twisted pair configurations, a capacitance test can be performed which will compare the capacitance against threshold format.

External equipment can also be connected as switched through the MK AT switching matrix.

If an insulation test and hi-pot test are selected, then the hi-pot test will only commence if the insulation test is successful without any point failures.

In the event of the hi-pot test being performed before the insulation test then the insulation test will only commence if the hi-pot test is successful.

All of the test sections described are supported by, screen, print to file and printer reports if required.

2.4 MK AT Electrical Concepts

Even if the operator is familiar with automatic test equipment, the following basic concepts will help in the understanding of the MK AT operation.

The MK AT measures resistances or volt drops by applying a fixed current and using a voltmeter to measure the dropped voltage. If a resistance value is required, then a simple ohm's law calculation is performed. For higher resistances then the internal impedance of the MK AT is also taken into consideration.

For a four wire measurement, the resultant value will be a close accurate value of the UUT, for a two wire measurement, the resultant value is likely to contain an element due to the connecting interface.

2.4.1 What Test Current Should I Use?

It is always best to use the maximum test current available, this will give the greatest volt drop which can be measured with the highest accuracy. This will also stress the UUT more which may show a potential problem.

Never select a test current which will damage the UUT or a current which result in too much power dissipation in a resistive load.

2.4.2 What is Voltage Limit?

The test current is supplied from a power supply which produces approximately 42 volts on most MK AT systems. If the current is supplied into an open circuit i.e. no current flows, then 42 volts will appear across the UUT

The voltage limit is a programmable limit to this open circuit voltage and is typically set to 30 volts.

If the UUT has a maximum voltage requirement, then the voltage limit can be lowered accordingly.

2.4.3 Auto Learn and Shorts Test Methodology

MK AT will apply the current from point one to all other points. If the voltage measured is equal to voltage limit i.e. open circuit then MK AT will move on to point two etc. If the voltage measured is less than clamp i.e. a connection, then a binary split will be performed until the end points are established.

The current will be applied, and voltage read to establish the connection value.

Auto learn and shorts test will only learn and test values within the electrical constraints of the programmed current and voltage limit. Values outside these parameters will be missed by the auto learn or show up as open circuits by the shorts test. To cover the maximum range for auto learn and shorts test, select the minimum current and maximum voltage limit.

2.4.4 Low Voltage Testing Methodology (Continuity Test)

MK AT will scan the list of expected connections, apply the current set up in the continuity test parameters and measure the resultant voltage. The voltage or resistance will then be compared to the limits and a result produced. If the voltage limit is reached when the current is applied, then a > maximum resistance will be reported.

2.4.5 Low voltage short circuit

MK AT will take each net list (a set of points that are common) and test them using low voltage to all other net lists defined within the shorts sub test. If a short circuit is found (i.e. Low resistance so voltage limit is not reached), then the MK AT will use a binary chop to determine which other net list it is shorted to. It will then remove that net list from the list to be tested against and repeat. This will allow the system to find any number of shorted net lists.

2.4.6 High Voltage Testing Methodology (Insulation and Hi Pot)

MK AT will then take each net list, as defined in the insulation sub test and test against each other net list defined within that sub test. The sequence of how this is done is detailed below.

It will then calculate insulation resistance or leakage current, compare the values to those set up and produce a result.

It is possible that the high voltage test will report values not detected by the low voltage test because of the constraints of the low voltage test detailed above.

2.4.6.1 High Voltage DC and AC Ramp Test Algorithm

This is the normal algorithm applied during high voltage testing of AC and the majority of DC systems and consists of the following stages:

2.4.6.2 Relays Switched On

The appropriate test points (from and to) are switched onto the bus.

2.4.6.3 Ramp Up

This is a programmable ramp in which the high voltage is increased in a controlled manner until the high voltage potential is achieved. If not achieved, then the software acts accordingly and reports as such.

2.4.6.4 Pre Dwell

This is a programmable dwell where the high voltage remains present to allow for any capacitive effects.

2.4.6.5 Measure Dwell

This is a programmable period over which numerous readings of leakage current are made to establish the insulation resistance or HiPot value

2.4.6.6 Ramp Down

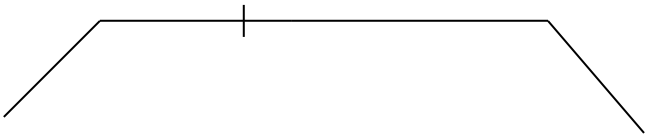
This is a programmable ramp in which the high voltage is decreases in a controlled manner until the high voltage potential is removed.

2.4.6.7 Safety Dump

This is a programmable time for which the safety dump is activated to discharge any residual potential. The high voltage is then checked to ensure that it has been discharged.

2.4.6.8 Relays Switched Off

The appropriate test point sources and monitors (signal and sense) are switched off the bus. The complete cycle then repeats.



Ramp Up Pre dwell Measure Dwell Ramp Down

3 SOFTWARE USER INTERFACE

MK AT software has been written with the primary intention of being simple to use, the aim being that familiarisation is quick and consistent in its use. As such the software is split into two major parts - the MK AT Editor and the MK AT Runner. The **Editor** is a desktop application that allows an operator to create test programs not only for MK AT but any MK test products. The **Runner** is designed for shop floor operation of connecting to and testing the UUT. As of version 10.14 the Runner can also be used as an aggregator of multiple other MKAT's. This feature uses the existing API with some new features to centrally manage the creation of programs, manage and maintain runner configuration, server test programs to connected MKAT's and operate as a store and forward result store. Refer to the API manual for details of the API calls and the MK AT Editor Software Manual for information regarding test creation/editing.

3.1 Installation

This is outlined in the separate MK AT installation guide.

3.2 MK AT Runner

3.2.1 DEFAULT LOGINS

The system is setup with 3 default logins, the usernames are not case sensitive, but the passwords are.

Username: Administrator	Password: MKtest2016
Username: Advanced Programmer	Password: MKtest2013
Username: Operator	Password: Mktest21013

3.2.2 SWITCHING THE MK AT ON AND OFF

Power up sequence

The controlling PC should be connected and powered up prior to the MK AT being switched on. When the MK AT mains power is switched on, only the standby (or SSR) green LED on the right should be lit.

When the operator double clicks the MK AT icon and logs in, the MK AT internal supplies should switch on and all green LED's (except the HV Dump LED) should be lit.

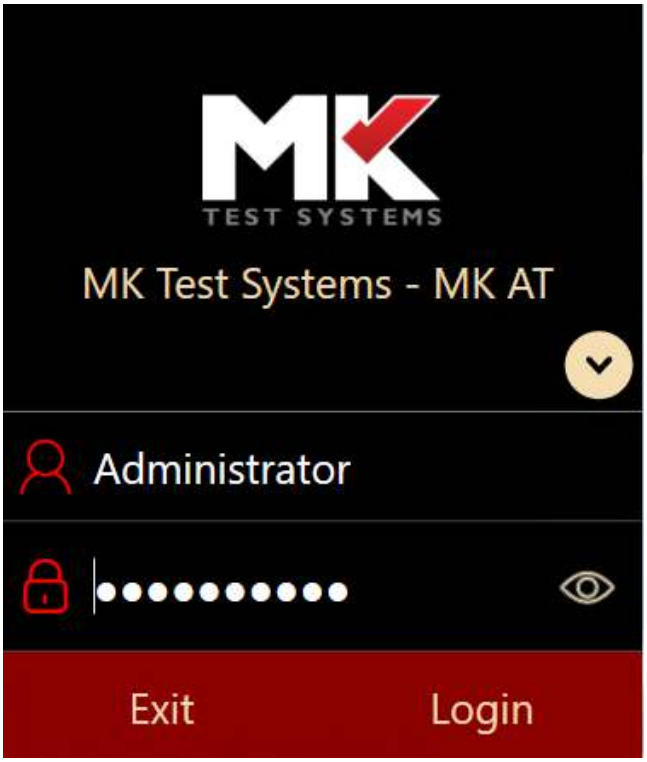
Power down sequence

Exit the runner and select the Logout on the top right of the screen. This will return the MK AT to the standby condition. Switch the MK AT mains switch off.

Caution – After switching off the system, always leave a minimum of 30 seconds after the final power supply indicator has extinguished before switching the system back on.

3.2.3 LOGIN SCREEN

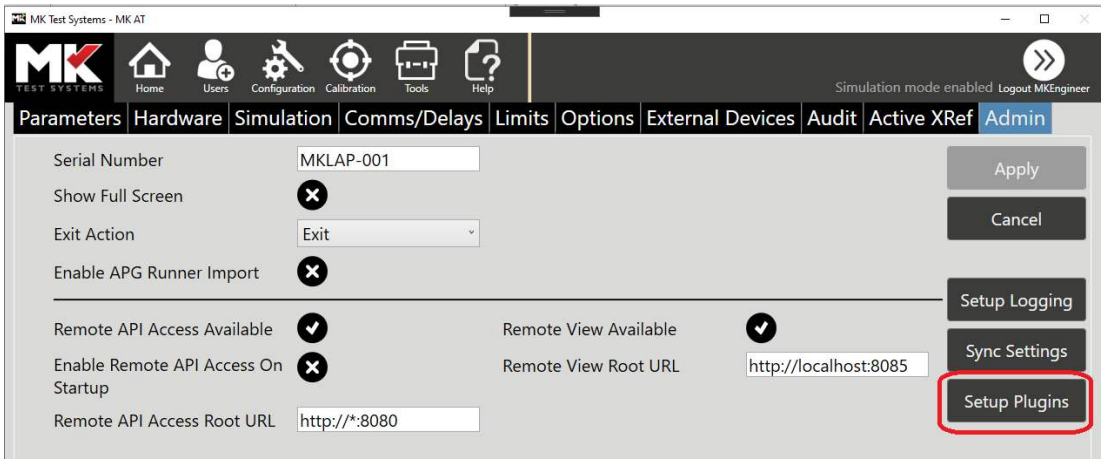
When opening the software, the login screen is displayed. A valid username and password must be entered to login.



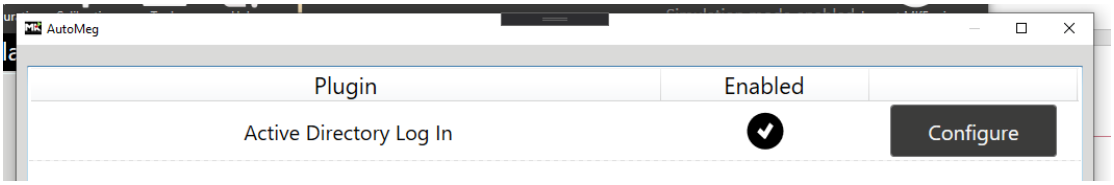
 Show/hide the password.

3.2.4 ACTIVE DIRECTORY

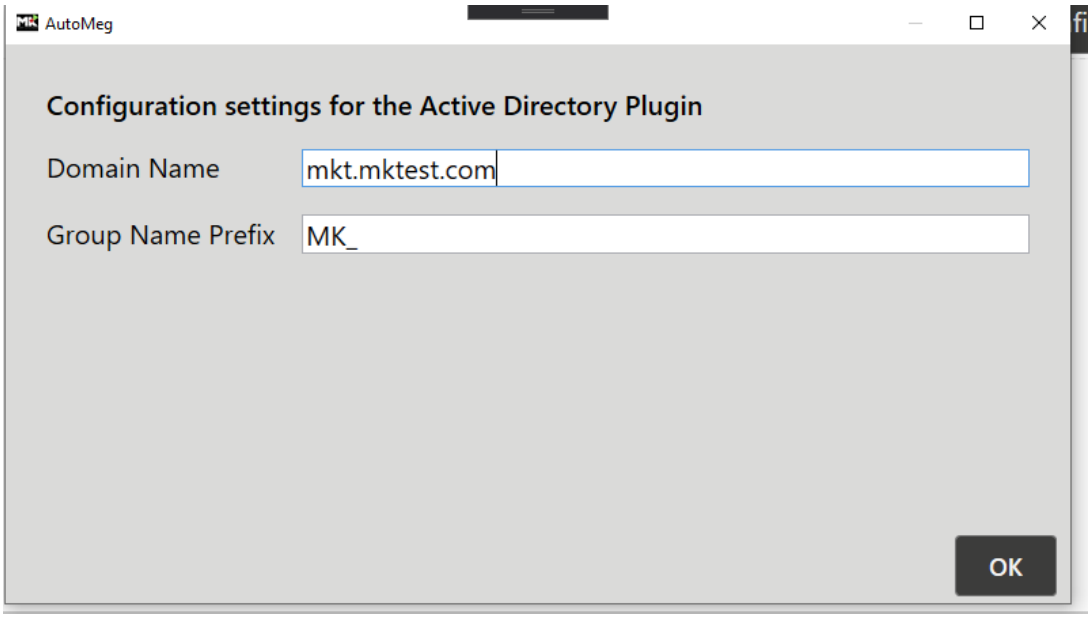
The default authentication model is to use the MKAT database to store usernames and hashed passwords. As of version 10.14, a plugin has been added to enable Microsoft AD authentication and user groups. To enable this feature select setup plugins from the admin screen.



Enable the plugin and then select *Configure*:



Enter the domain name and the group name prefix. AD credentials can then be used to login with the associated user group permissions.



3.2.5 Running Other Software

Because the MK AT is operating in real time, it is **not** recommended to run other software, while the MK AT is being controlled by MK AT for Windows.

Of note is the use of screen savers, the computer controlling the MK AT should have the screen savers **disabled** as they can affect the real time timing and make any safety warnings invisible.

It is acceptable to run MK AT software on a remote system not connected to a MK AT with other windows-based software.

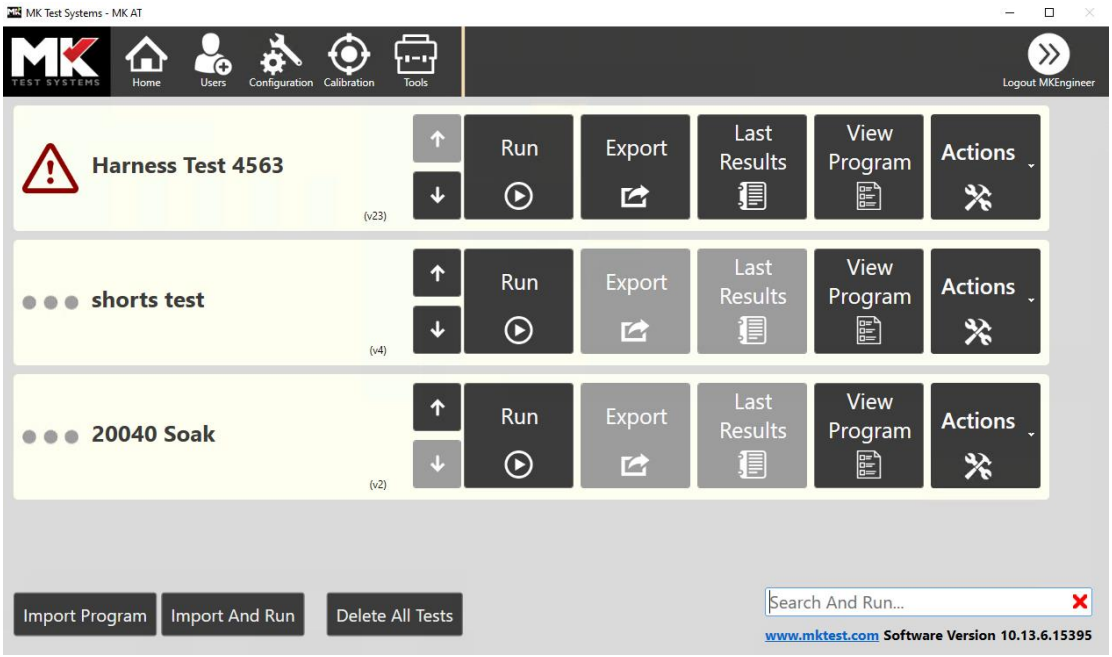
As the software normally operates in full screen, it is necessary to use the windows custom key (normally keyboard bottom left and right) to display the windows toolbar.

3.3 Home 

3.3.1 IMPORTING A TEST PROGRAM

To load a test program into the Runner, select *Import Program* and then *Import Single* and navigate to the relevant test program and select *Open.* Alternatively, select *Import Program* and then *Import Multiple* and navigate to a folder and select *Open*. MK AT will import all test programs in this folder.

Loaded test programs are listed on the Home screen, as shown below:



To remove a program from the list, select the *Delete Test* option from the *Actions* menu, shown below:

Alternatively, all the currently loaded test programs can be removed at once by selecting the *Delete all test programs* button. *Note, this does not delete the test program file, it removes the test from the list and deletes data from the database associated with this program.*

There is also a *Clear Results* option, available from the *Actions* menu. This clears all the results for a program. It is recommended that this is done regularly to ensure that the database does not grow too large.

The latest imported test program will appear at the top of the list. This list can be reorder using the up and down arrows.

As well as the test program name, the test program version is displayed in brackets. This version number is automatically incremented whenever the program is saved.

If an operator attempts to run a test program that is no longer the latest saved version, the system will prompt to load the latest version first.

The most recent test results can be exported as an XML file by selecting the *Export* button.

The *Last Results* option displays the last test run results. If the last test run contains failures, a program with just the failed tests can be created by selecting the *Create test from failures* option from the *Actions* menu. This will create a new program that will test the failed connections without impacting on the original results.

The *View Program* option displays a summary of the test program. This includes the file path location where the program is stored on the file system.

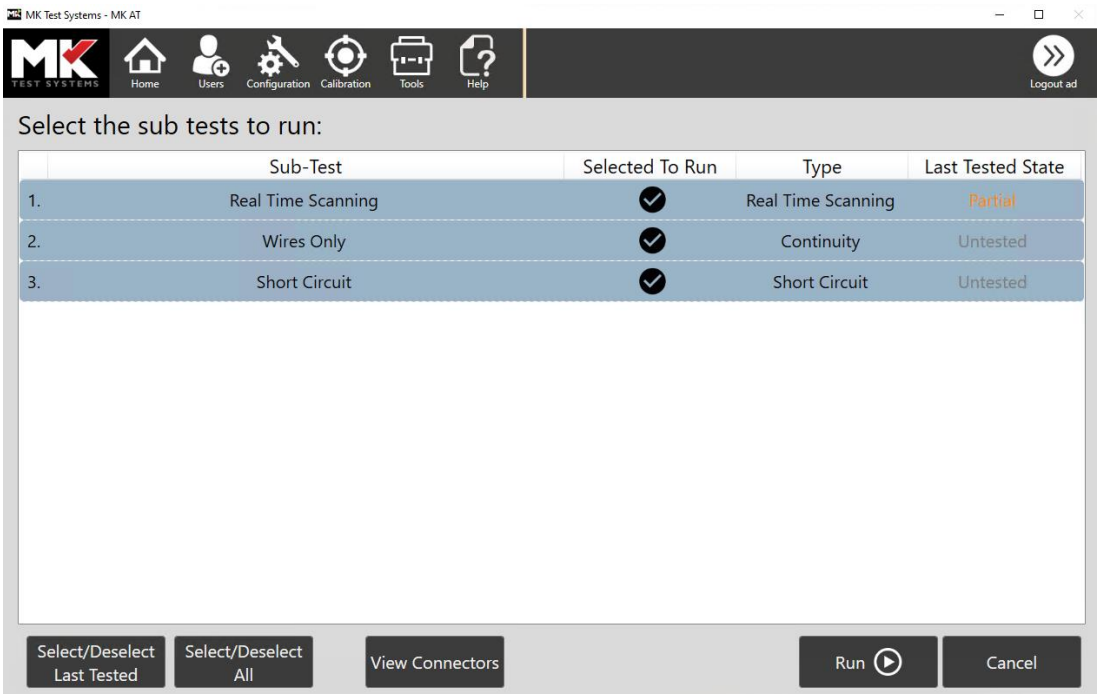
3.3.2 RUNNING A TEST PROGRAM

To run a test program, choose the test from the list on the Home screen and select the *Run* button. The *sub test selection screen* will be displayed, as shown below:

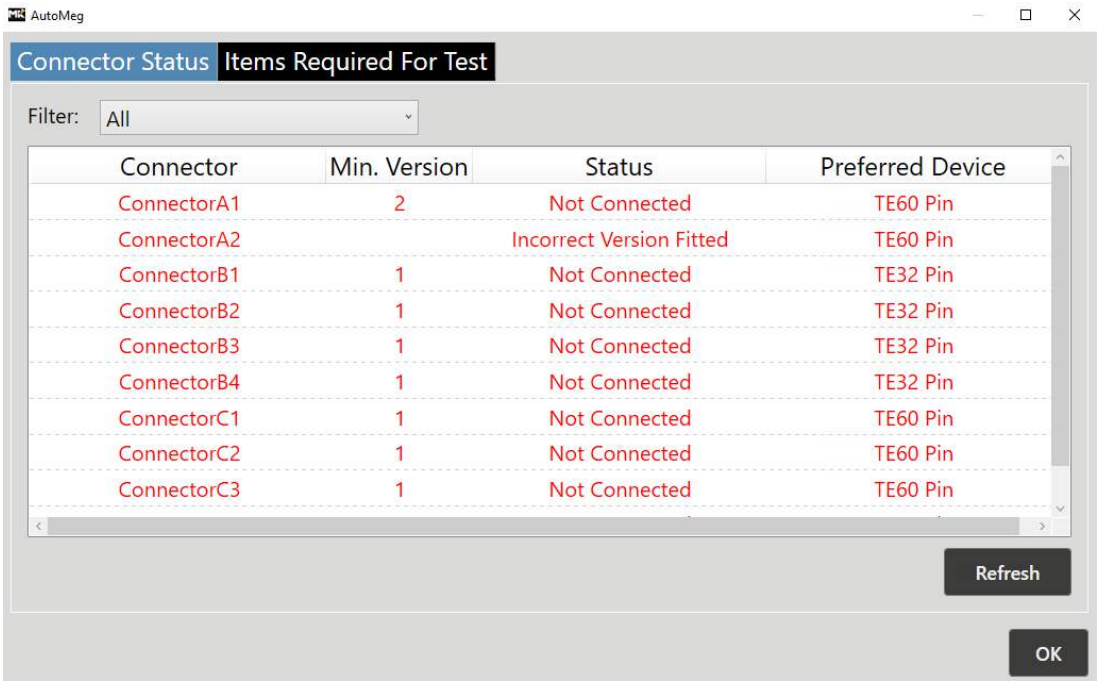
This screen shows all the sub tests in the program and allows sub tests to be chosen for testing, as required. By default, all the sub tests are selected. To de-select or re-select a test, choose the relevant item from the *Selected To Run* column. All tests can be selected or deselected at once using the *Select/Deselect All* button. The *Run Continuous* option causes the Runner to repeat the selected test program until it is aborted.

Once the required sub tests have been chosen, select the Run button to being testing.

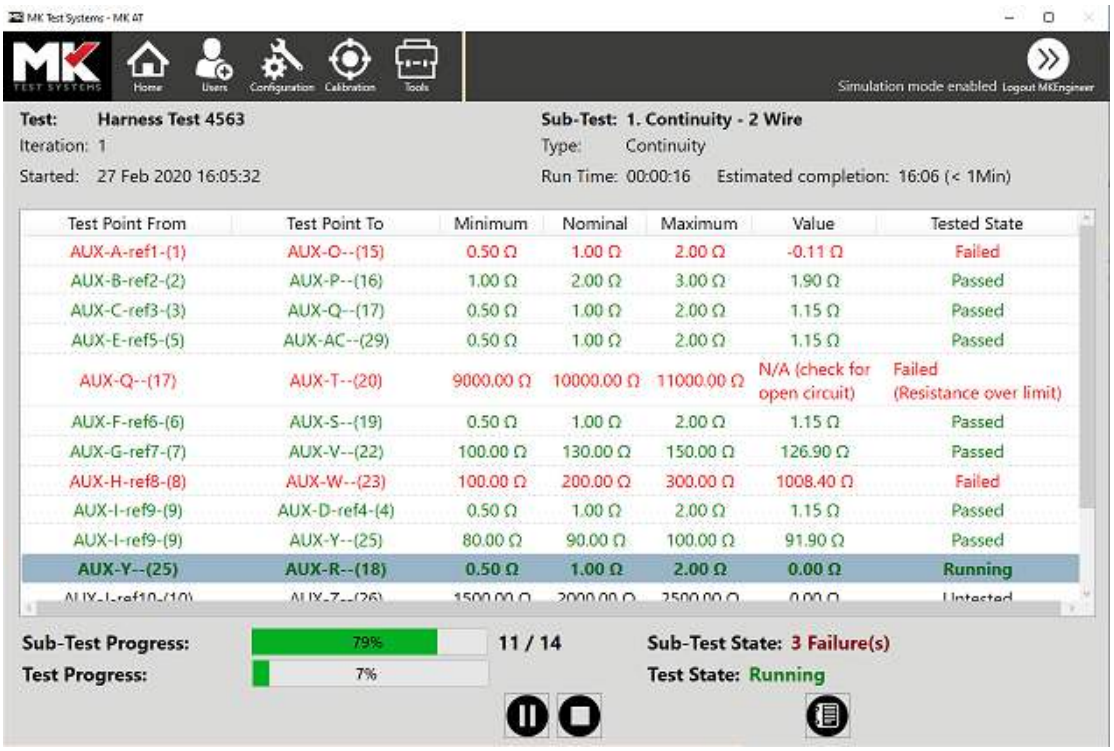
As of version 10.14, an additional option of *View Connectors* has been added to the sub test selection screen, see below.



This allows the user to view the dynamic devices that are required for an RTS system (*Items Required For Test*) and the current status of connectors (*Connector Status*):



While a test program is running, test parameters and live test results are displayed. The example below is a continuity test:

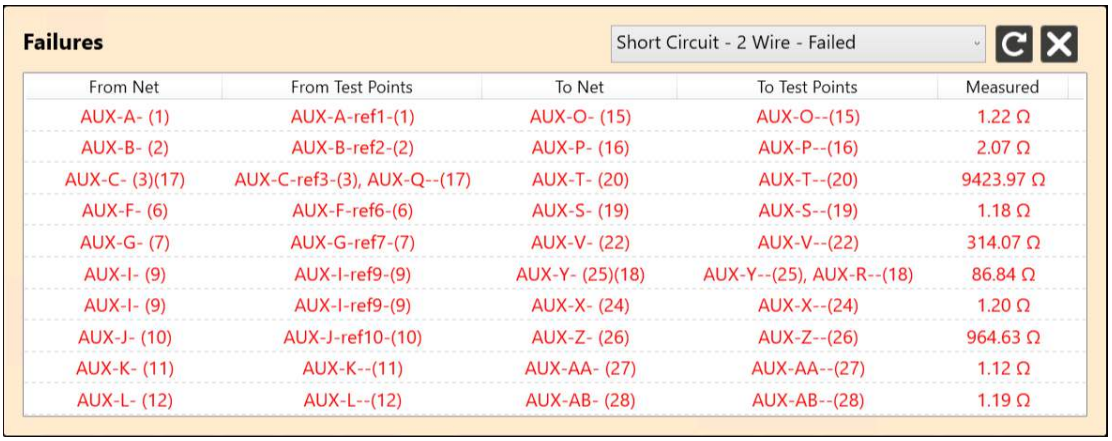


The run screen has the following controls:

Pause the test program. When activated, this button will change to a play symbol that can be used to resume testing.

For Real Time Scanning this will move to the next sub-test, for Continuity Scanning this will skip the current measurement and move to the next.Stop the test program. Any results will be displayed, and the test report will show a *Tested State* of *Aborted*.

Show failures. Failures can be viewed while continuing to run a test program. See the example below showing the failures from a short circuit test:



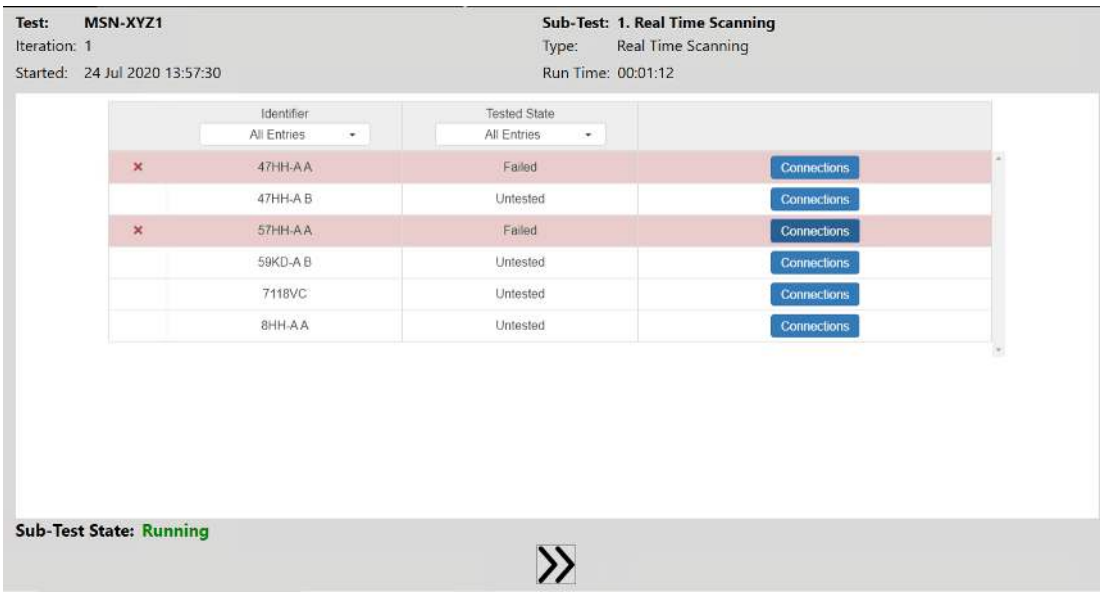
From Net	From Test Points	To Net	To Test Points	Measured
AUX-A- (1)	AUX-A-ref1-(1)	AUX-O- (15)	AUX-O--(15)	1.22 Ω
AUX-B- (2)	AUX-B-ref2-(2)	AUX-P- (16)	AUX-P--(16)	2.07 Ω
AUX-C- (3)(17)	AUX-C-ref3-(3), AUX-Q--(17)	AUX-T- (20)	AUX-T--(20)	9423.97 Ω
AUX-F- (6)	AUX-F-ref6-(6)	AUX-S- (19)	AUX-S--(19)	1.18 Ω
AUX-G- (7)	AUX-G-ref7-(7)	AUX-V- (22)	AUX-V--(22)	314.07 Ω
AUX-I- (9)	AUX-I-ref9-(9)	AUX-Y- (25)(18)	AUX-Y--(25), AUX-R--(18)	86.84 Ω
AUX-I- (9)	AUX-I-ref9-(9)	AUX-X- (24)	AUX-X--(24)	1.20 Ω
AUX-J- (10)	AUX-J-ref10-(10)	AUX-Z- (26)	AUX-Z--(26)	964.63 Ω
AUX-K- (11)	AUX-K--(11)	AUX-AA- (27)	AUX-AA--(27)	1.12 Ω
AUX-L- (12)	AUX-L--(12)	AUX-AB- (28)	AUX-AB--(28)	1.19 Ω

Refresh the failures list. This option updates the list with any new failures that have occurred.

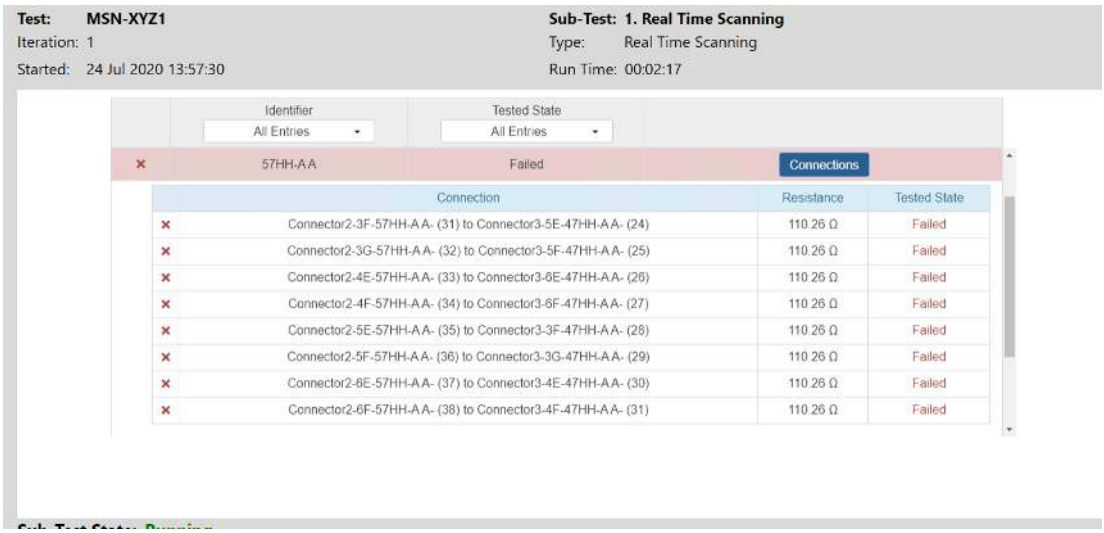
Exit the failures window.

3.3.2.1 Real Time Scanning

Whereas all other test types are a sequential process of testing, the Real Time Scanning (RTS) test type, introduced in version 10.14, runs until the operator chooses to end the test. This type of test allows for devices to be connected and disconnected during the test sequence and therefore makes use of the RTS dynamic devices. It is recommended that, if used, this is the first subtest as this can run during hook-up to display errors in real time as they are detected. This allows for instant identification and resolution so that, when subsequent subtests are run, no continuity errors will be present.

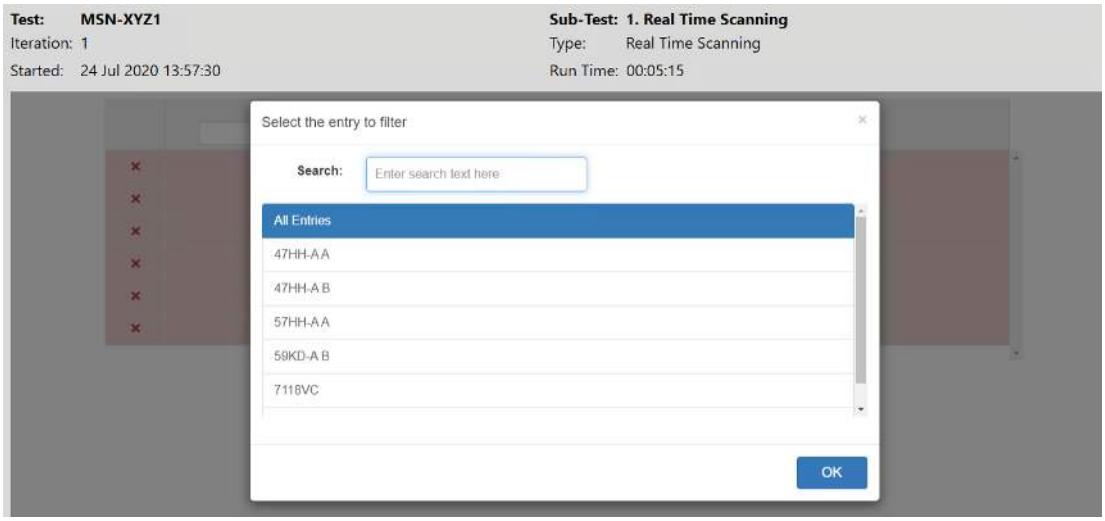


To view further details of connections within a connector, select *Connections.* The individual connections are displayed with the measured resistance and tested state:

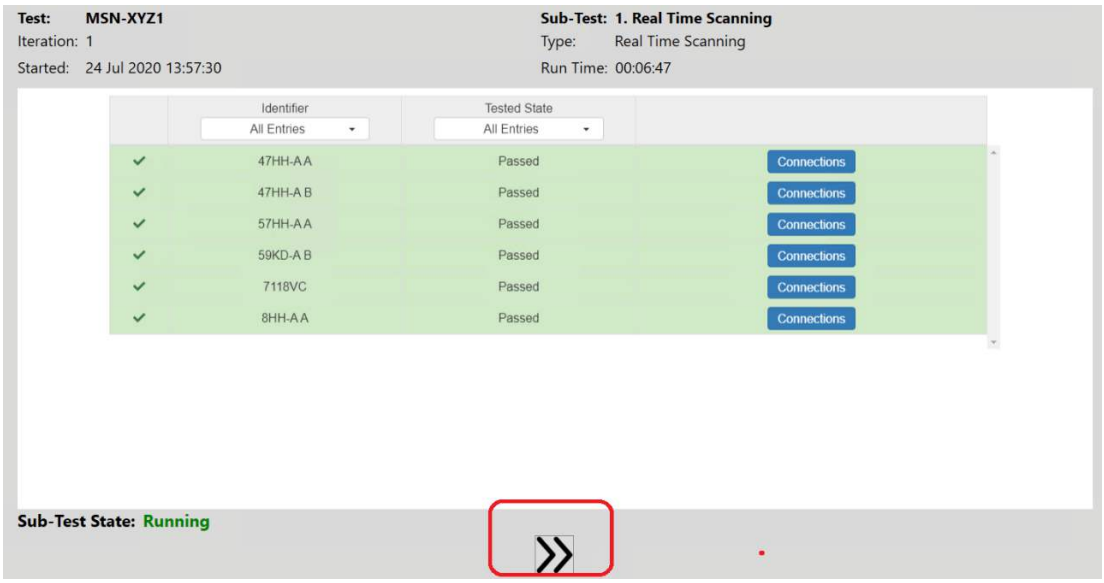


As more devices are detected, their results are automatically added to the display:

The display can also be filtered based on connector ID or test state:

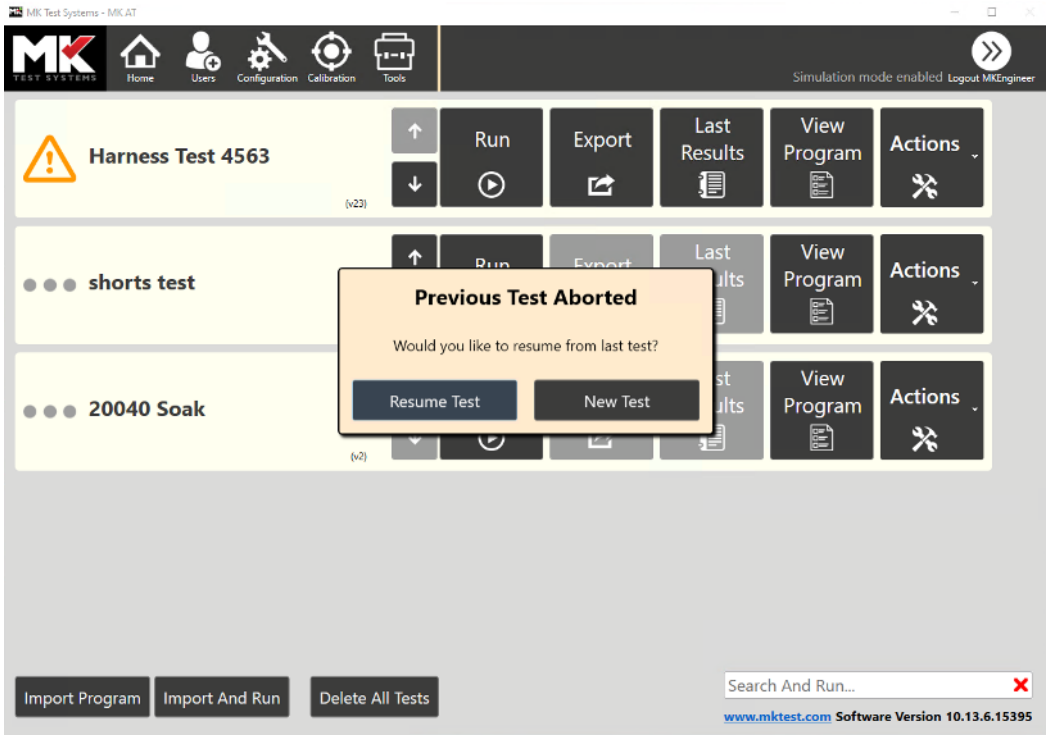


At any time, the user can complete the RTS test and continue to the next subset by selecting the forward icon at the bottom of the screen.

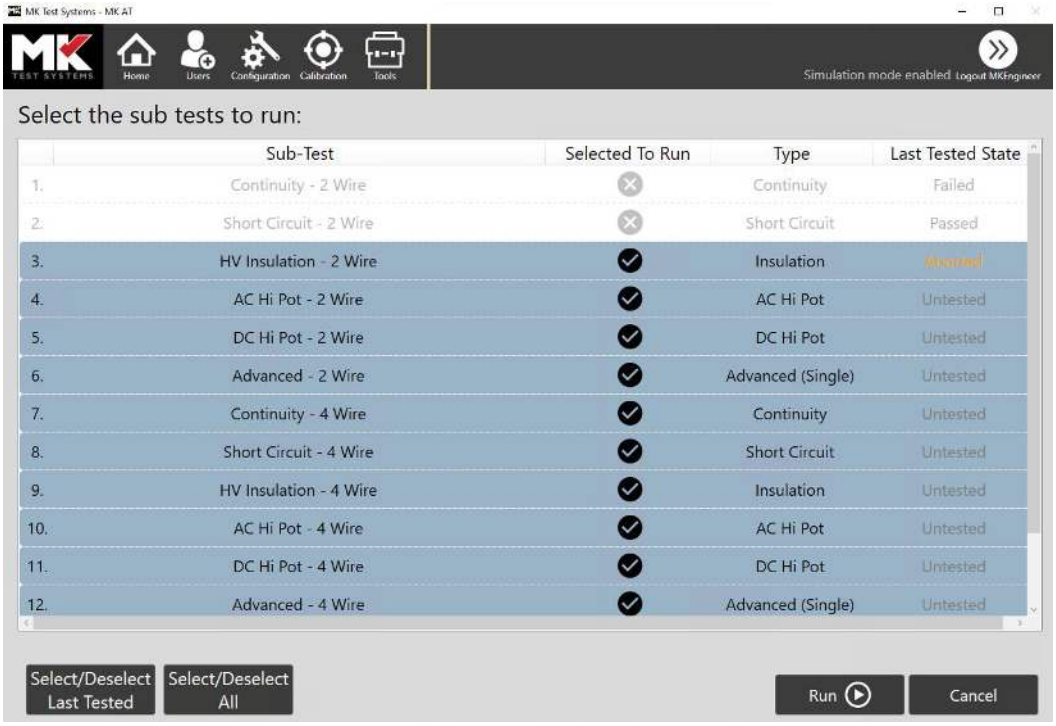


3.3.2.2 Resuming a test program

If a test program is stopped before it is complete, the *Tested State* will be *Aborted*. If this test program is run again, the operator can have the option to either resume the test or start the test from the beginning, as shown below. However, access to this is controlled via group permissions.

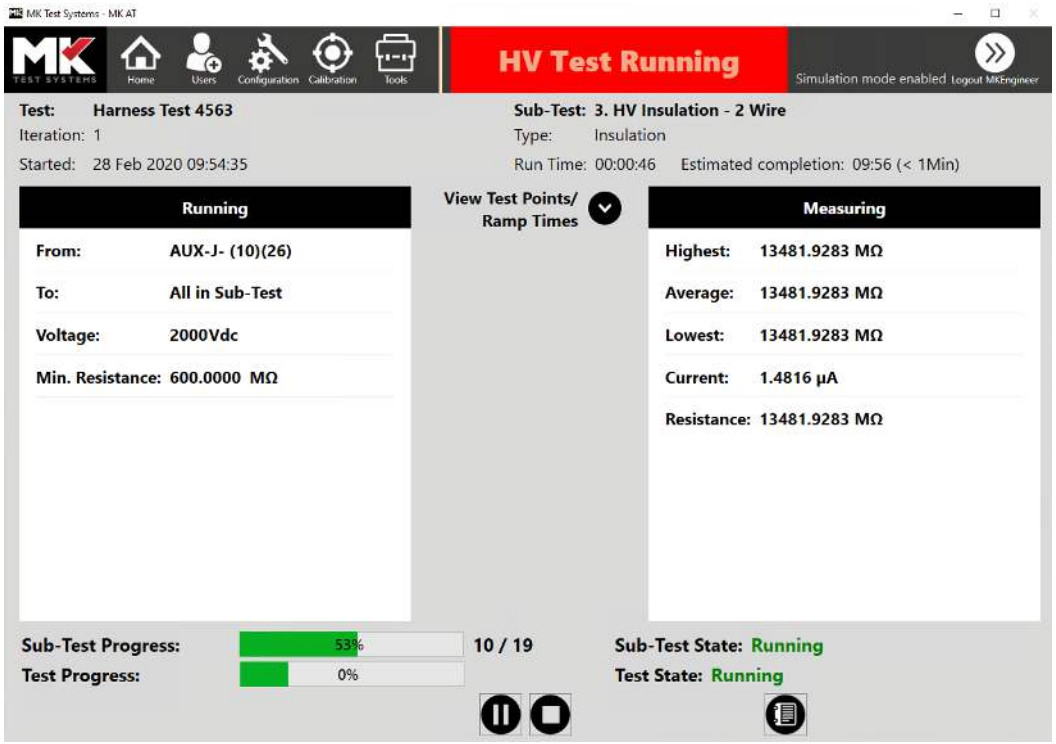


Resuming the test, starts the testing from the point that it was stopped previously. In this case, the sub test selection screen will automatically disable any completed tests. In the example below, the program was stopped during the *HV Insulation* test:

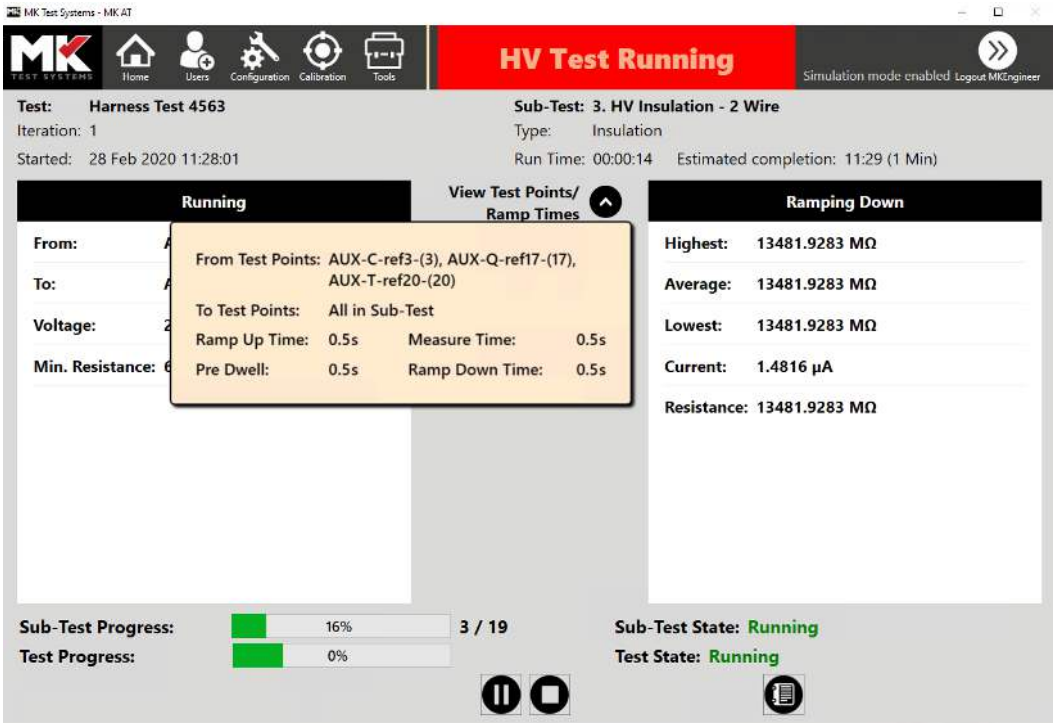


3.3.2.3 Running HV Tests

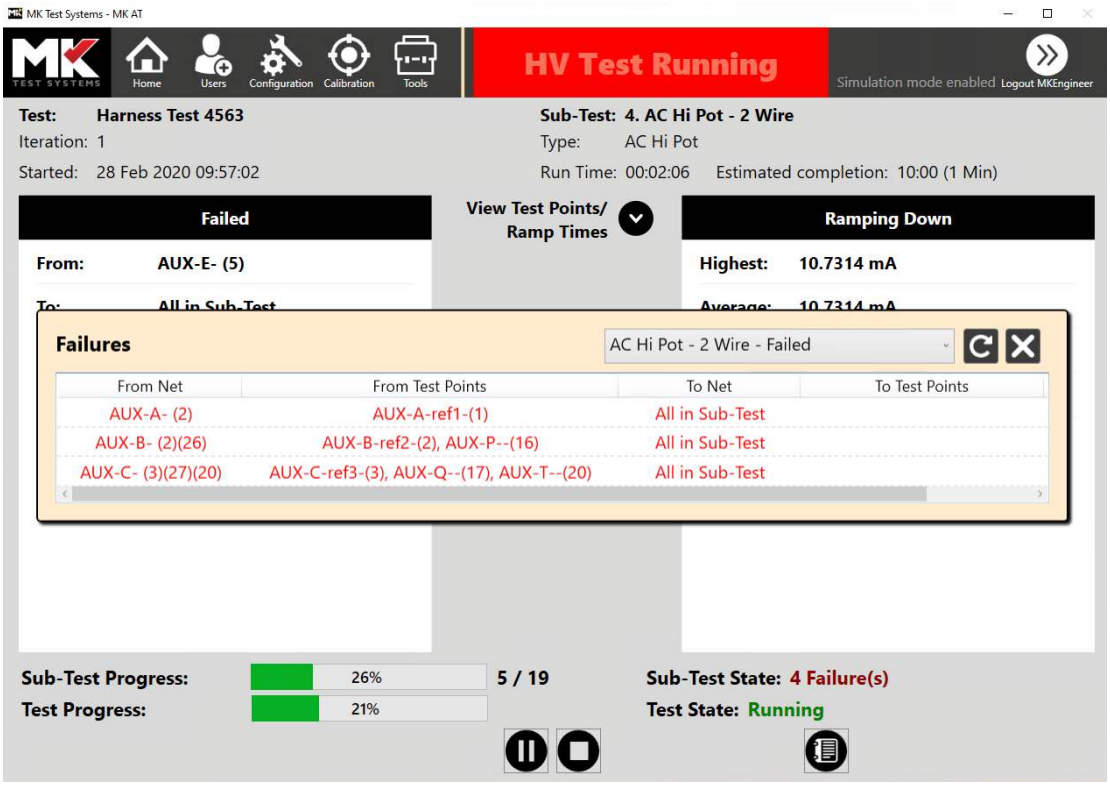
When running a high voltage test, a warning is displayed at the top of the screen, as shown below:



The panel on the left displays the test parameters and the panel on the right displays the results. Where multiple test points are grouped into *nets* the left panel will display the group name. In this case, the test points can be viewed from the *View Test Points/Ramp Times* drop down menu, along with further HV test parameters. See the example below:

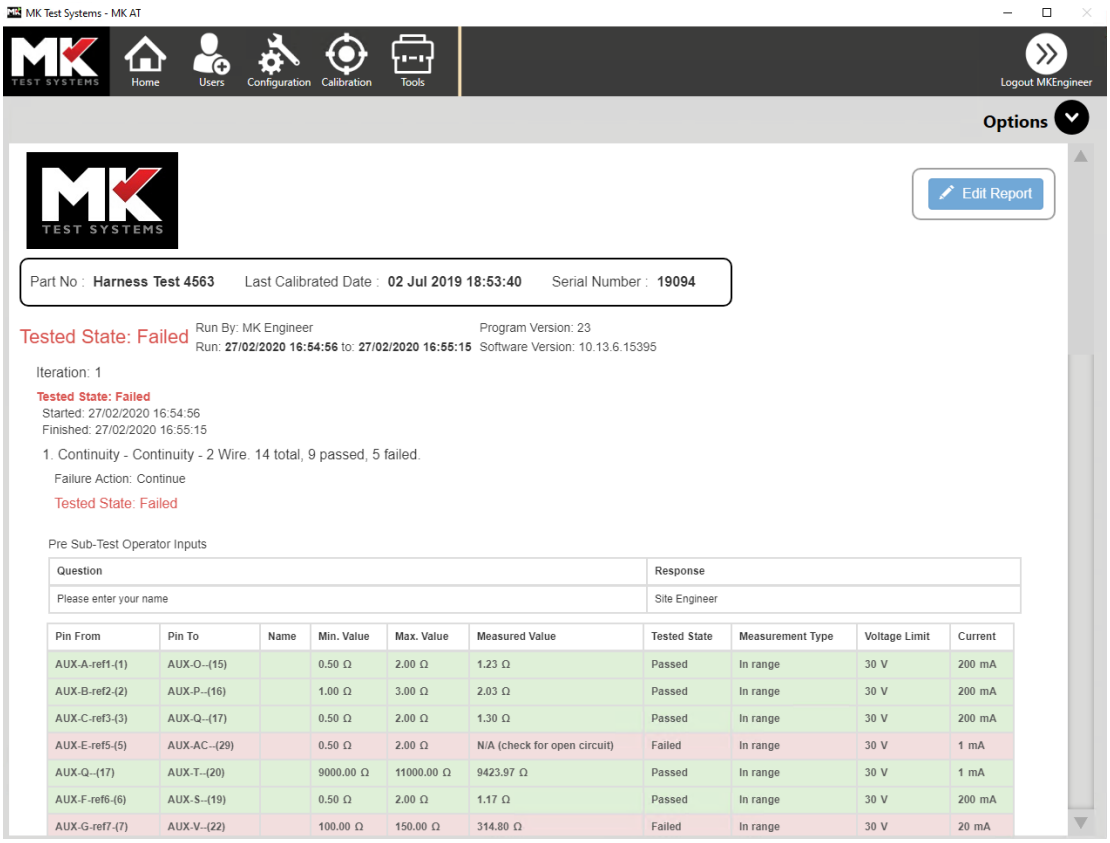


To view failures during a high voltage test, select the failures button. This will open a failure window that can be updated by selecting the update button, see the example below:

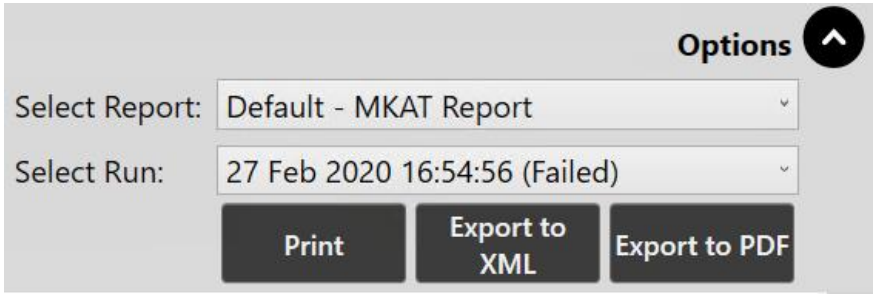


3.3.2.4 Viewing the test results

Once a test program is complete, the test results will be displayed automatically. The example below shows a continuity test, displayed using the *Default - MKAT Report* template.



Selecting the Options menu reveals the following dropdown:

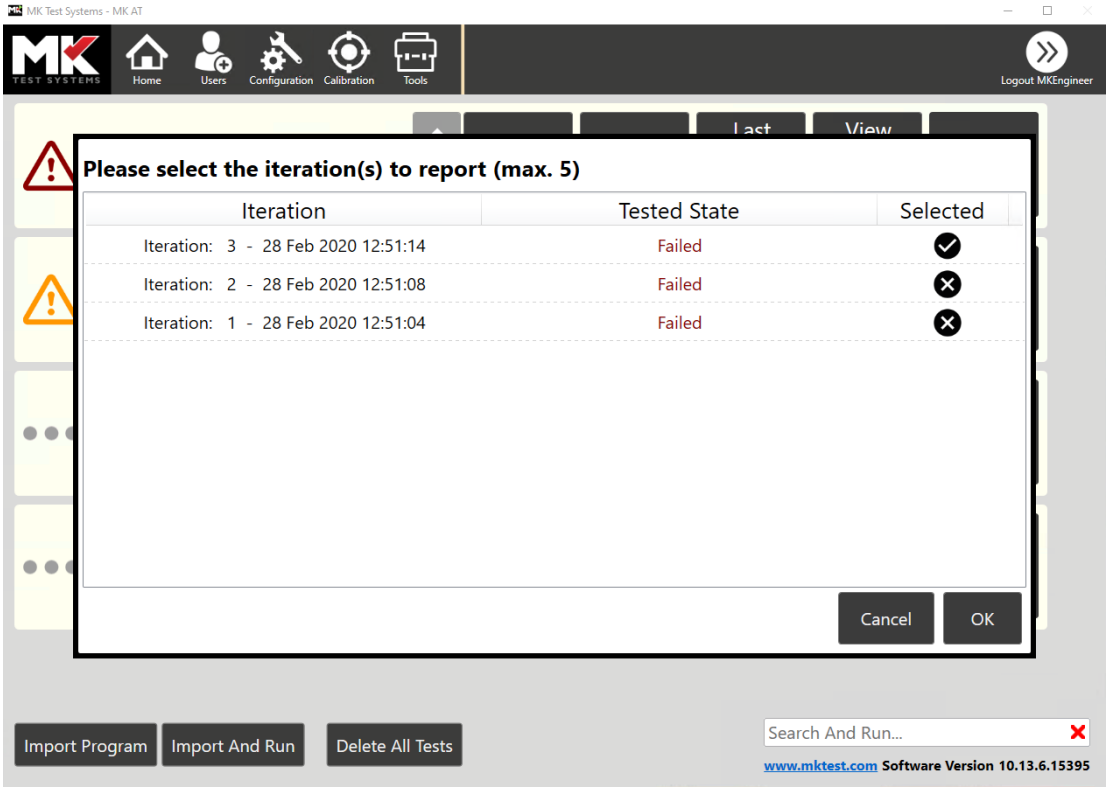


Alternative report templates can be chosen from the *Select Report* list.

If the test program has been run multiple times then the required iteration can be selected from the *Select Run* list.

The *Print* button can be used to print the test report directly to the default windows printer or the report can be exported to either XML of PDF.

If the test program has be set to run for a number of iterations, once complete, the operator will have the option to choose which iterations to display on the report. The most recent iteration will be shown at the top of the list and up to a maximum of five can be selected to display on the report.

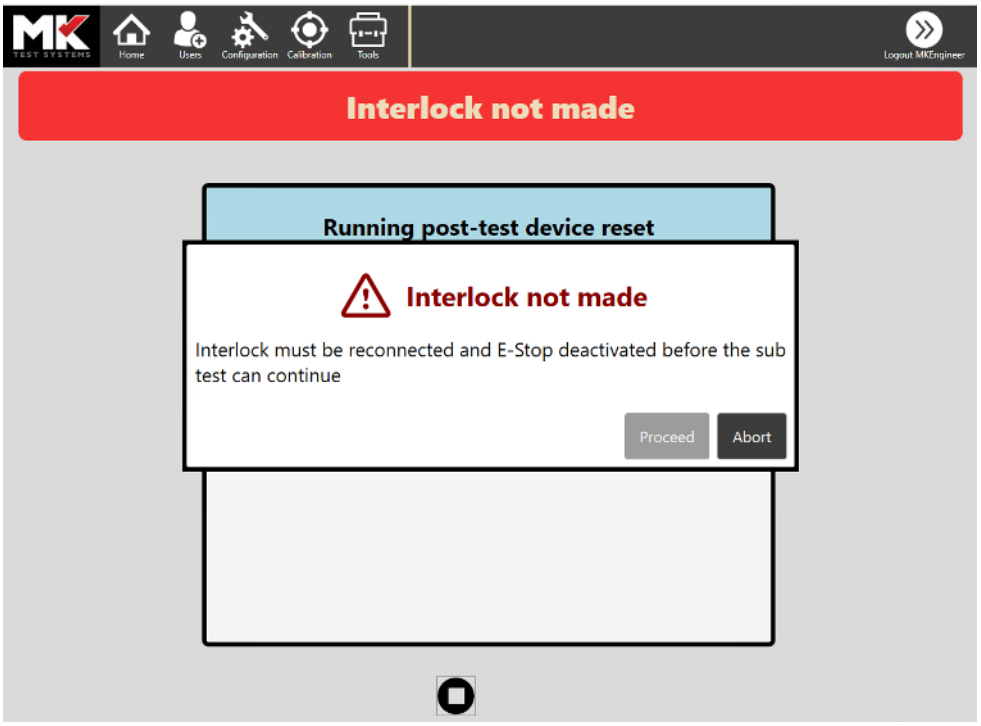


3.3.2.5 Closing a test

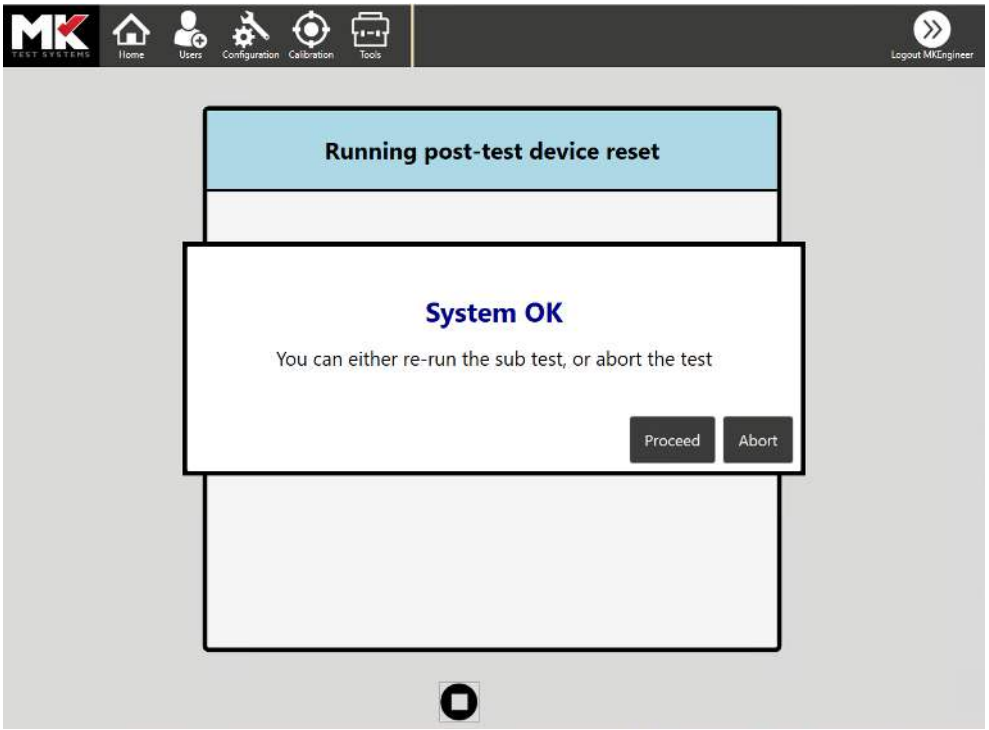
From version 10.14, an option has been added to aggregate results from multiple MKAT's through a single Master Runner and from there to a customer hosted web service. To initiate this process a *Complete Test* button has been added to the runner when the system is configured to use this process. Once clicked it will complete a test and start the upload process.

3.3.2.6 Interlock

The interlock is a hardware safety feature that is fitted to MKAT test racks that allows power to be switched off in an unsafe scenario (e.g. opening a door or lid to the UUT). When the interlock is broken, the HV/LV Current & Voltage is turned off and all external devices, including EM test points, are turned off. A warning message will be displayed as shown below:

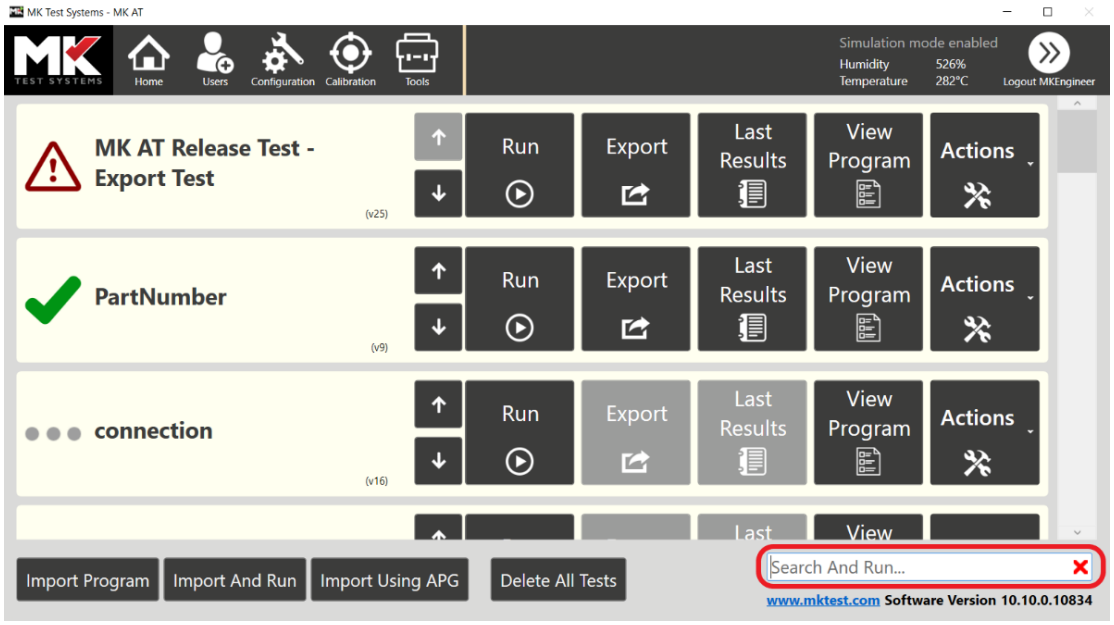


Once the interlock is remade (e.g. by closing the safety door) the system will give the operator the option to either proceed with the test program or abort.

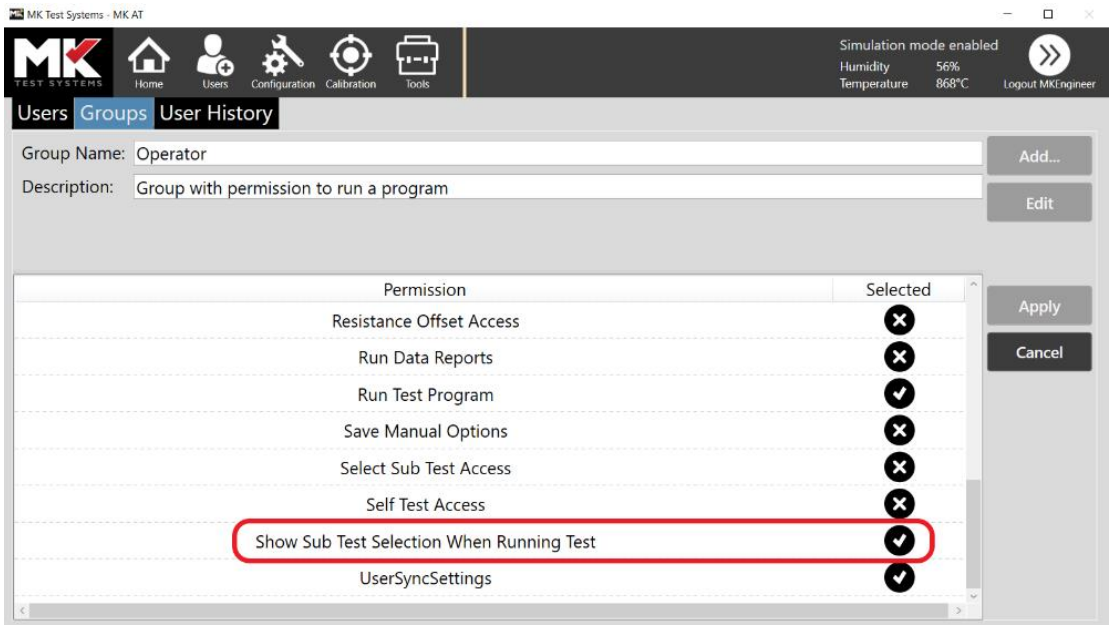


3.3.3 SEARCH AND RUN

- This feature allows the operator to search the loaded test programs by name.

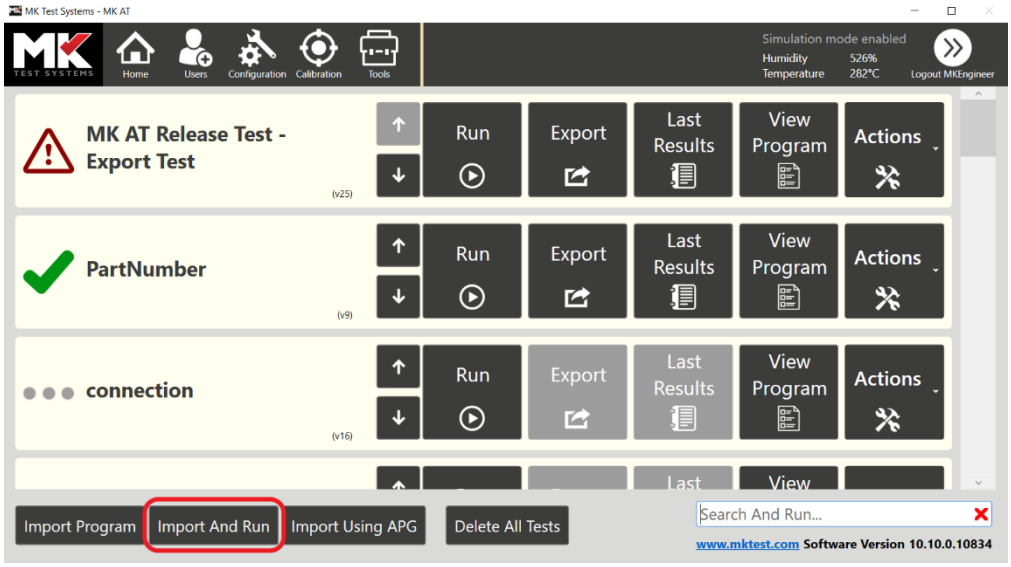


- The search is case insensitive and begins when the first character is entered into the search field.
- If a matching program is found, pressing the *Enter key* will run it automatically.
- For multiple matches, the last imported match will be selected.
- The subtest selection screen is configurable by the user. With this option disabled, the matched program will run without showing the sub-tests screen.



3.3.4 IMPORT AND RUN

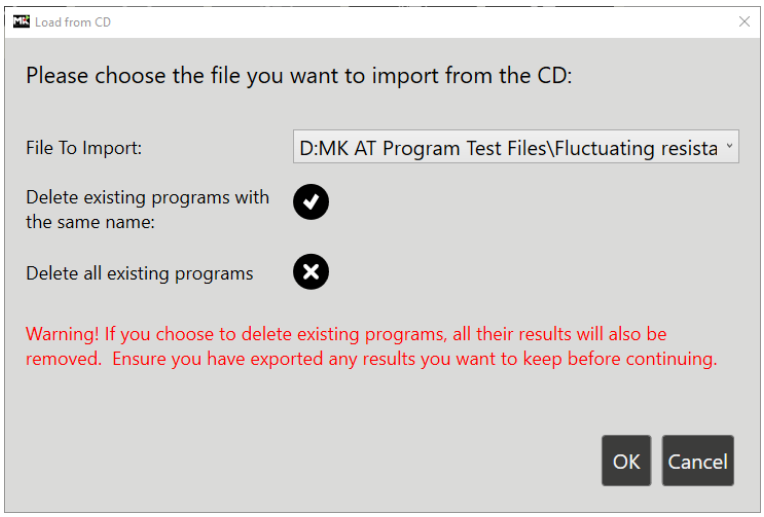
- The *Import And Run* feature enables test programs to be run automatically after import.
- Visibility of the sub-test screen is configurable within user permissions.



3.3.5 IMPORTING FROM A CD

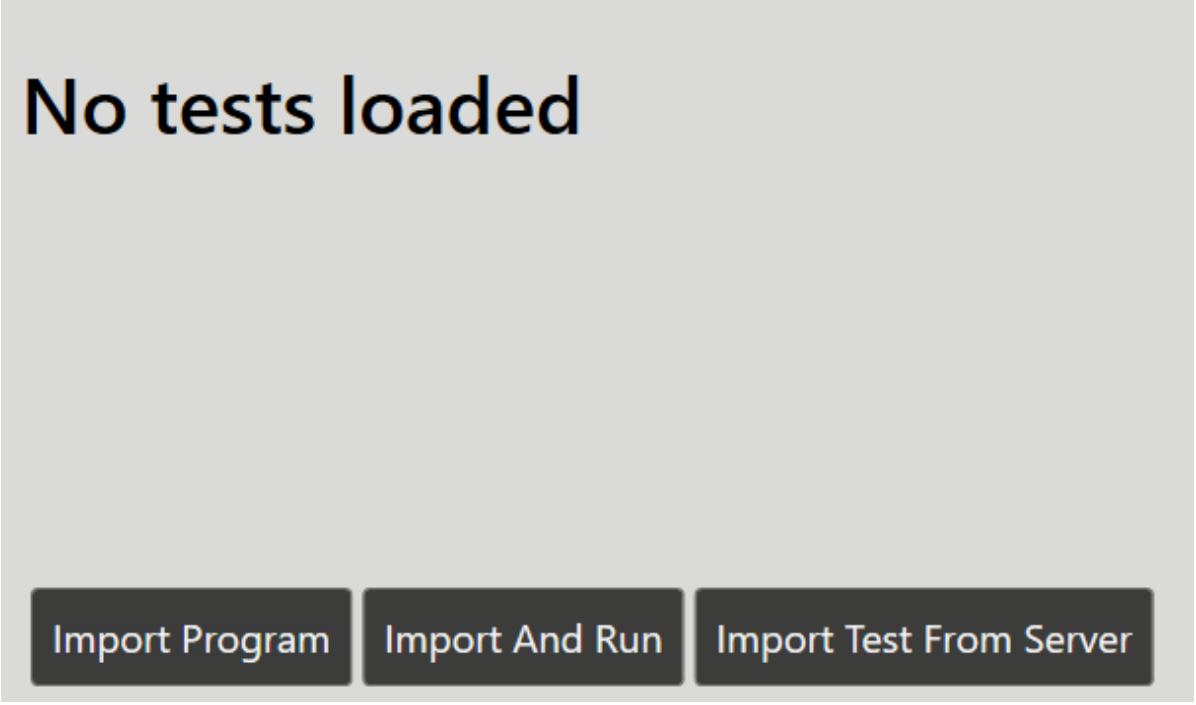
Test programs can also be imported from a CD. When a CD is inserted into the disk drive, a popup window appears within the runner (see below). You can select either a program or configuration that you wish to use from the *File To Import* drop down menu. There are several options available, as shown below, which can be toggled on and off. If *Delete existing programs with the same name* is selected, if the new file has the same name as an existing test program, the new program will be imported and the old one will then be deleted. Selecting *Delete all existing programs* will remove all imported test programs and import the new one from the CD.

An import can also be carried out by using the *Import Program* button at the bottom of the home page. Use the file explorer to navigate to and select the program you wish to import.

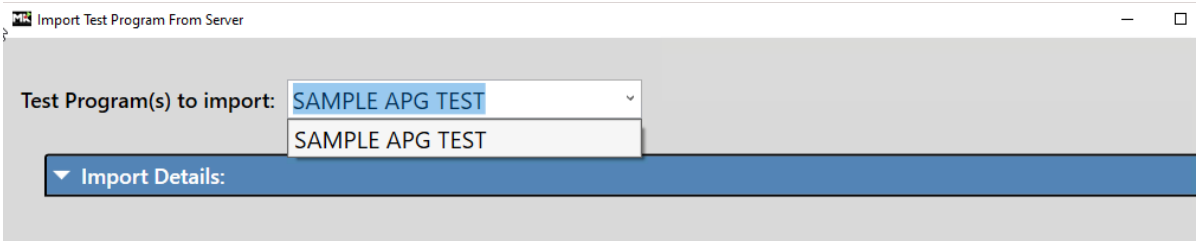


3.3.6 Import Test Programs From Server

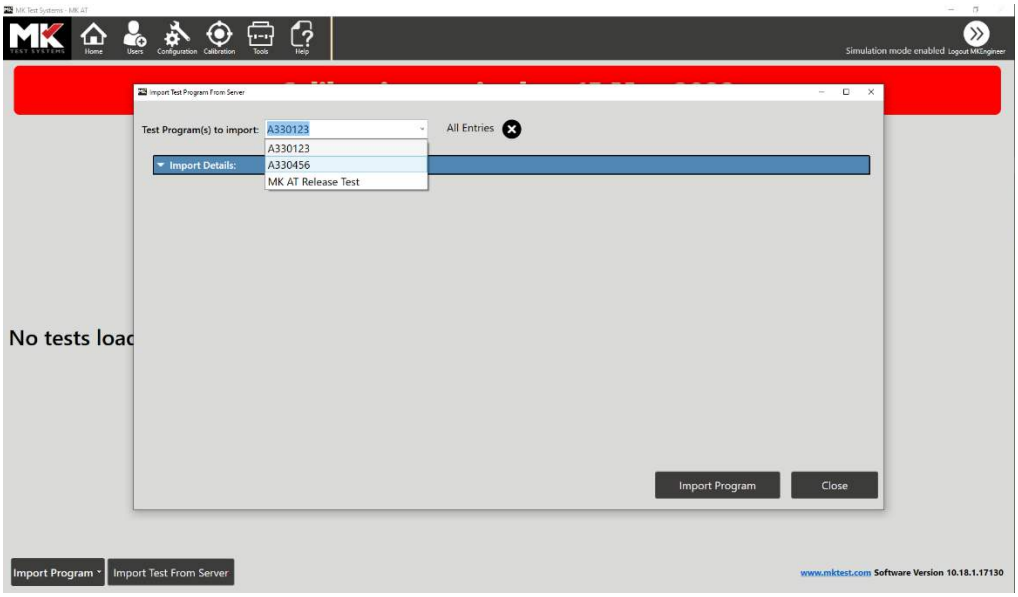
When MKAT systems are configured to synchronise their configuration, as detailed later, this also provides an option to import test programs from the master MKAT server. Once enabled, an extra button is added to the home screen, *Import Test From Server:*



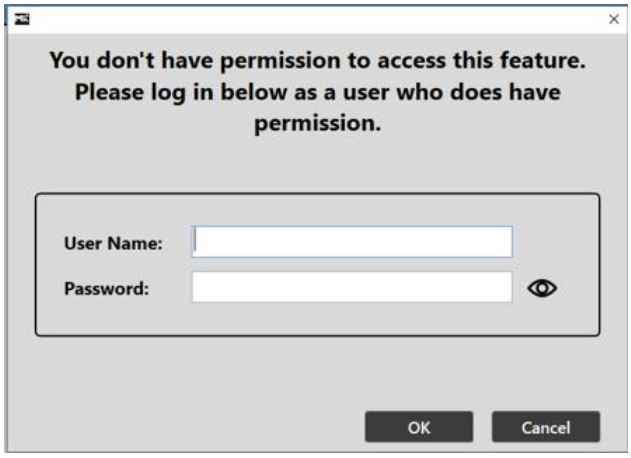
This will load a pop up where the user can select or type the name of the test program to run:



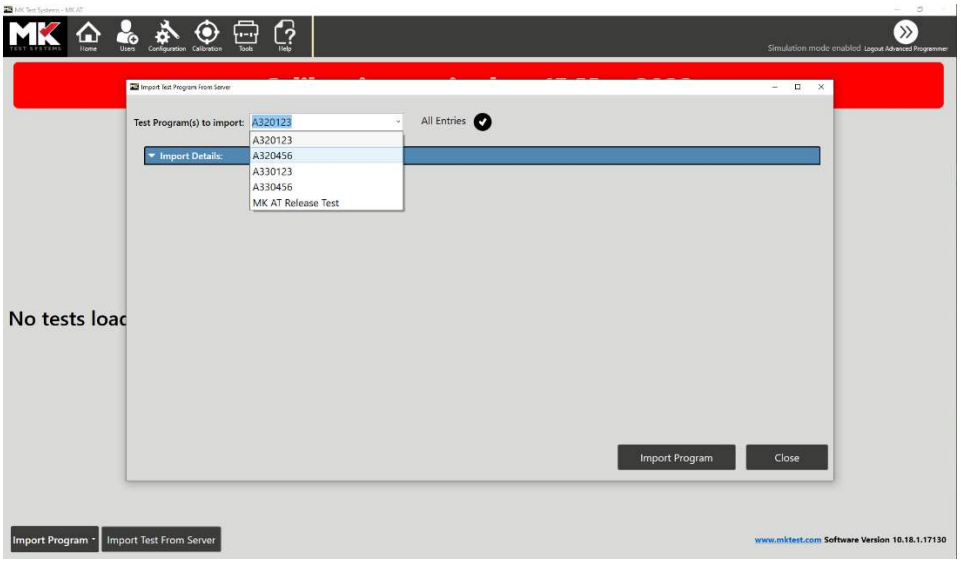
The available programs to download can be filtered if the program has specified any of the additional custom fields defined in the configuration admin section. For details on how to create the programs please refer to the API manual. If the operator requires downloading a program that was not originally targeted at the test console then select All Entries button.



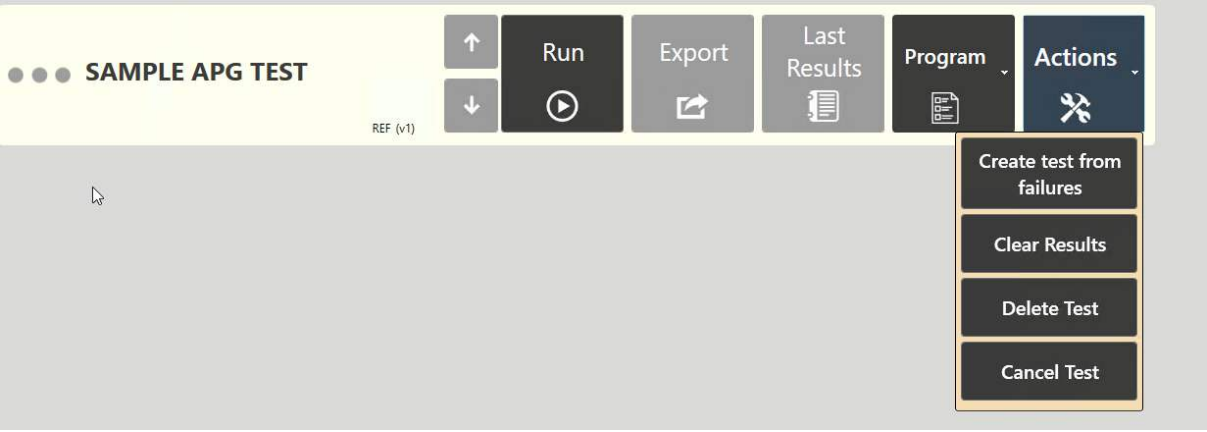
This will display a prompt for a user with permissions to authorise this



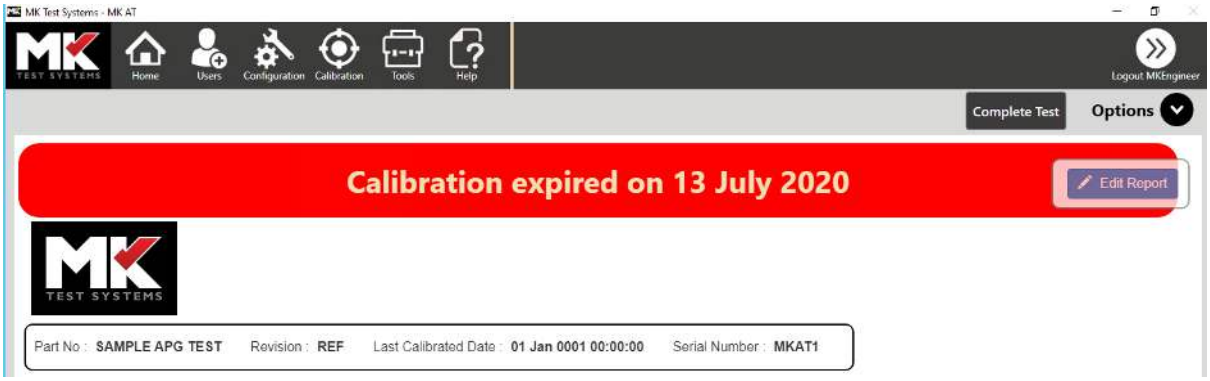
All programs on the server will then be displayed



Once imported to the slave, the program will no longer be available to other slaves for download. If the program is not required, it can be returned to the master by cancelling it from the slave using the *Cancel Test* button. This will then make it available to download again by another slave MKAT.



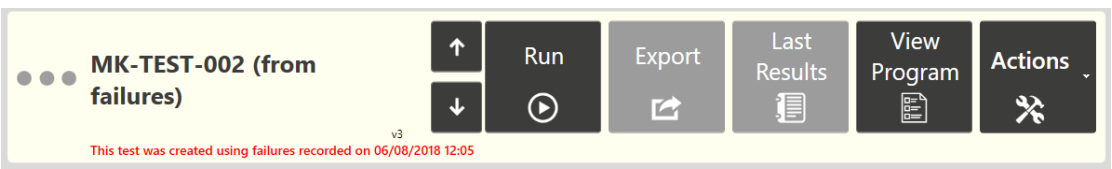
Once the test has completed, the *Complete Test* button will upload the results from the slave back to the master where the test program was imported from. This removes the program from the MKAT runner to avoid rerunning the test.



3.3.7 CREATE TEST FROM FAILURES

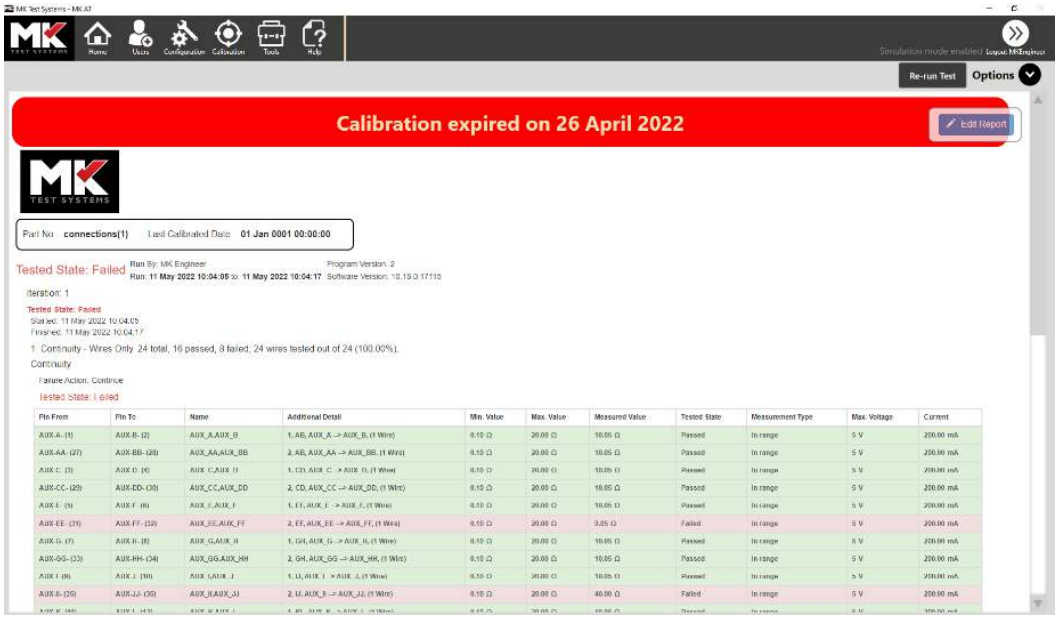
If you have run a test and there have been failures reported, you can create a new test directly from the results. This new program will contain just the failed items from the original test, allowing you to find and fix errors without having to re-run an entire test program.

If a test program has failed items, it will be highlighted by a  symbol. You can create a test program from the *Actions* menu  . It will scan the previous results and generate a new test program. You can now run this test independently of the main test program. This test program is treated as a new test program and as such can be exported/imported the same as any other test programs.

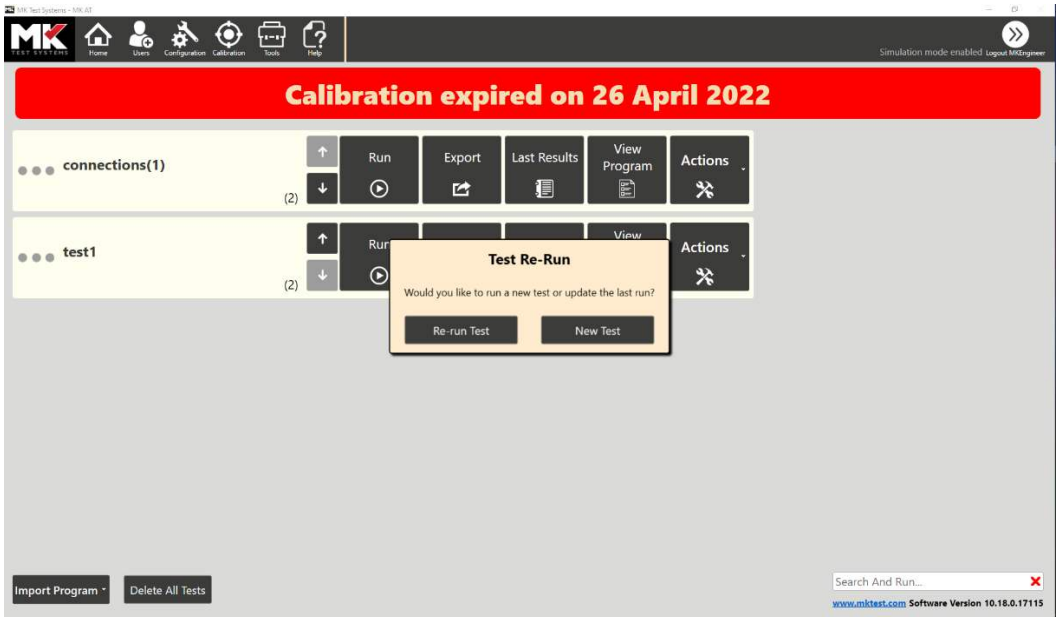


3.3.8 RE RUNNING FAILED TESTS

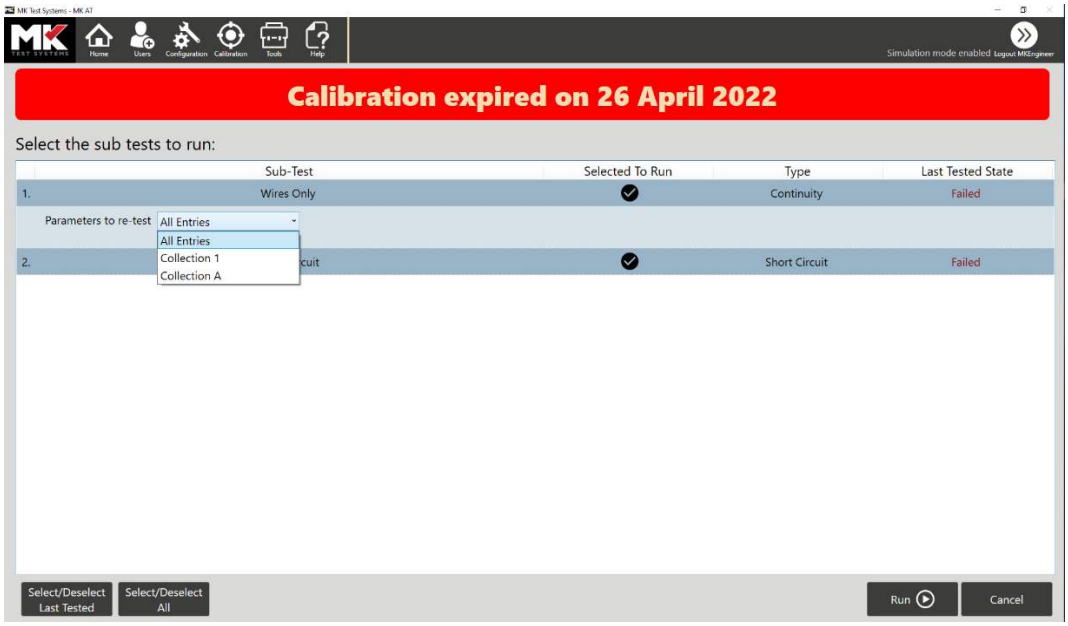
For test programs created via the APG with additional columns mapped and when the users that have the group permission “Re-run continuity test from failures” and “select sub test access” enabled when a test fails an extra option will be available to re-run a test.



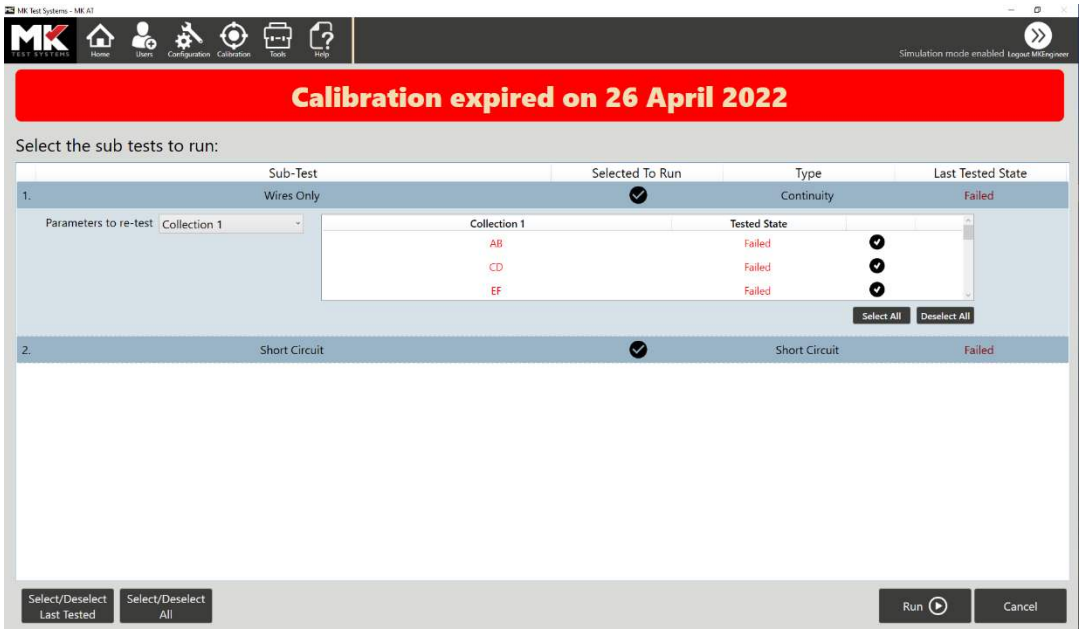
Selecting this and selecting re-run test on the next pop up will take the user to a page where they can filter what tests to re-run.



Any columns that had been mapped as additional data in the APG will be available in the drop down list to filter which groups of failed test should be re-run.



Once a grouping column has been selected the operator can select which ID they want to re test, all failed ID's will be selected as default. All tests with same the ID as selected from the grouping column will be re tested and their previous results of pass or fail will be updated with the result from the next run.



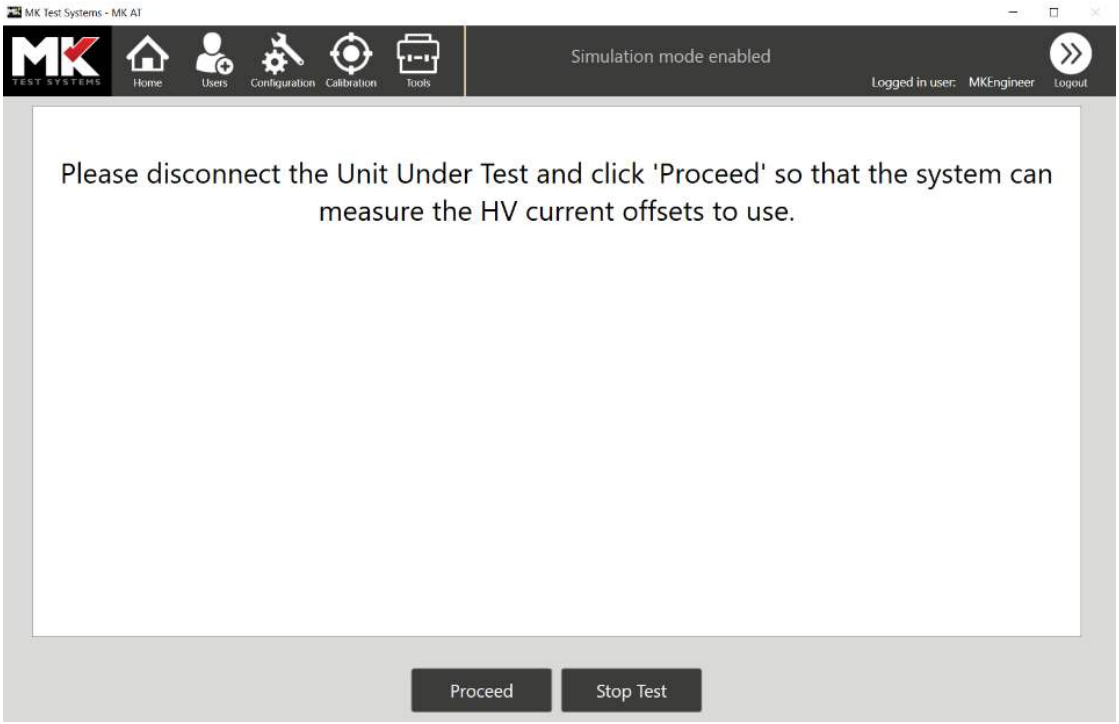
It is important to note that without the correct permissions and additional mapped columns in the test program this feature will not be available.

3.3.9 HV OFFSETS

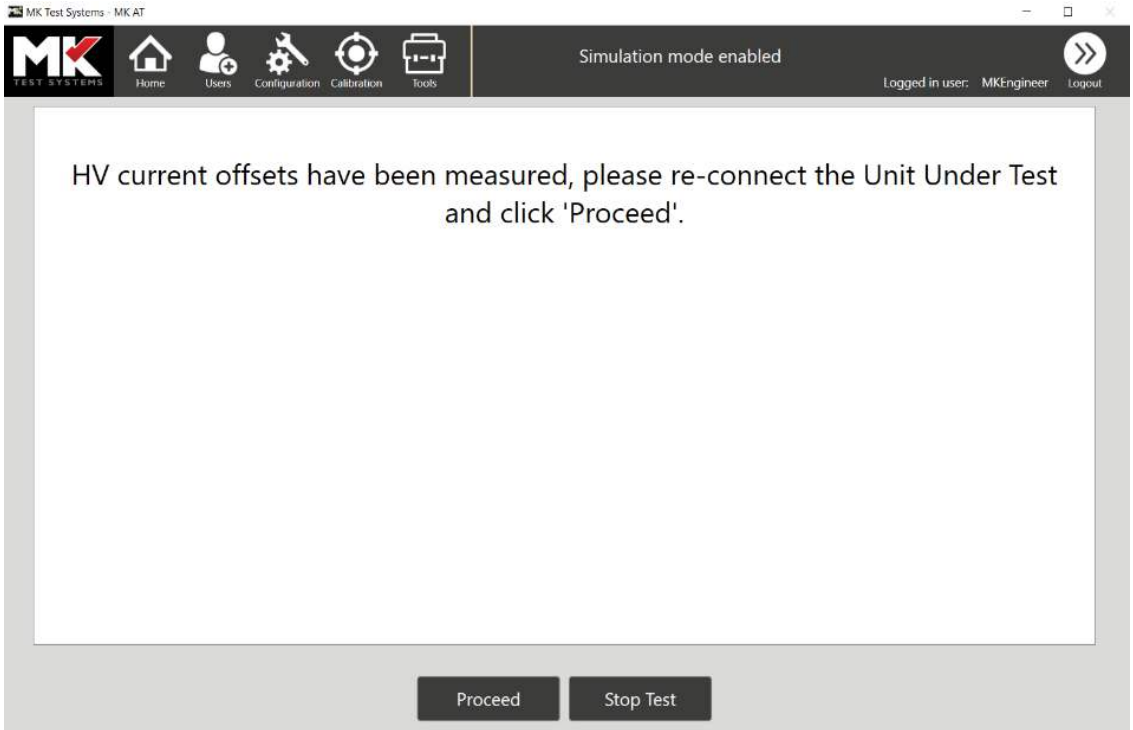
A table of current offset values can be generated with the UUT disconnected, and these values can be stored and subtracted from subsequent measurements taken with the UUT connected.

This will obtain more accurate results. This option is available for both AC and DC HV tests. It can be enabled within the Editor from the Sub-Test Options screen, (see Editor Manual for details).

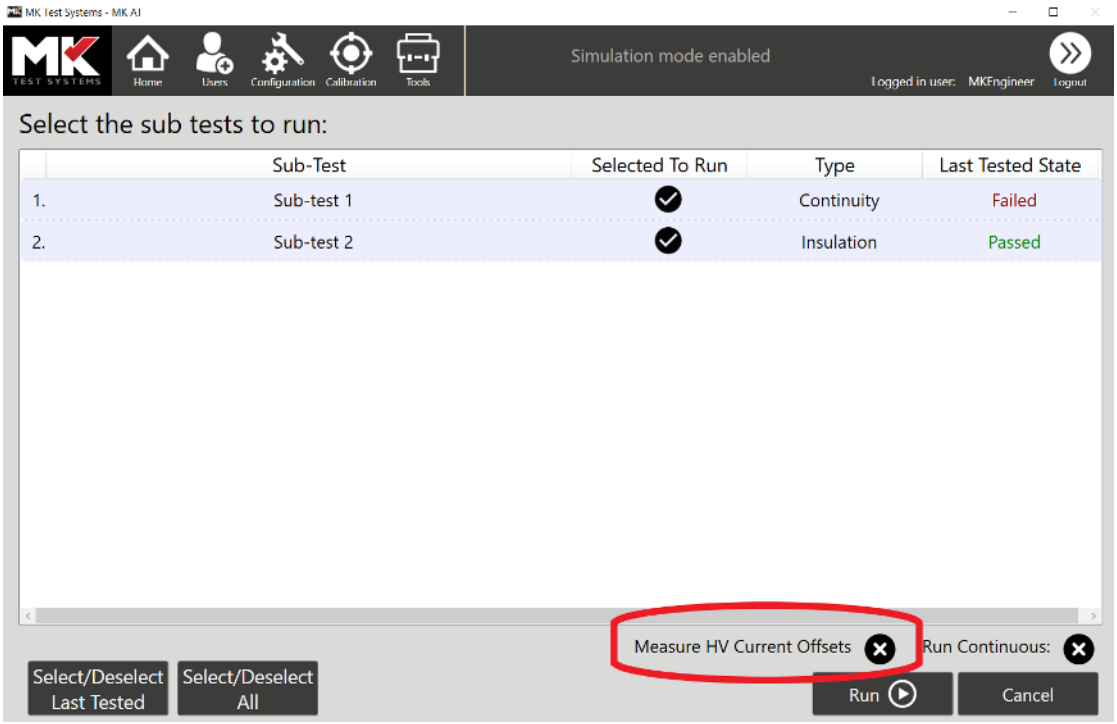
With this option enabled, the first time the program is run, the operator is prompted to disconnect the UUT, and the current offsets are measured.



Once complete, the operator is prompted to reconnect the UUT and the testing continues in the normal way.



After the first measurement, the offsets are stored and used in any further tests where relevant. If the program is run again, the operator then has the option to remeasure the current offsets, if required. This is done by selecting the option *Measure HV Current Offsets* in the run screen, as shown in the example below:



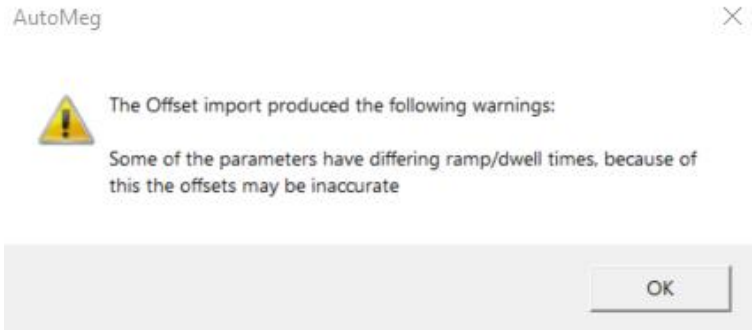
3.3.9.1 Import & Export of HV Offsets from a file

For Programs that require HV offsets to be measured, there is the option to import and export the offsets from a file.

If a program has not been run before, there will not be any offsets available to export and the *Export HV Offsets* option will be disabled, as shown below. These options are accessible from the *Actions* menu on the Home screen of the Runner.

Once a program has run for the first time, offsets can be exported to a file using the *Export HV Offsets* option. For a new or reloaded test, offsets exported previously can be imported if the Pin To & Pin From values and the Voltage are the same. If the offsets are imported and any of these parameters have changed, the import will fail with the following error:

If the offsets are imported and either the *Ramp Time* or *Dwell Time* have changed, the import will complete but a warning message will be displayed:



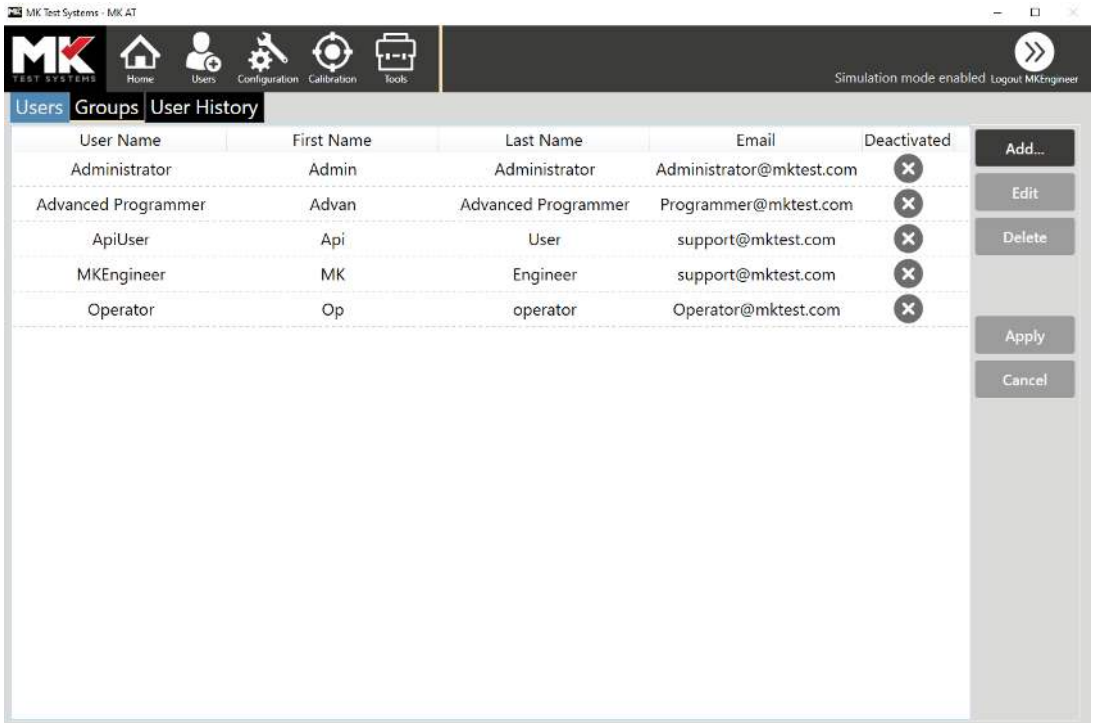
The offsets can be used across multiple test programs. The sub-test names don't have to match. As long as the settings outlined above match, the offsets can be imported.

3.4 Users

Access to the Runner software is restricted and controlled using login credentials. Users are set up and assigned a username and password which must be entered for the user to access the software. In addition, the user is linked to a user group which controls access to key functionality.

3.4.1 USERS

The *Users* screen displays all of the current users that have been setup on the system. Following a new installation, there are several predefined users set up as shown in the example below.

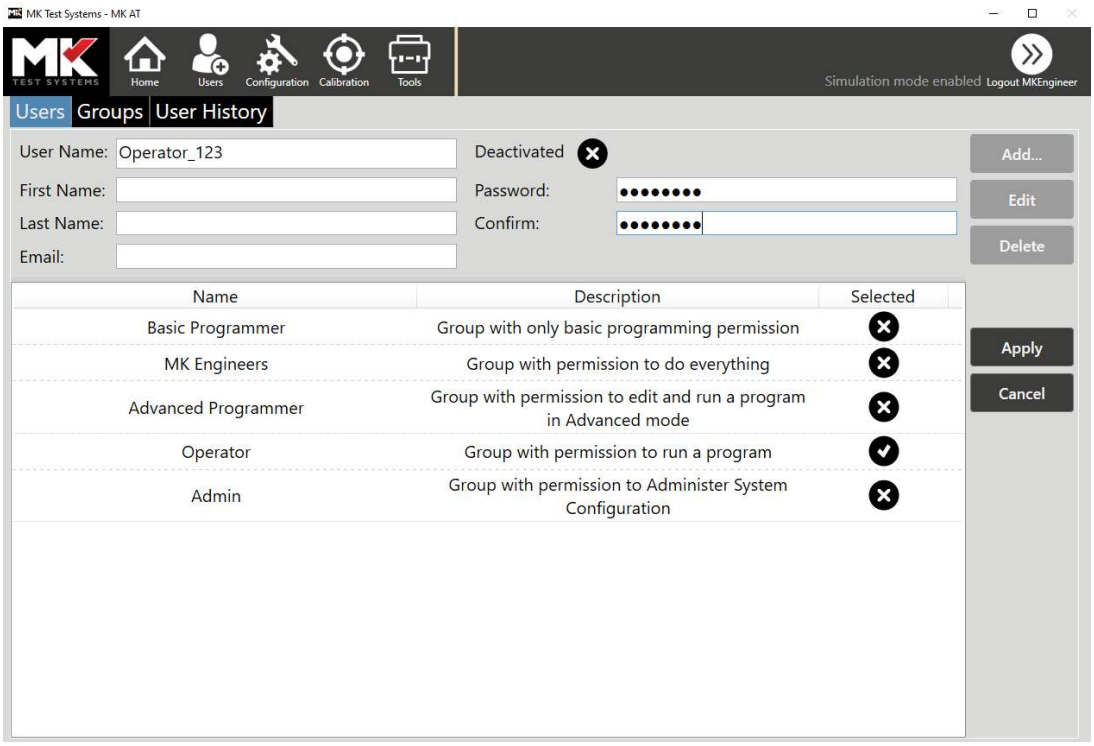


3.4.2 ADDING A USER

New users can be added as follows:

- Login to the Runner as an Administrator.
- Go to the *Users* screen and select the *Add* button.
- Enter the required details which must include a username and password
- Select the desired user group from the list. The user group selected determines access to specific functionality.
- Select the *Apply* button.

The example below shows a new user being set up with the username *Operator_123* and assigned to the *Operator* user group:

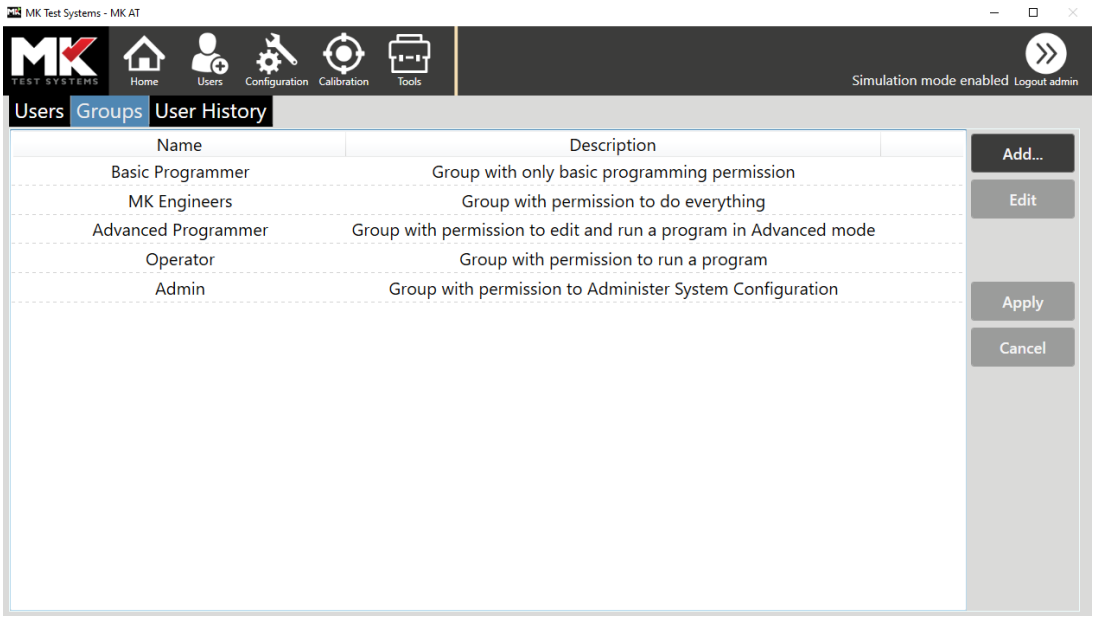


Details of existing users can be modified by choosing the relevant user from the Users screen and the selecting the *Edit* button. Once changes have been made, select the *Apply* button to save.

Users can be deleted from the list of users using the *Delete* button, but this is only permitted if the currently logged in user has permission to administer users. Also, deleting the currently logged in user is not permitted.

3.4.3 GROUPS

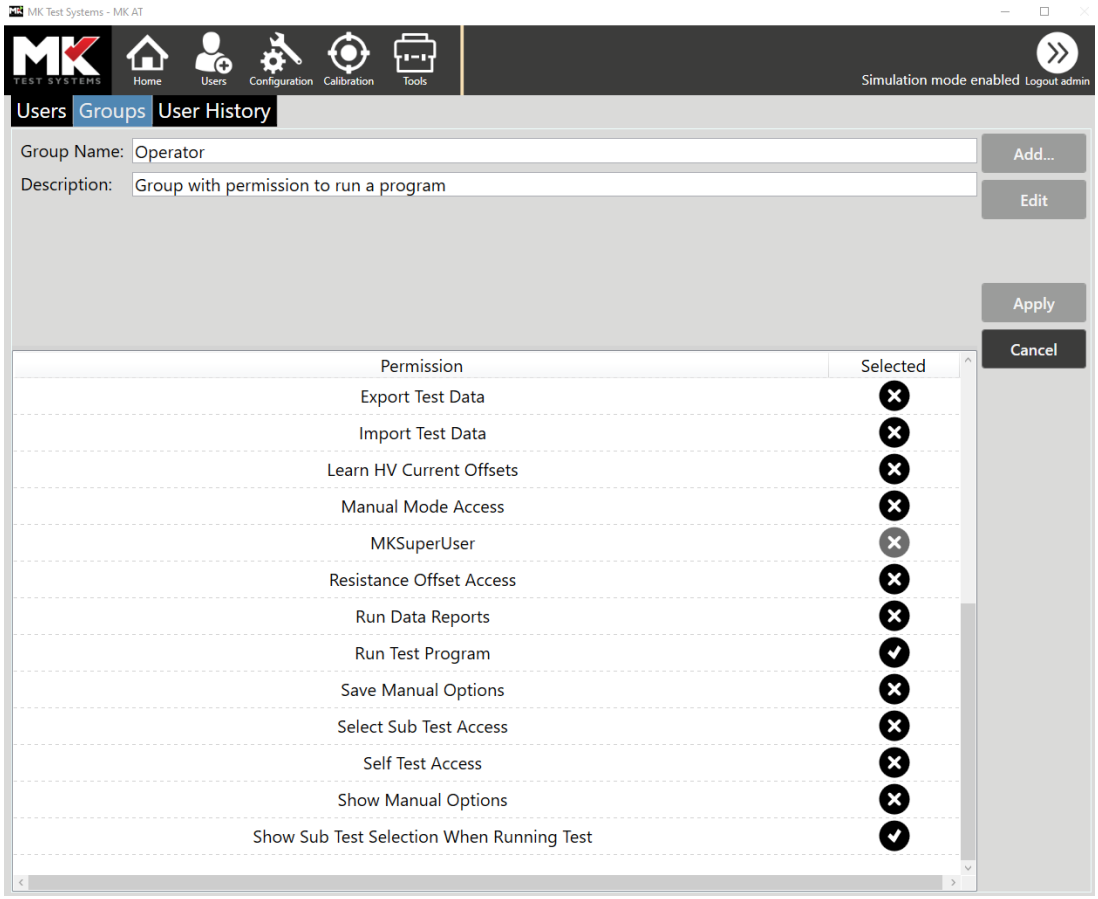
The *Groups* screen displays all of the current groups that have been setup on the system. Following a new installation, there are several predefined groups set up as shown in the example below.



Each group contains a list of permissions to the key functionality of the software and each of these permissions can be enabled or disabled as required, creating an access profile that can be assigned to a user.

3.4.4 Editing Group Permissions

To view and edit the permissions associated with a group, choose the desired group from the list and select *Edit*. Note that this action is only permitted if the currently logged in user has permission to administer users. The example below shows the Operator group permissions. Any user assigned to this user group would be limited to running a test program and entering the sub test selection screen.



To modify the access level of a user group, enable or disable the required permissions and then select the *Apply* button. These changes will affect all users that have been assigned to this group.

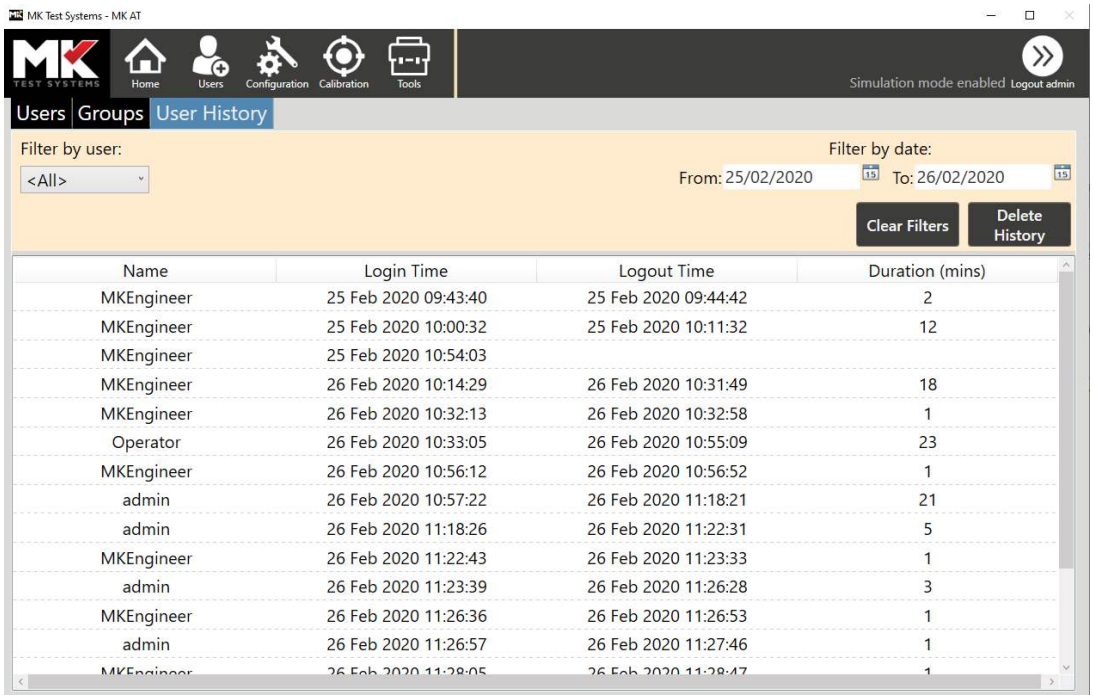
Hardware Configuration Access:

There are two permissions that relate to the access to the hardware configuration screen:

- *Basic Hardware Configuration*: This allows an operator to view the hardware configuration but restricts changes to enabling and disabling Micros and Switching Modules.
- *Detailed Hardware Configuration*: Full access to the hardware configuration.

3.4.5 USER HISTORY

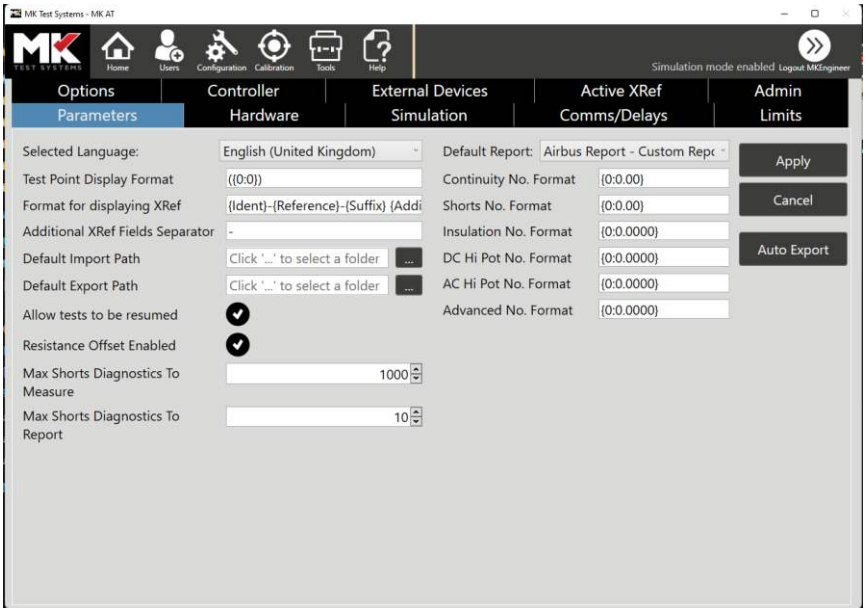
The User History screen displays details of the system usage. The data can be filtered by user or by date, see the example below:



3.5 Configuration 

3.5.1 PARAMETERS

This section allows configuration of parameters that control the MK AT system:



Selected Language: Allows the selection of alternative languages for the Runner.

Test Point Display Format: specifies the display format for connections, typically as a simple integer as shown in the example above.

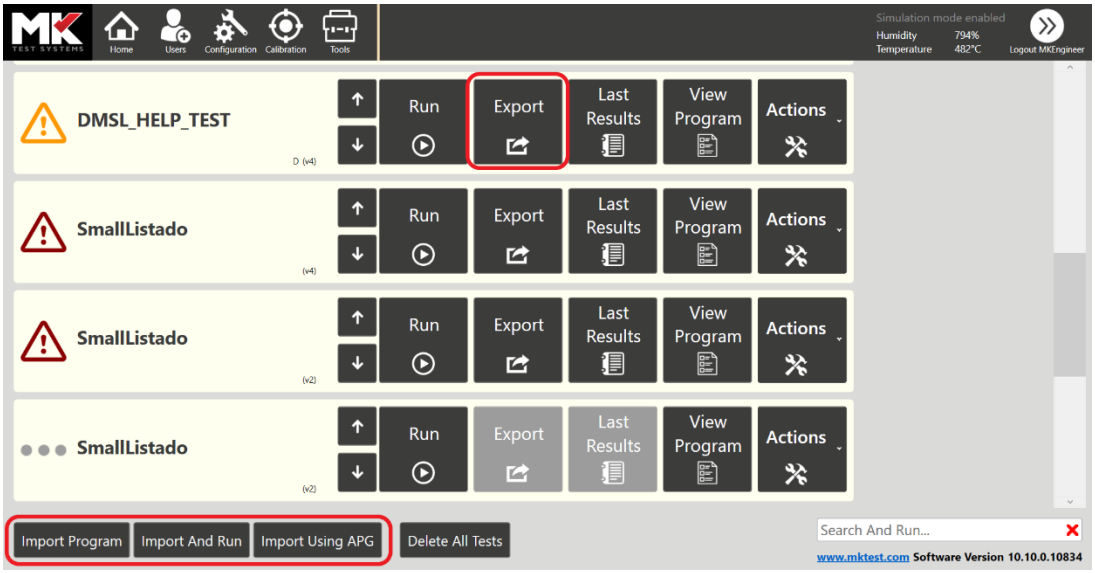
Format for displaying XRef: The XRef is compiled from three components, the Identifier(Ident), the Reference and the Suffix. This parameter allows the ordering of the components to be configured. In the example above the XRef would be *Identifier-Suffix-Reference.*

Additional XRef Fields Separator: Defines the separator character to be used between any additional XRef fields that have been added.

Default Import Path: This is the file path that will be used by the *Import Program*, *Import and Run*, *Import Using APG* functions, shown below.

Note, the Import Using APG function behaves slightly differently. It will use the default import path until the path is changed by the user to an alternative location. Once changed, the new path will persist.

Default Export Path: This is the file path that will be used by the Export function on the home screen, shown below.



Resistance Offset Enabled: If this option is checked, the resistance offsets, saved for individual test points, will be used for continuity measurements. See the section *System Offsets* for more details.

Calibration Card: Specifies the location of the calibration card, where required.

Max Shorts Diagnostics To Measure: Sets the maximum number of diagnostic tests to perform following a failed shorts test.

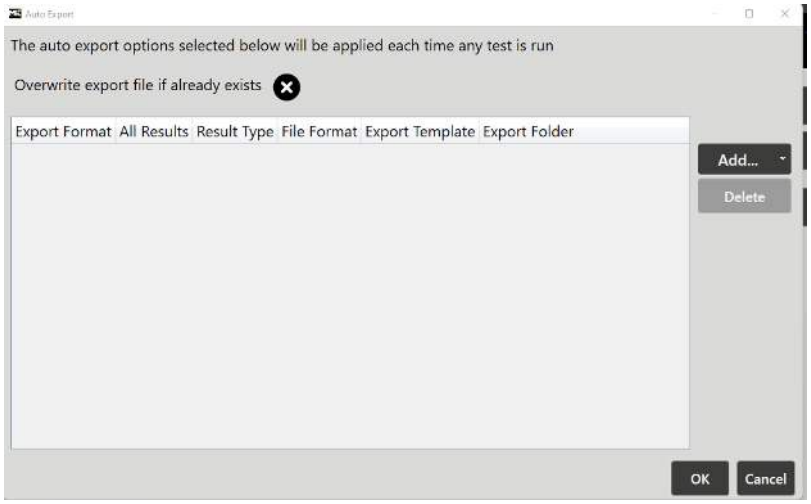
Max Shorts Diagnostics To Report: Sets the maximum number of diagnostic tests to report following a failed shorts test.

Default Report: Sets the default report template that will be used when the Runner displays test results. (*Note: If the default report is defined as a test program option, the report defined by the test program takes precedence*).

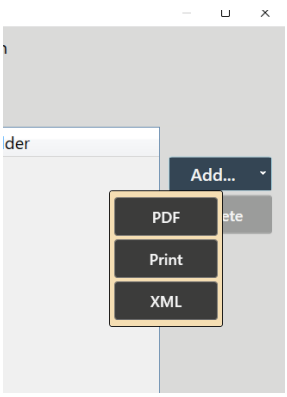
Display Formatting: The display format for each test type can be configured. In the example shown below, Continuity is setup to display to 2 decimal places and Insulation is setup to display to 4 decimal places:

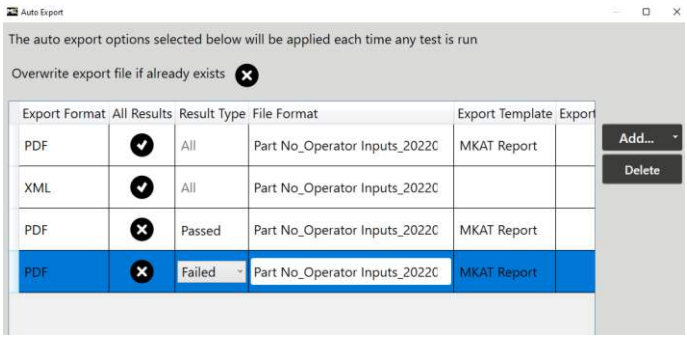
Continuity No. Format	{0:0.00}
Shorts No. Format	{0:0.00}
Insulation No. Format	{0:0.0000}
DC Hi Pot No. Format	{0:0.0000}
AC Hi Pot No. Format	{0:0.0000}
Advanced No. Format	{0:0.0000}

Auto Export: The Auto Export button opens a pop up where the administrator can configure exporting results to a file for every test that runs. This functionality exists in the editor where it can be specified for an individual test program where as in the runner the option is applied to all tests run on the system. On selecting the Auto Export button the following pop up is displayed.

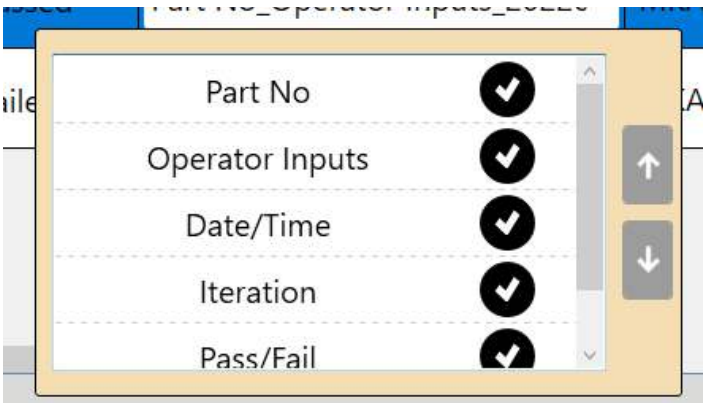


Administrators can select if they require to overwrite a file if the filename being used already exists and to add new rules for exporting files. Selecting add will allow the user to select which file format to use. This can be a pdf, xml or printed directly to the Windows default printer.





For each auto export, when to export the file can be specified. This is always selected by default but unselecting the All Results option allows a result type to be specified. The *File Format* column defines the rules for the file name and from here the user can define what fields are used to build the file name:

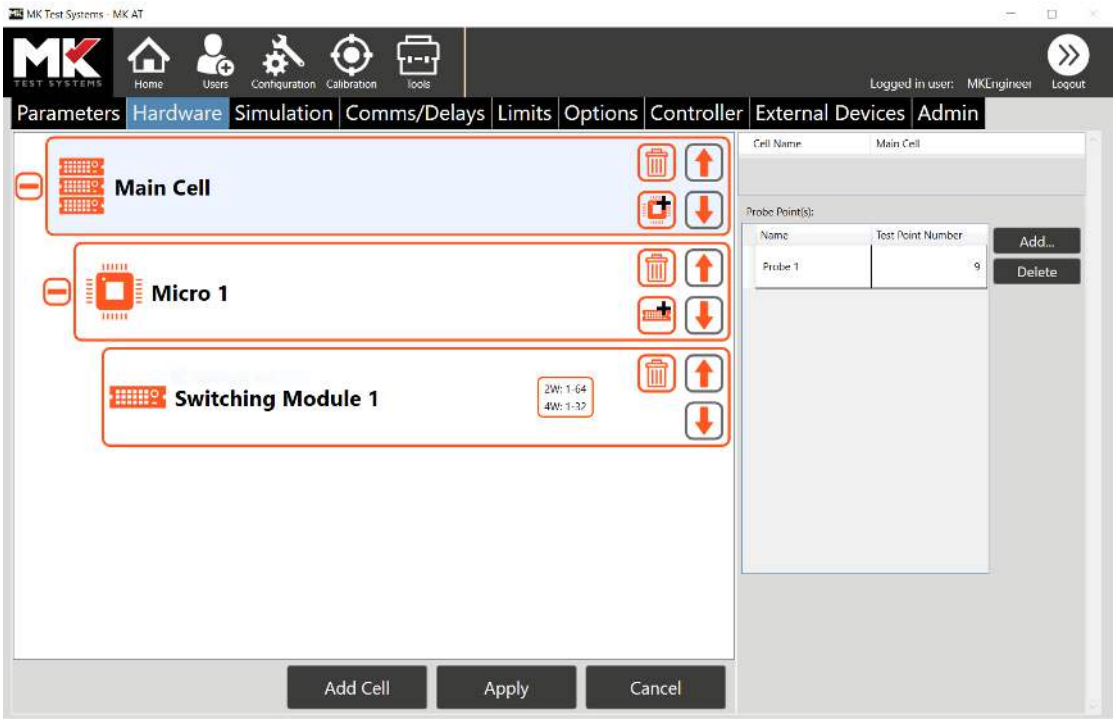


For printed and pdf output the next column allows the user to define the report template to use in generating the content. This can be any of the reports installed on the system. The last option is to specify the location for the exported file.

For systems that synchronise configuration to multiple machines great care should be taken that the specified report layout and file location will be available on all the synchronised runners as it will not be checked when saved on the master that the options are viable on slave devices.

3.5.2 HARDWARE

The hardware configuration can be set up in this section. Selecting the main cell allows the name to be edited and probe points to be added in the right-hand panel. Further cells can be added using the *Add Cell* button.

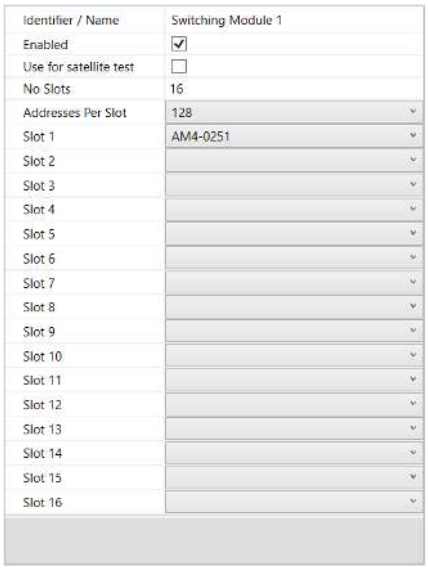


Clicking on the "Add Micro" button enables the addition of one or more microprocessors, which can then be removed by using the "Delete Micro" button. Once a microprocessor is selected, a window on the right-hand side will appear, which allows the user to edit its properties.

Microprocessor Address	Micro 1
Enabled	☑
Measurement Micro	☑
Switching Micro	☐

Similarly, by using the "Add Switching Module" button, one or more switching modules can be added to the micro. To remove a switching module, the user can click on the "Delete Switching Module" button. Selecting the switching module will open a window on the right-hand side where its properties can be edited.

If the user wants to create a duplicate of a module, they can use the "Duplicate" button. This action will result in the creation of a new switching module that has the same properties as the original module. All the switching modules can be removed using the Delete All Racks button.

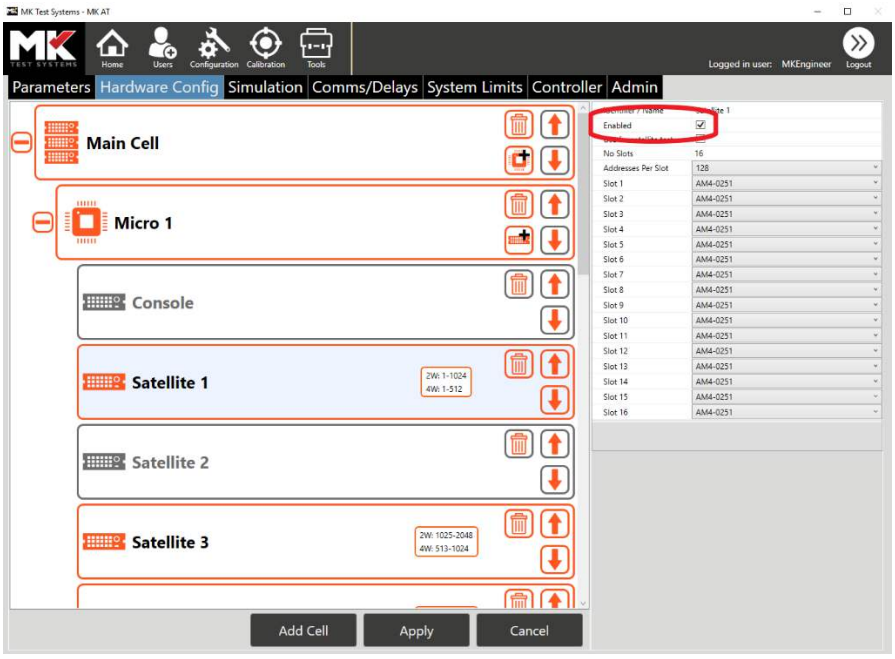


The *Enabled* option can be used to enable and disable switching modules, allowing the same program to be run across different setups. This may be used where there are multiple switching modules set up as satellites.

If the *Use for satellite test* option is selected, the system performs a self-test on the first point of the switching module at the start of each test iteration. This ensures that a remote satellite is switched on before starting a test.

The *No Slots counter* is the total number of card slots available in the switching module. The total number of addresses per slot can be selected form the *Addresses Per Slot* drop down menu.

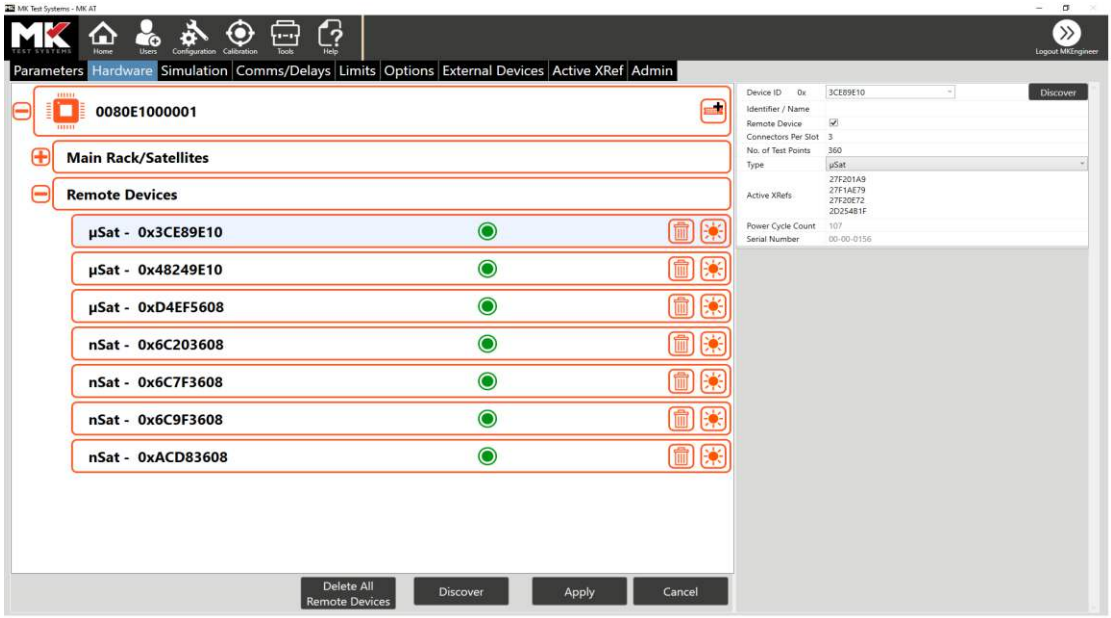
The specific card type for each slot can be selected by clicking on the dropdown menu next to each slot.



In the example above, several switching modules have been set up as satellites. In this case, only satellites 1 and 3 are going to be enabled (using the check box on the right) while the Console and Satellite 2 are disabled. If any changes to the setup are made, they must be confirmed (by selecting the *Apply* button).

The test point values shown for each satellite are automatically updated for 2 and 4 wire, as shown in the orange box.

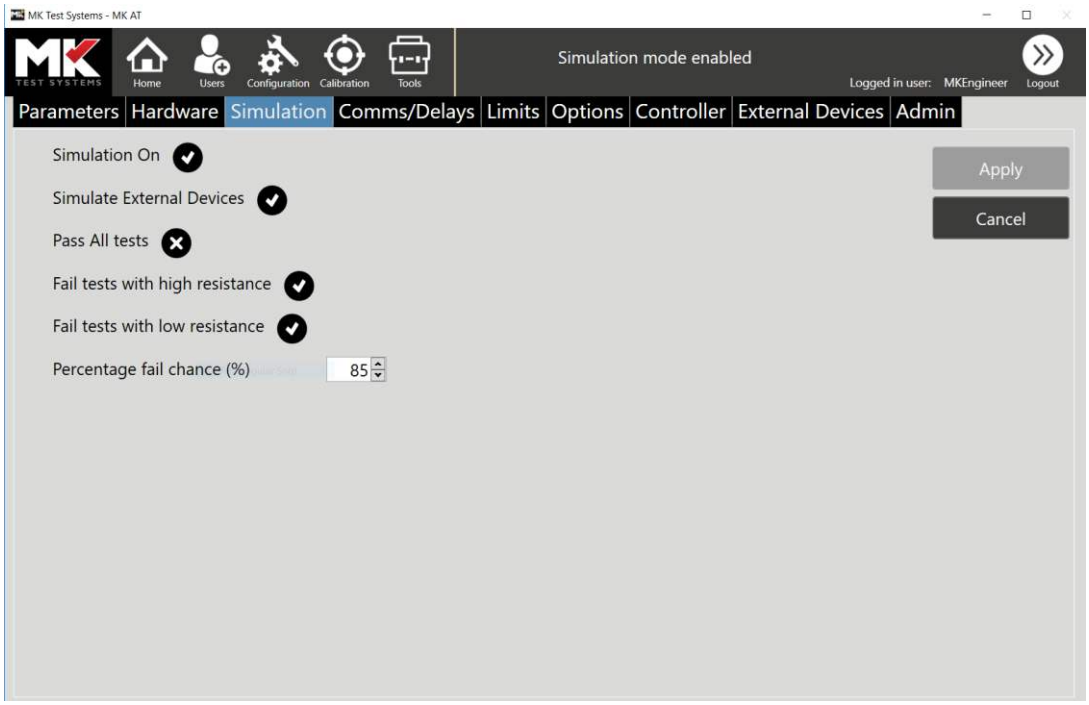
For systems with RTS remote devices it is also possible to view additional information in the right hand panel for connected and powered devices. If these devices also have one or more connected active Xref cables this information is also displayed.



3.5.3 SIMULATION

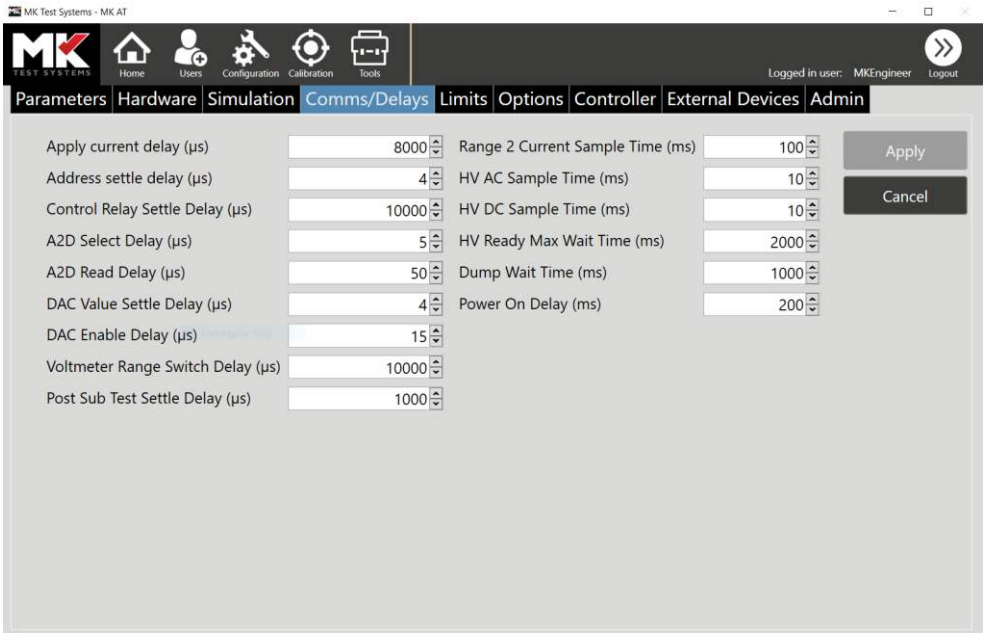
The runner has a simulation mode which allows it to run without connection to physical hardware, for training and testing purposes. This functionality is switched on using the *Simulation On* check box. Connection to external devices such as a thermometer can be simulated by selecting the *Simulate External Devices* checkbox. The remaining options control the generation of the results in simulation mode. *Pass All tests* force all test results to pass and the *Percentage fail chance* option controls the proportion of pass and fail results in simulation mode.

Any changes made to the simulation options must be confirmed by pressing the *Apply* button. Once simulation mode has been activated, the warning message *Simulation mode enabled* flashes in the top panel of the Runner, as shown below.



3.5.4 COMMS/DELAYS

The parameters listed in the *Comms/Delays* section directly affect system measurements and should only be changed under direction from a MK Test Engineer.

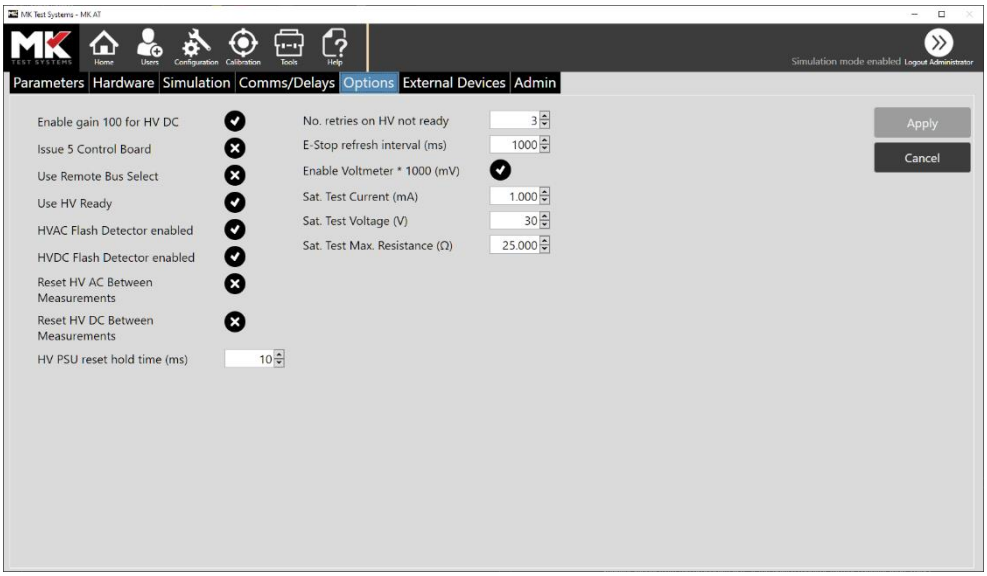


3.5.5 LIMITS

The parameters listed in the *Limits* section directly affect system measurements and should only be changed under direction from a MK Test Engineer.

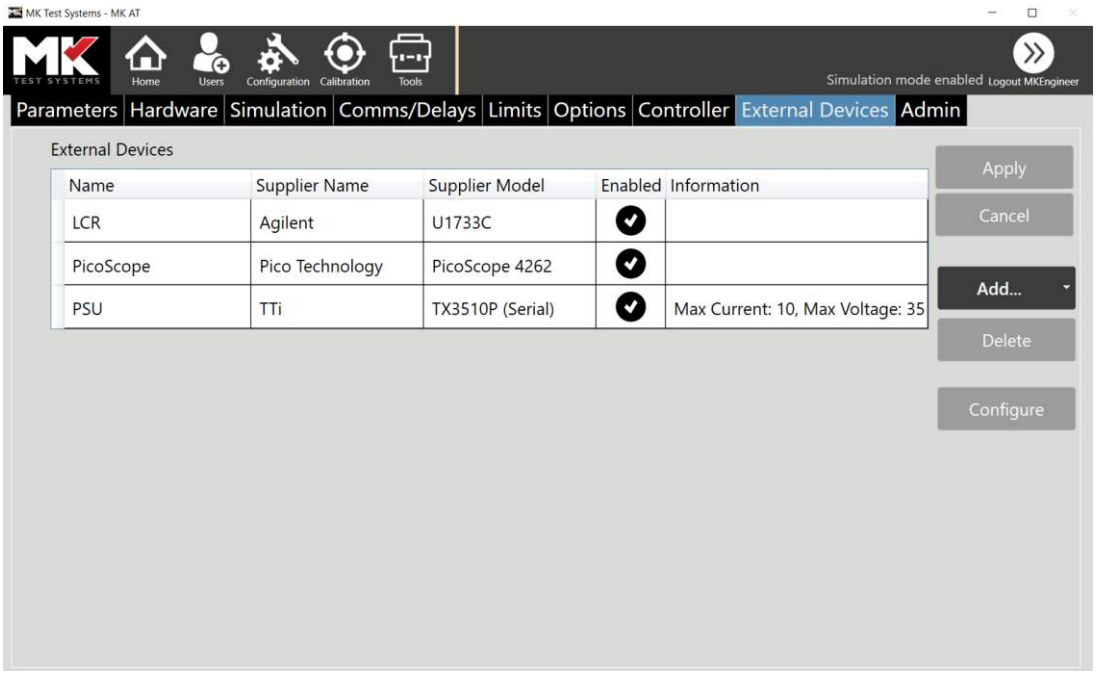
3.5.6 OPTIONS

The parameters listed in the *Options* section directly affect system measurements and should only be changed under direction from a MK Test Engineer.

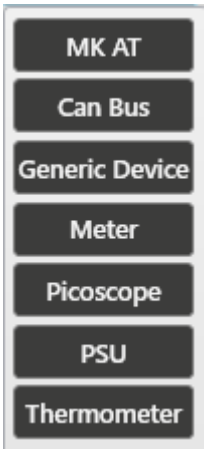


3.5.7 External Devices

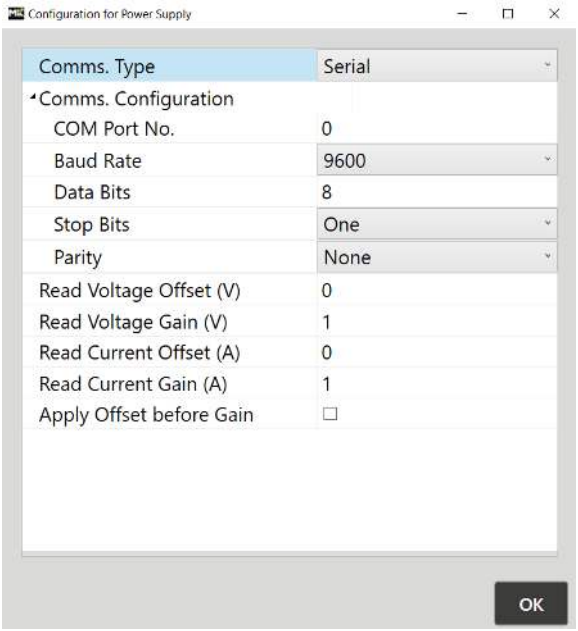
External devices such as LCRs, external meters, or oscilloscopes can be added and configured in this section.



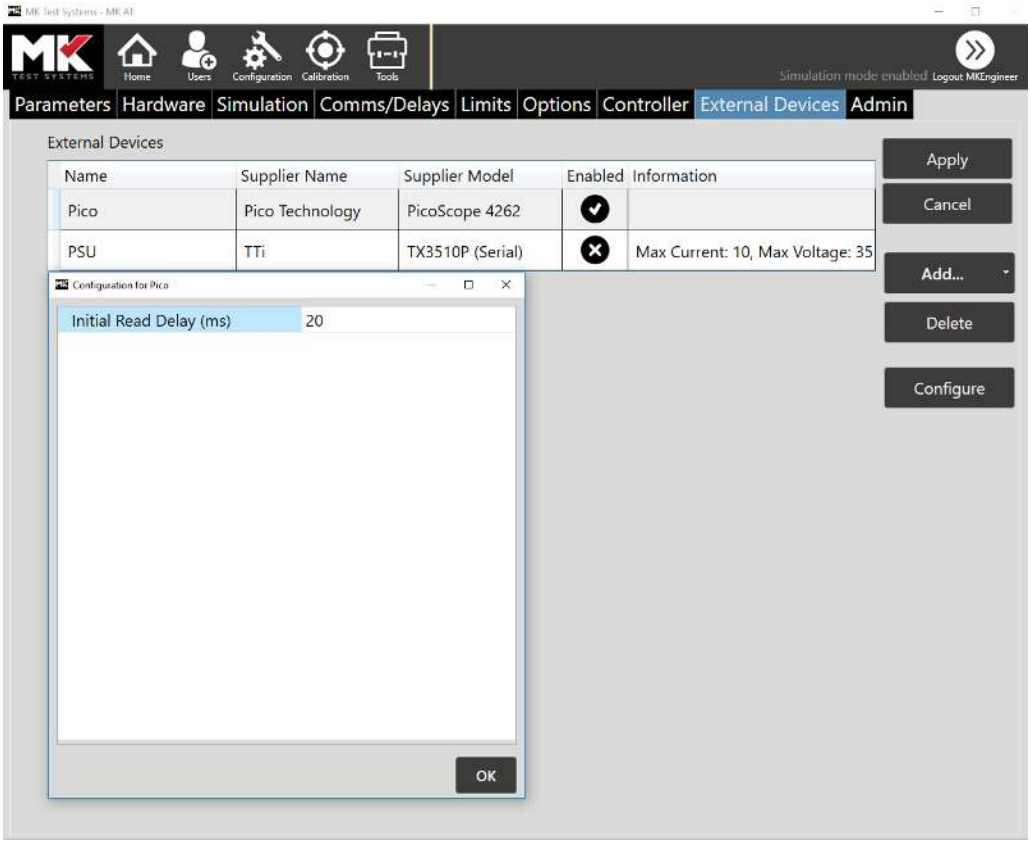
To add a new external device, select the *Add* button. This enables the options shown below:



Select one of the listed options and enter the required details: *Name*, *Supplier Name* and *Supplier Model* from the dropdown lists. If the device requires further configuration, select the *Configure* button and enter the required details. The example below is for the configuration of a serial Power Supply:



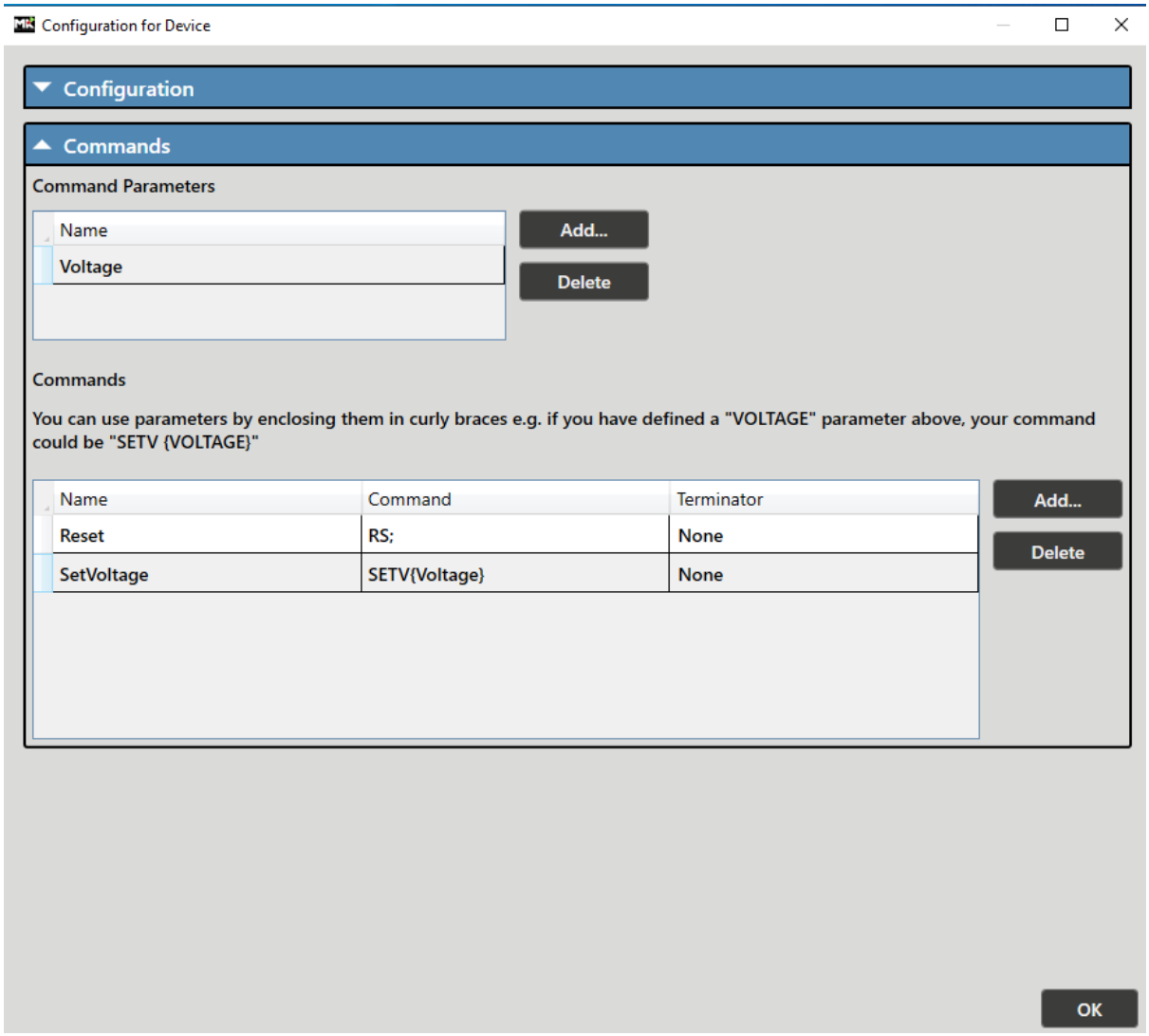
PicoScopes can be configured with a pre-read time delay at device level. The default delay is 30 milliseconds.



All changes must be confirmed using the *Apply* button. External device entries can be removed from the list using the *Delete* button.

3.5.7.1 Generic Devices

The “Generic Device” option allows the user to configure a device with commands not built in to MKAT. The Communication Configuration is the same as other devices but the main functionality and flexibility is in the “Commands” section.

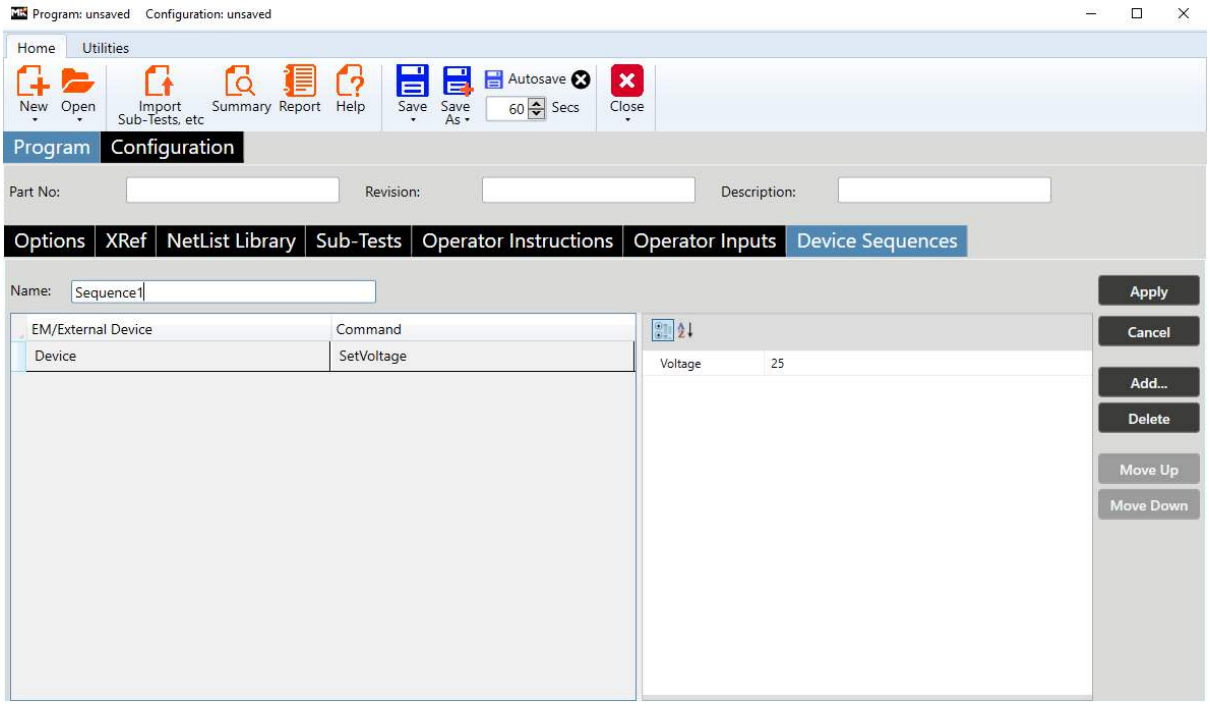


The “Commands” table has 3 columns:

- Name – the string used to identify the commands on screens like the “Device Sequences”
- Command – the command that will be sent to the device
- Terminator – this will be added to the end of the “Command” every time it is sent. Terminator options are: Carriage Return, Carriage Return/Line Feed, Line Feed, None, Tab

Whilst the explicit commands can be set here, if a command can be re-used with different parameter(s) then this can be set up too. The “Parameter” needs to be defined in the “Command Parameters” section which can be used in the commands by putting the name of

the parameter in curly brackets {}. When using the command in the editor or runner, the parameter will be available as a text entry field. When the command is sent to the device the value entered in the text field will be put in place of the *{PARAMETER_NAME}* in the command.

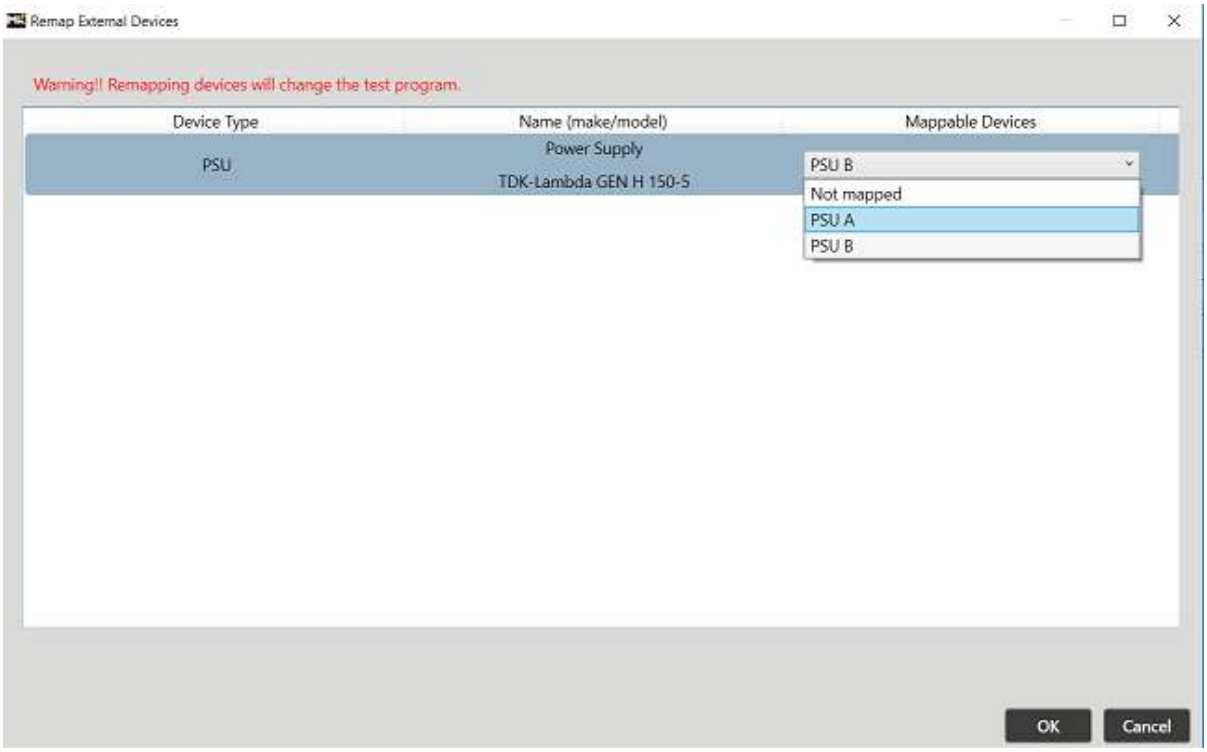


Example: The above would send the command “SETV25”

3.5.7.2 Remapping of External Devices

If a program is opened where the required external device(s) are not available from the current configuration, there is now an option to remap the external device to a compatible external device from the loaded configuration.

- When importing a sub test, any required external devices must be present in the configuration.
- If the configuration file (on the target system) contains one or more versions of the required external device, the user will have the option to remap this device for the imported program. This updates the imported program so that all references to the external device are changed to match the selected device. (This allows sub-tests to be imported onto a system that already has a compatible external device set up, without having to make further changes)



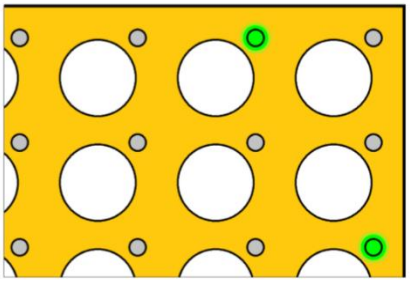
- In the example above, the imported program requires a *TDK-Lambda GEN H* power supply.
- The target system has two power supplies that match, *PSU A* and *PSU B*, as shown in the Mappable Devices column.
- If the operator selects *PSU A*, for example, all references in the imported program will be automatically updated to reference this power supply.

3.5.8 ACTIVE XREF TROLLEYS

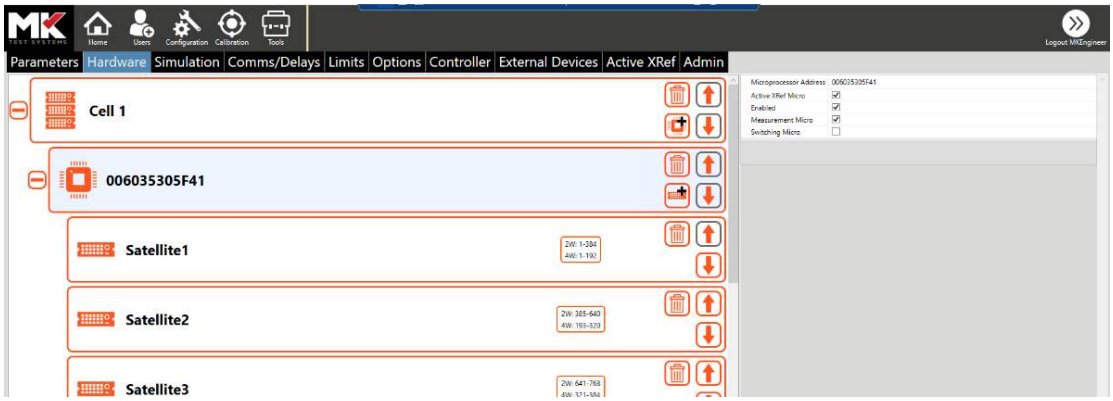
This feature removes MKAT test point references from the test program and replaces them with trolley type and trolley pin number.

The concept of an intermediary connection module or *trolley* is utilised, each trolley having a defined number and type of connectors and is assigned a *location* or *type*. The UUT is connected to the trolleys and the system will automatically indicate (using LEDs) which trolley connectors must be connected to the MKAT system. These connections can be made to any available test position on the MKAT system without the need to change the test program. Further details can be found in the *Active XRef Guide.*

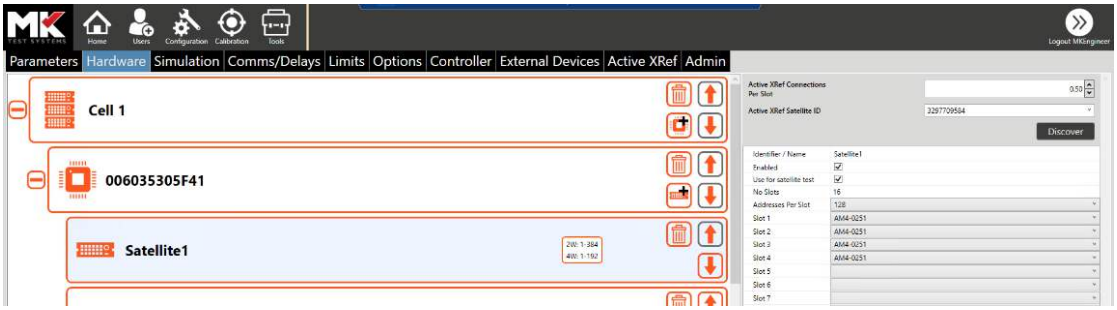
Trolley LEDs indicate the trolley connectors required at run time:



The *Microprocessor Address* field requires the address of the master controller. This is a module that coordinates the Bluetooth comms between the trolleys and the satellites. The *Active Xref Micro* option enables Active Xref functionality.



Each satellite is configured with a unique Active Xref Satellite ID. The IDs of all available modules can be selected from a drop-down list which is populated by selecting the *Discover* button.



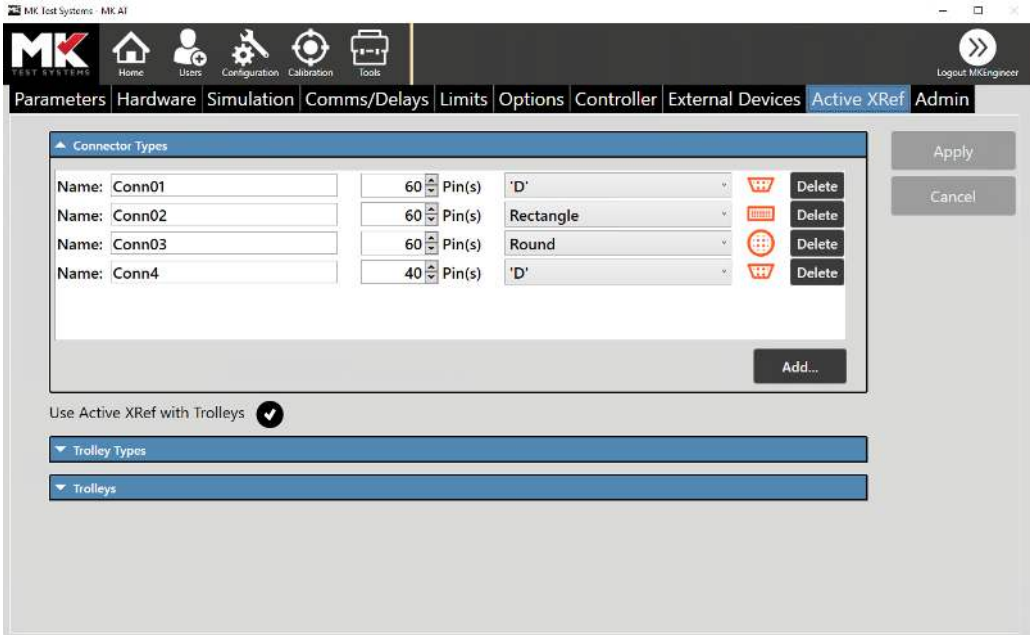
The *Active XRef Connections Per Slot* field can be configured here. Typical use: ZIF connector that connects 2 relay cards (4 D connectors) to 2, 60 pin circular connectors, so the value in this case is 0.5.

Typical trolley, 20 x 60pin connections

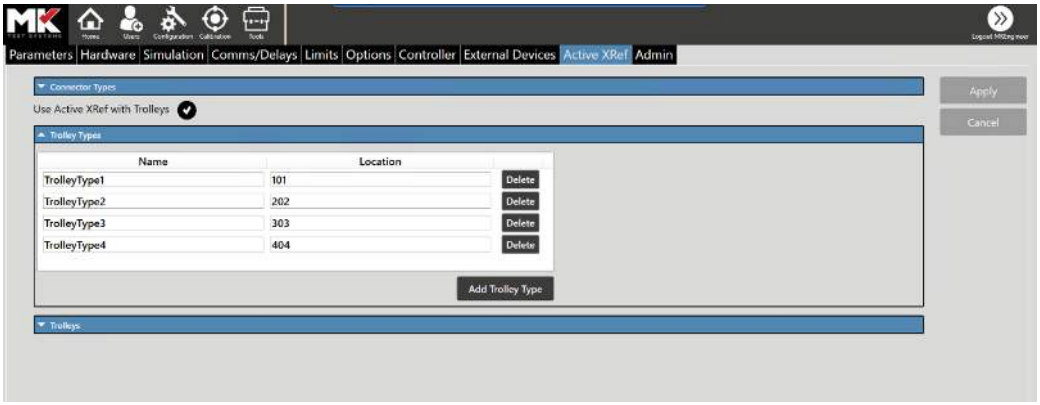
Control module fitted inside each trolley

Active Xref Setup Tab

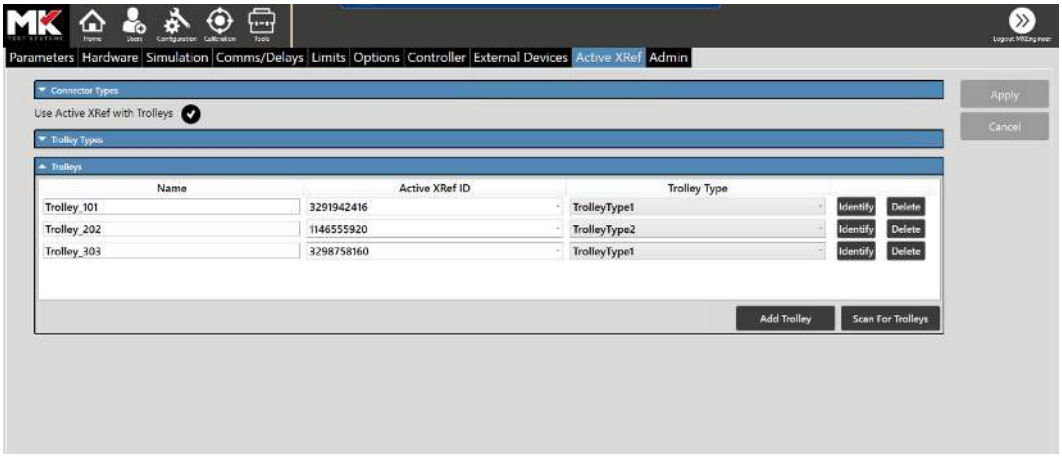
Connector types:



Trolley Types:



Trolleys:

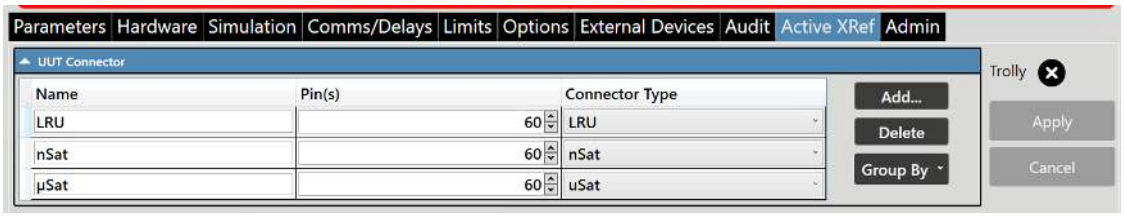


Multiple trolleys can be assigned to one trolley location/type. E.g. multiple 60 pin x 20 connector trolleys can be set as location/type 101

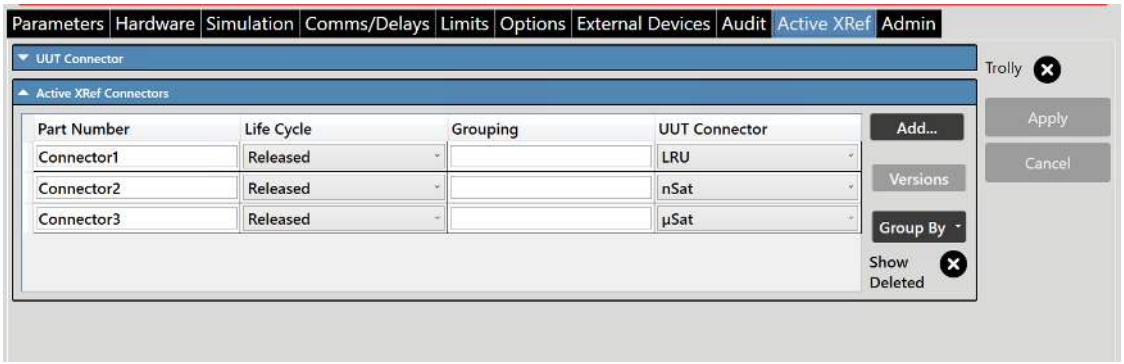
3.5.9 ACTIVE XREF CABLES

As well as the trolley option described above, MKAT also supports Active Xref harnesses. This is where an ID chip is embedded in a connector that can connect to the UUT and RTS connector. As with the trolley option, there is some configuration required to map IDs and pins.

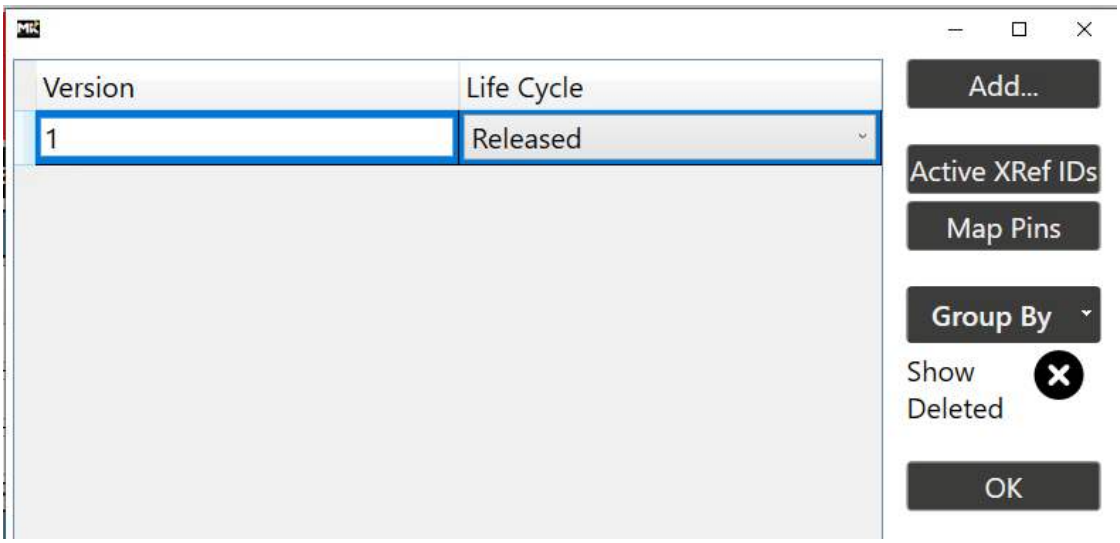
As with the trolley option, the first stage is to define the connectors used in the system and provide them with a suitable user defined name.



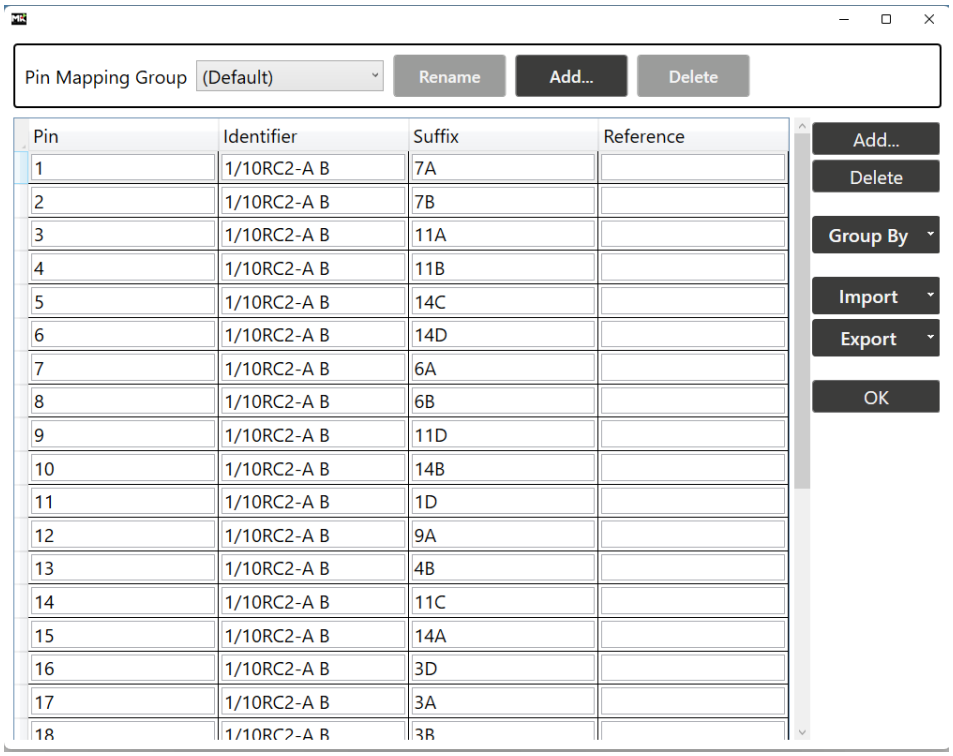
Once these connector types have been defined, a type of connector can be created. This provides the ability to associate user defined part numbers, optionally a group id, and a lifecycle state which can be one of *New*, *Released* or *Deleted*.



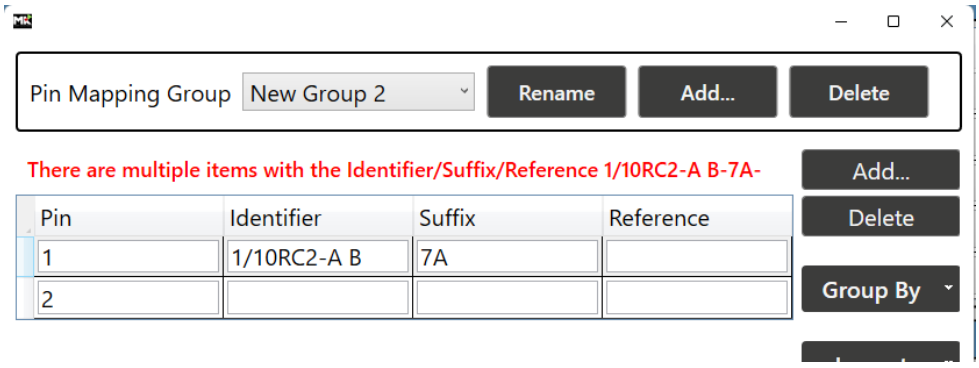
For a selected Part Number, the system can have one or more versions, again in any of the defined lifecycles states:



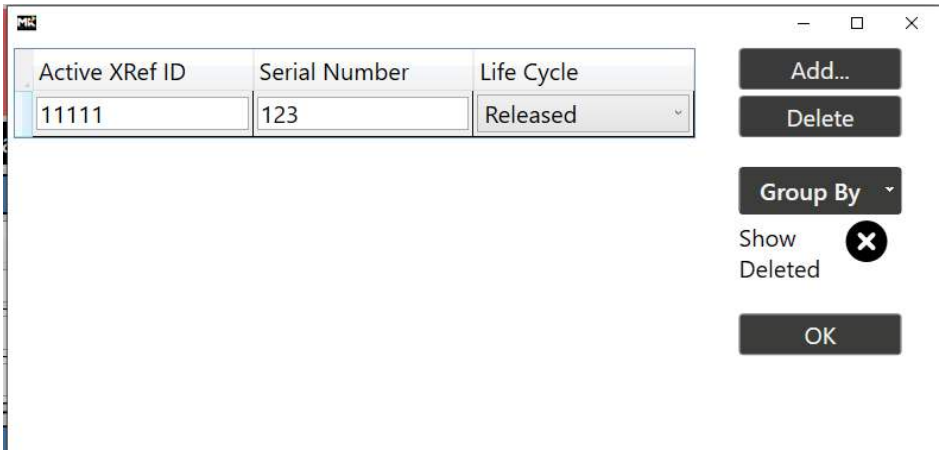
Each version can define the Active Xref IDs associated with the part number and version as well as the pin mapping used by this part number. When a version is released, its pin mapping cannot be changed but Active Xref IDs can be updated. The user can type a pin mapping, or it can be imported & exported.



Groups of pin mappings can also be created for each connector but these must contain unique Identifier and suffix.



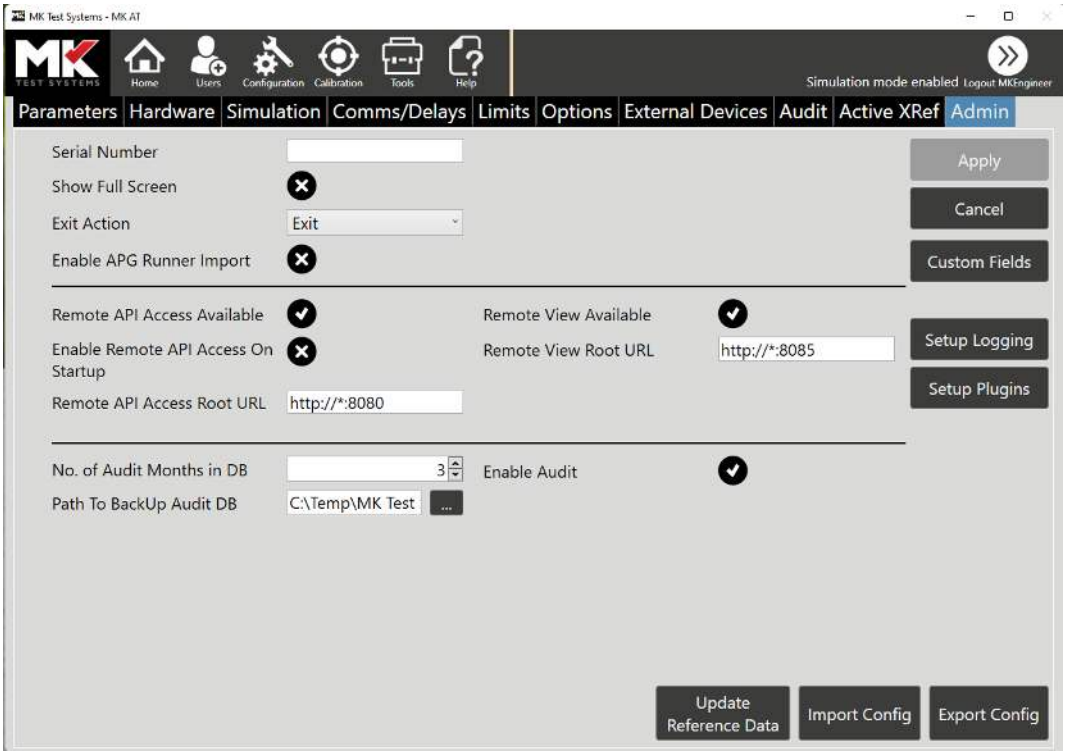
Active Xref IDs can be edited in all lifecycle states and have an optional serial number field



The Active Xref data can be edited in the runner or the editor with one important difference. The runner is connected directly to the back-end database and as such all saved changes are saved directly to the database. To avoid any calls over the remote API being used when the configuration is part way through a change, the API is disabled when logging into the runner to make these changes. Once all changes have been made, the API (if used) can be reenabled to work with the new configuration. The Editor is not connected to the database and provides a means of updating the configuration offline. Once a new configuration is complete, the user can log into the runner and upload the new configuration.

3.5.10 ADMIN

System controls:



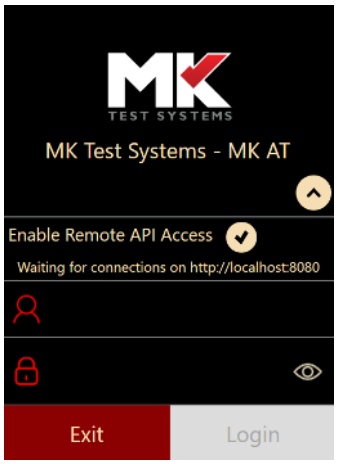
Serial Number: An identifier for the test console which is used in exported data

Show Full Screen: Toggles full screen mode for the Runner.

Exit Action: Action to follow when exiting the Runner. Choose from *Exit, Shutdown, Hibernate* and *Log Off*.

Enable APG Runner Import: This option allows programs to be created automatically using the APG, directly from the Runner. Once enabled, a button called *Create Test Program From APG* appears on the Home screen after the next log in.

Remote API Access Available: This option enables remote API access, allowing the system to be controlled by third party software. If checked, the option *Enable Remote API Access* appears on the login screen. If this is enabled, a message is displayed showing the root URL that connections can be made on.



Enable Remote API Access On Start-up: Allows API access to be enabled automatically when the Runner is launched. The option *Enable Remote API Access* on the login screen will be enabled automatically.

Remote API Access Root URL: If remote API Access is required, the root URL is specified here.

Remote View Available: Enables remote view. See the remote view section below for details.

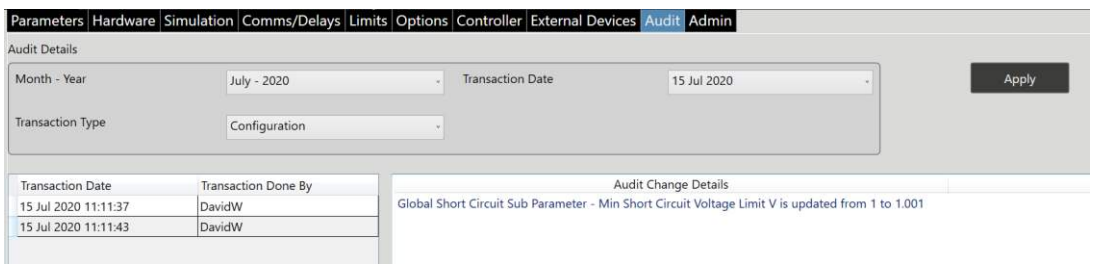
Remote View Root URL: If remote view is required, the root URL is specified here.

Update Reference Data: This function allows missing or amended commands for external devices to be imported into the system, without the need for a software update.

Import Config: Import an existing configuration file. The existing configuration will be overwritten, so export it first, if it needs to be saved.

Export Config: Export the current configuration and save for later use.

Enable Audit: Enables or disables detailed logging of changes made to the system.

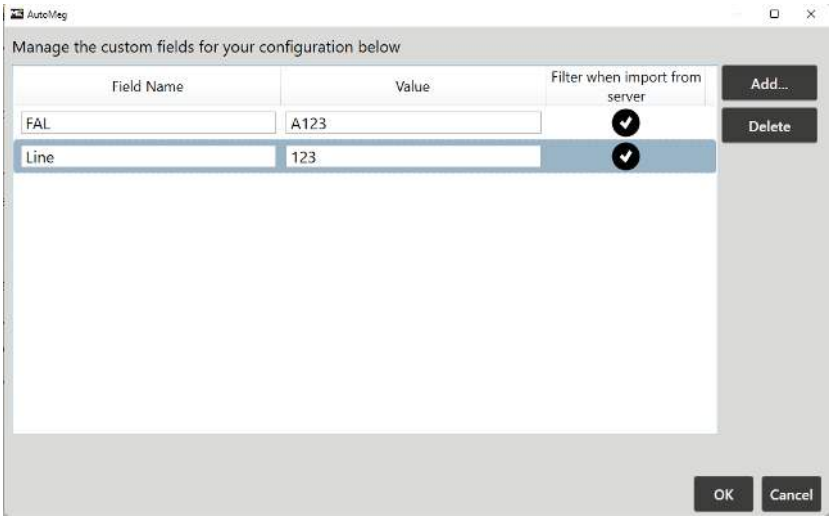


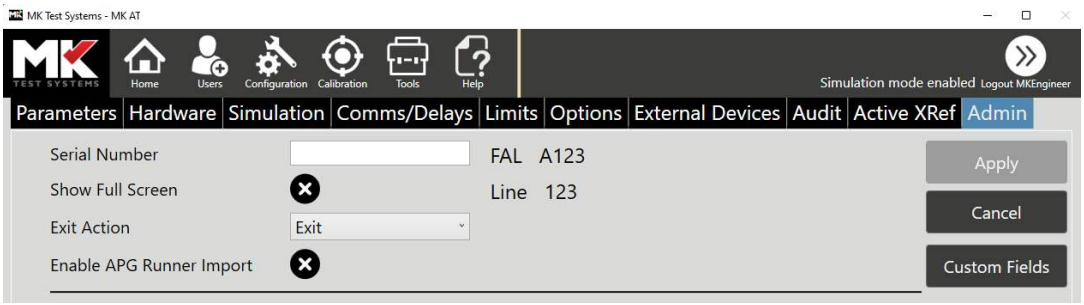
Audits will show details of what was changed, by whom and when.

***No. of Audit Months in DB**:* The number of months' worth of data held in the current database before backing it up.

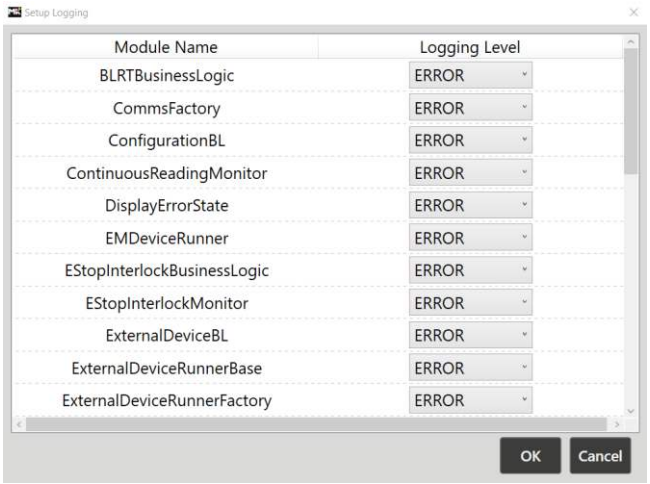
Path to Backup Audit DB: The location where the backups will be stored

Custom Field: As well as the system serial number a new option as of version 10.18 is a to add user defined fields. These fields can help the user identify locations where a console is deployed and can be utilised in systems that downloading of programs from a central server as the additional fields can be used to limit the available programs to download.





Setup Logging: This button opens the *Setup Logging* window:

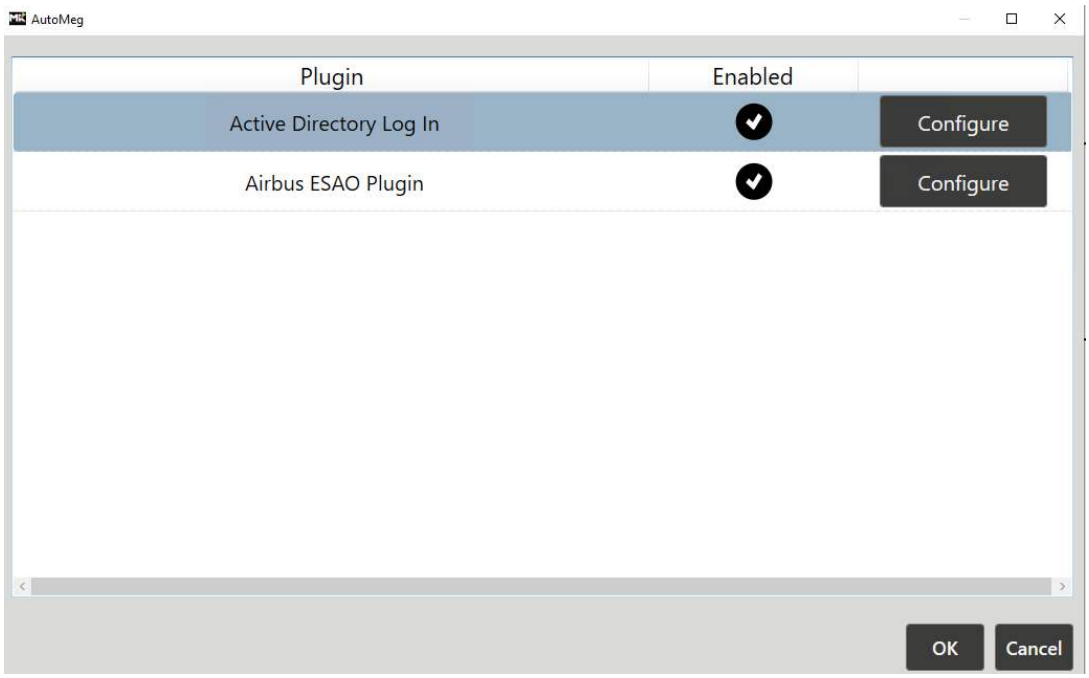


For each module listed, a logging level can be selected from the dropdown menu. This feature should only be used under guidance from a MK Test engineer.

3.5.10.1. Plugins

Plugins are modules that can be added to the MKAT software package to enable support for specific functionality. For example, the Active Directory plugin in the example below adds support for Windows Active Directory authentication when logging into the Runner.

Setup Plugins: This button opens the *Setup Plugins* window:



Plugins can be enabled or disabled as required using the *Enabled* check button. The specific configuration of each plugin can be accessed using the *Configure* button.

Plugins are installed as part of the MKAT software installation and then enabled and configured where required. Any subsequent updates to the MKAT software will automatically update the plugin and no further action is required.

However, some plugins are designed to a particular customer's requirements. In this case, when subsequent updates to the MKAT software occur, a new version of the custom plugin will be supplied as a library file (.dll) and this file will need to be copied to the plugins folder shown below after the MKAT software update process is complete.

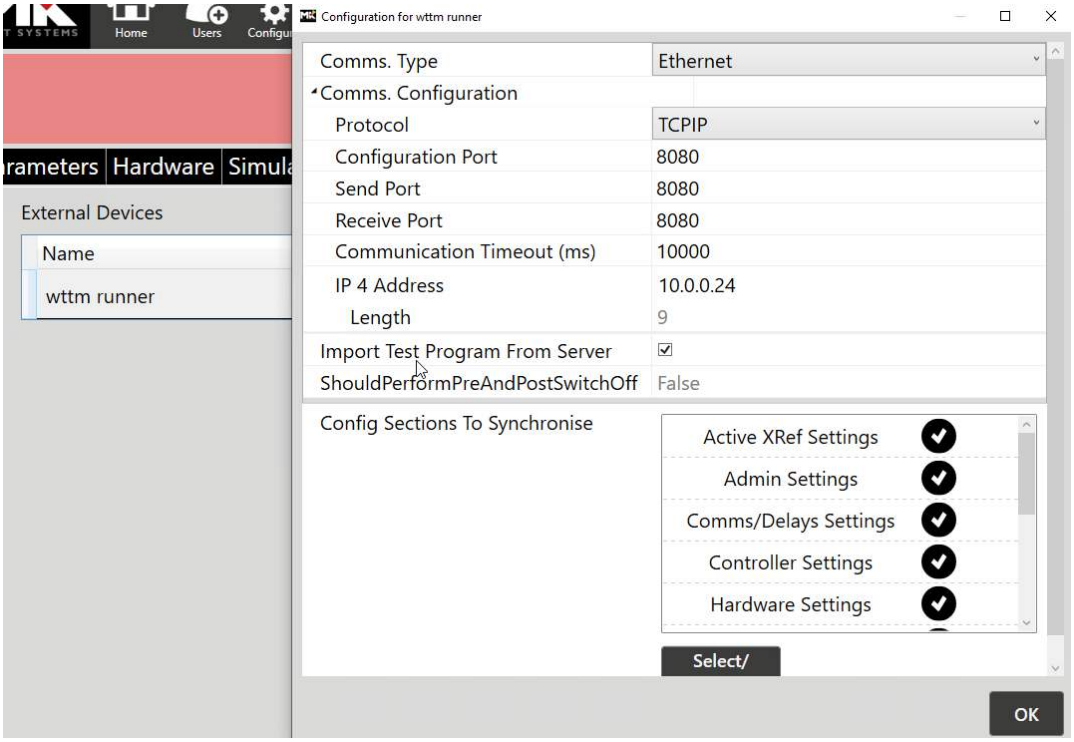
C:\Program Files\MK Test Systems\Plugins

3.5.11 Synchronising Configuration

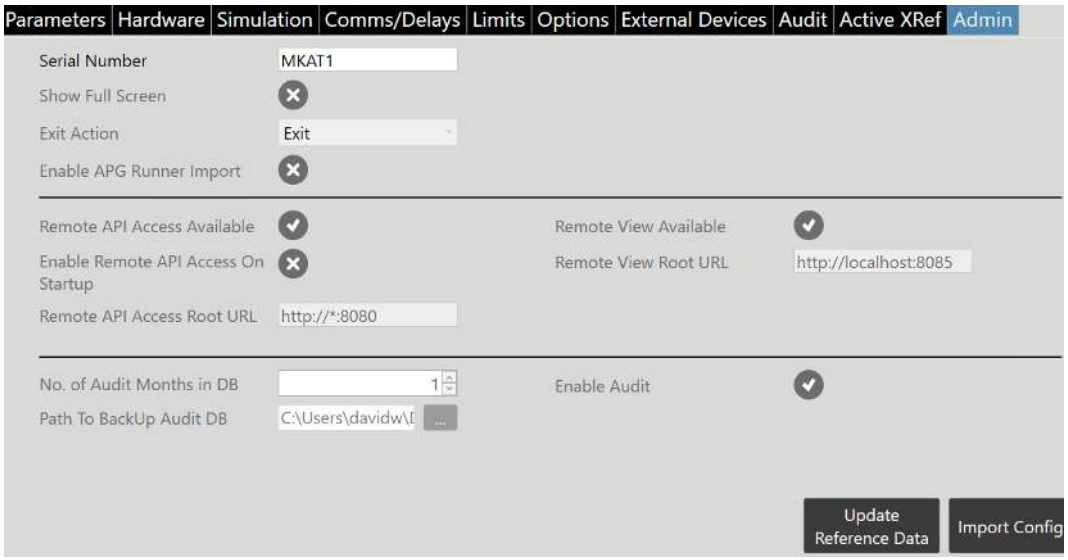
As of version 10.14, a new feature has been added to allow synchronisation of the system configuration between multiple MKAT runners. This is achieved by defining one MKAT runner as the master and then defining this master as an external device on each of the linked slave runners.

One or more sections of the configuration can then be selected for synchronisation. Items that are never synchronised are the name of the MKAT device and calibration data.

Once added as an external device on the slave, the sections to be synchronised are selected, along with the option to pull test programs from the master MKAT:



Any sections of the configuration that are set up to be synchronised become non editable on the slave runner. In the example below, *Admin Settings* are selected to be synchronised:



3.6 Calibration

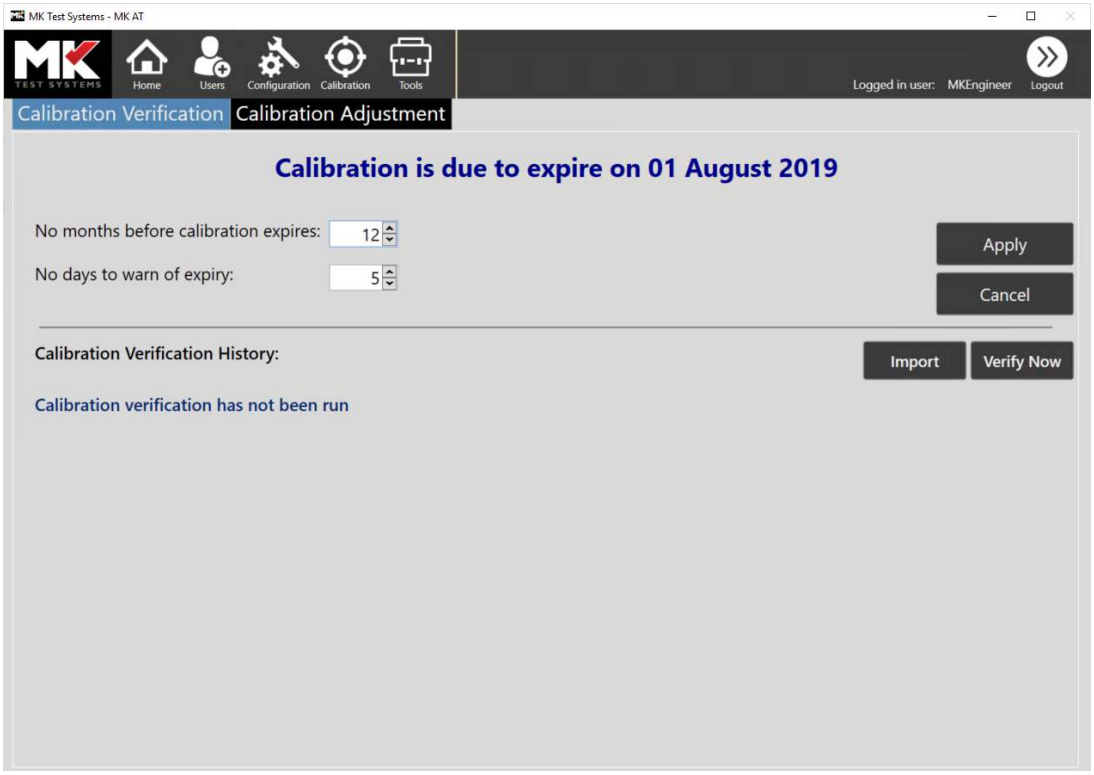
Calibration should only be completed by trained and authorised persons. Please contact MK Test Systems for more details.

3.6.1 VERIFICATION

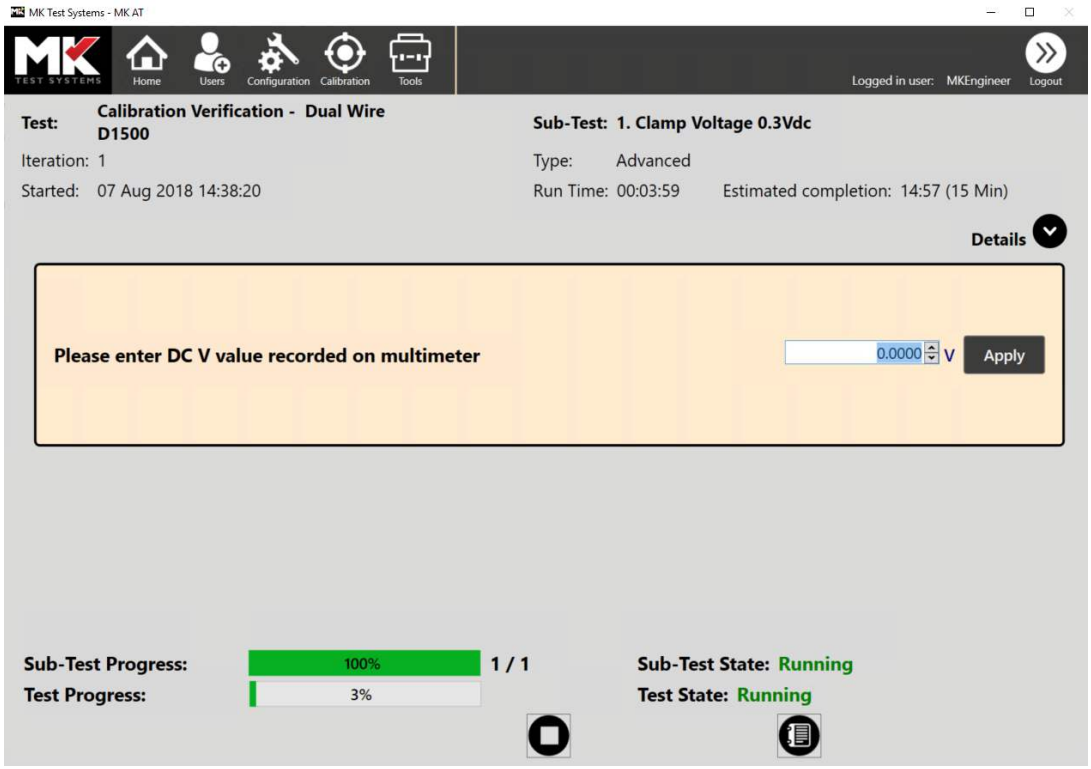
Verification of the calibration should be carried out regularly - typically once a year, prior to the expiry date displayed on the system. The verification process is used to confirm that the system is still within tolerances but does not actually adjust the calibration values.

The calibration expiry date is displayed at the top of the window, as shown below. This message turns from blue to red several days prior to the expiry date, as a warning. The number of days can be configured by entering a value into the *No days to warn of expiry* box.

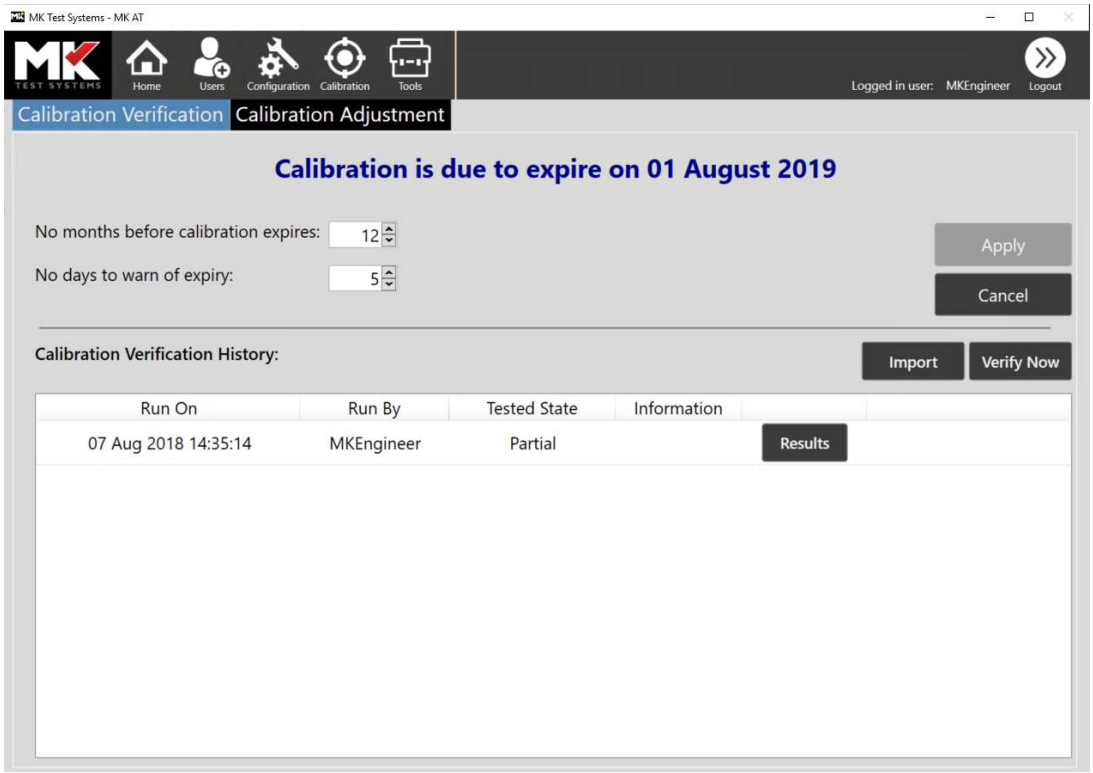
The calibration expiry period can be set by entering the desired number of months into the *No months before calibration expires* box.



Calibration verification is performed by running a verification program on the Runner, then comparing the results with the expected values. The verification program will be supplied with the system and will be run in the factory before the system is released. To import a verification program, select the *Import* button and navigate to the correct program. Then select the *Verify Now* button to begin the process. Run the program by selecting the *Run* button. The program will lead the engineer through the process of connecting the calibration adaptor and multi-meter to the system and entering the measured values. Once the measurement is entered, the *Apply* button is selected to confirm the reading and move onto the next one, as shown below.



Once the verification program is complete, a new entry appears in the Calibration Verification History section, as shown below. All subsequent verifications will be added to this list, forming a history of system conformity.



The results are now manually compared with the expected values. If they fall within the specified tolerances, a calibration certificate can be issued. (A template for the calibration certificate is available from MK Test upon request). The next calibration verification date can now be set, typically one year from the date of the last verification. This can only be achieved from the Calibration Adjustment screen by making a change to a *gain* or *offset* value and selecting the *Apply* button. (If no adjustment is required, a value can be amended and then the change reverted before selecting the *Apply* button).

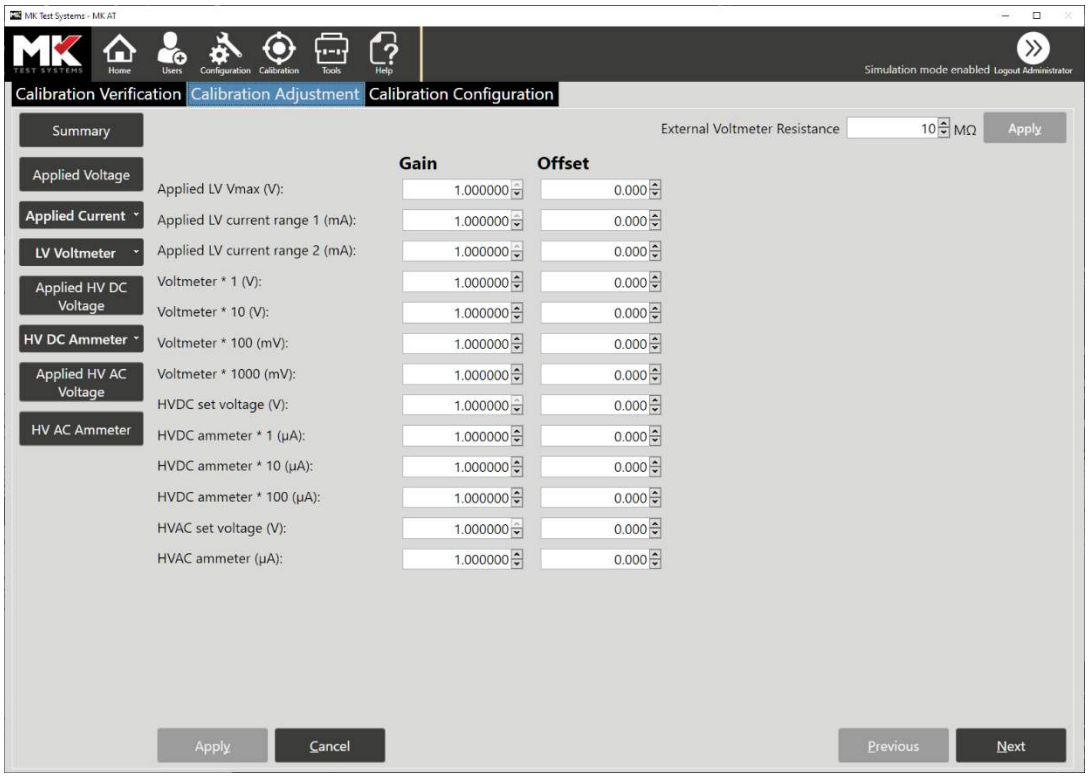
3.6.2 ADJUSTMENT

Adjustment is used to set the *gain* and *offset* of an MK AT. This correction is usually configured at MK Test systems factory, however there may be times when a new calibration adjustment is needed. A calibration board should be used, and relevant cables connected to a calibrated multi-meter.

Turn the MK AT off. The calibration board can then be connected to the card being used for calibration (this card must be set in the parameters tab in configuration). Position the multi-meter so you can read the values without having to touch the multi-meter. Switch on the MK AT system and open the runner software.

Under calibration, you can set the adjustments manually. Follow the instructions on each screen. Click *next* to progress.

Each calibration test will ask you to set the reading type on the multi-meter. Begin the reading - you will be asked to manually input the reading given on the multi-meter.

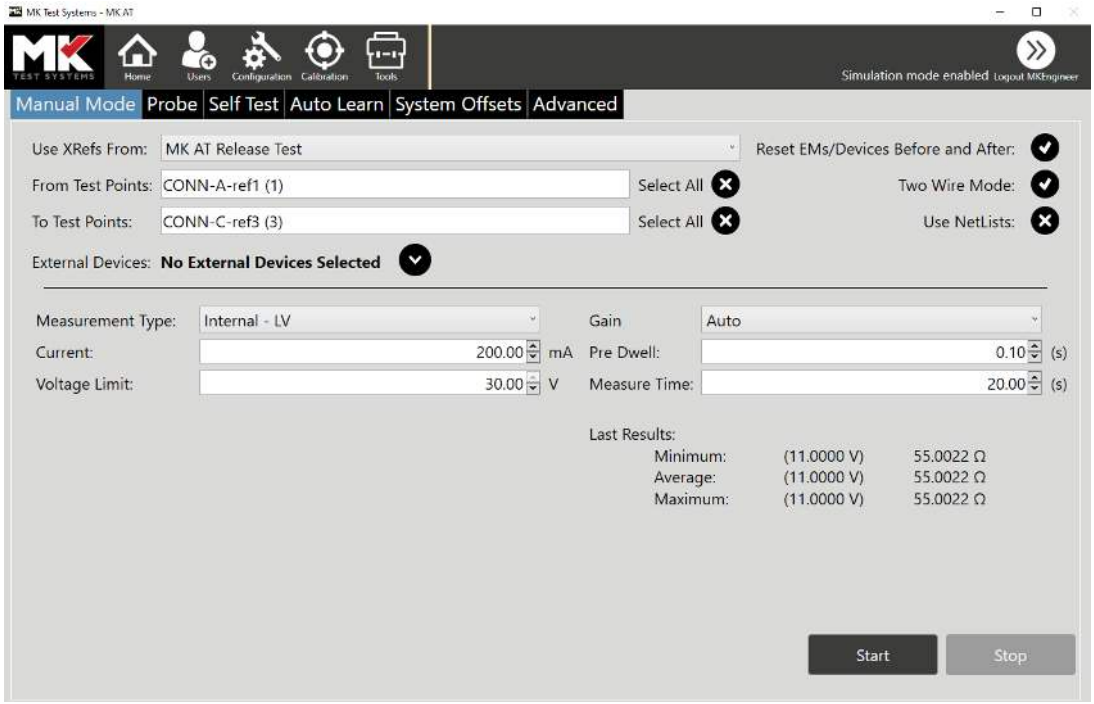


3.7 Tools

The tools menu, shown below, can be accessed from the home screen by selecting the Tools icon. Note, access to this feature is restricted by the *Show Manual Options* permission.

3.7.1 Manual Mode

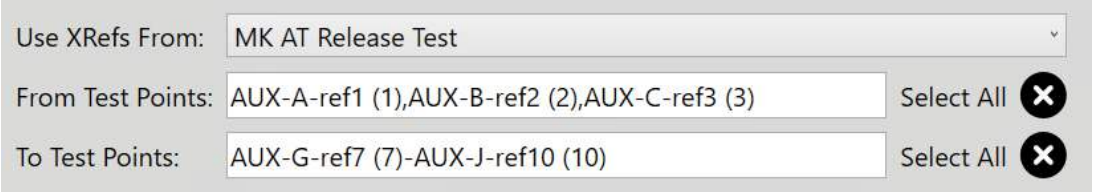
Manual Mode allows an operator to make any type of measurement and setup *ad hoc* device sequences and can be used to diagnose faults. Also, if your system has external devices, any external energisation and or switching can be set up to match the automated testing and run during a manual test.



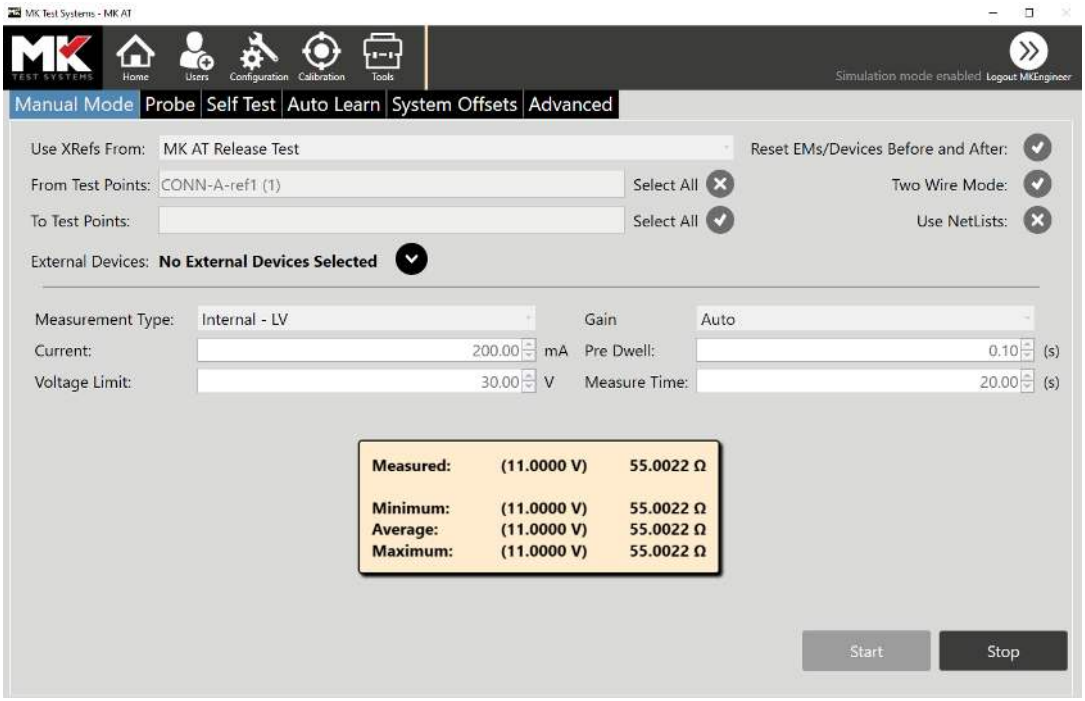
The *From Test Points* and *To Test Points* can be entered manually, or a *net* from any currently loaded test program can be chosen by selecting the *Use NetLists* option, then clicking on the edit button next to the *NetList From* or *NetList To* text boxes.

Alternatively, the XRefs from any loaded test program can be displayed alongside the test point numbers (which are shown in brackets). To do this, select the relevant test program from the drop-down list labelled *Use XRefs From.* In the example above, the XRefs from the test program *MK AT Release Test* are being applied to the *From* and *To* fields.

Multiple test points can be entered in either field by entering a comma between values or a range of test points can be entered using a hyphen. In the example below, the test will be performed from test points 1, 2 and 3 to test point range 7 to 10.



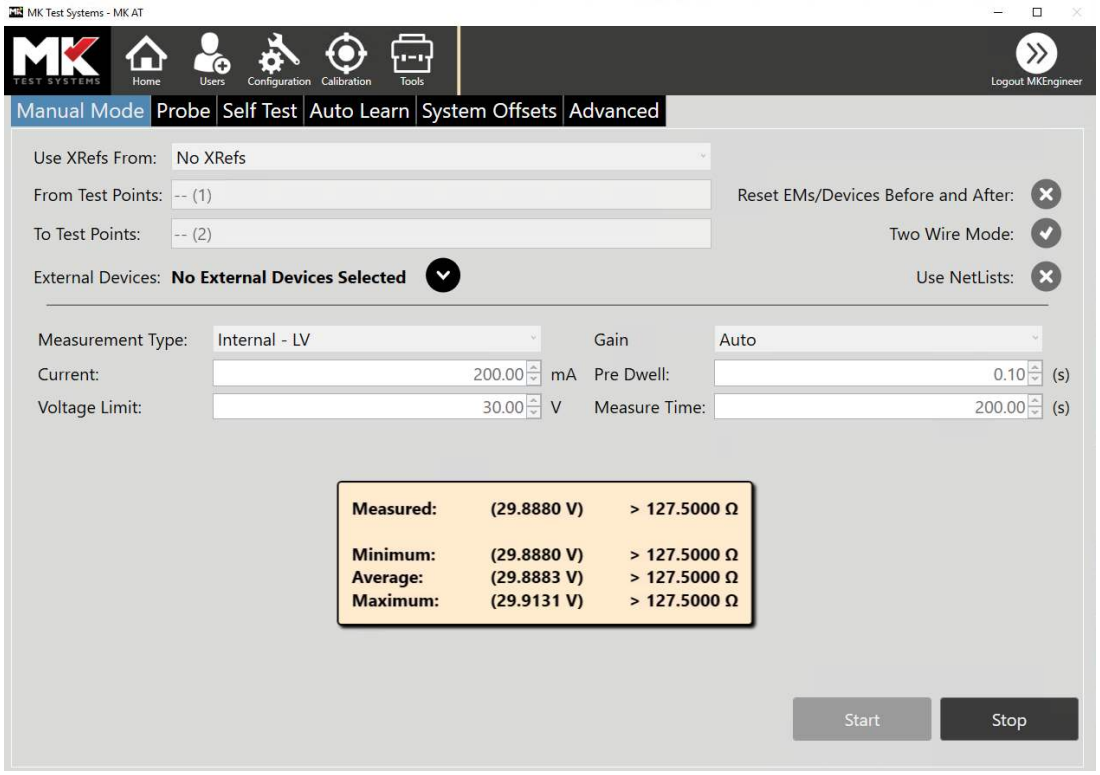
The *Select All* option can be applied to either the *From* or *To Test Points* fields. This option automatically selects all other test points in the system configuration. In the example below, resistance between test point 1 and all other test points in the system configuration is being measured.



Relays and external devices can be reset before and after each test using the *Reset Ems/Devices Before and After* option. The *Two Wire Mode* option toggles the system between two and four wire mode.

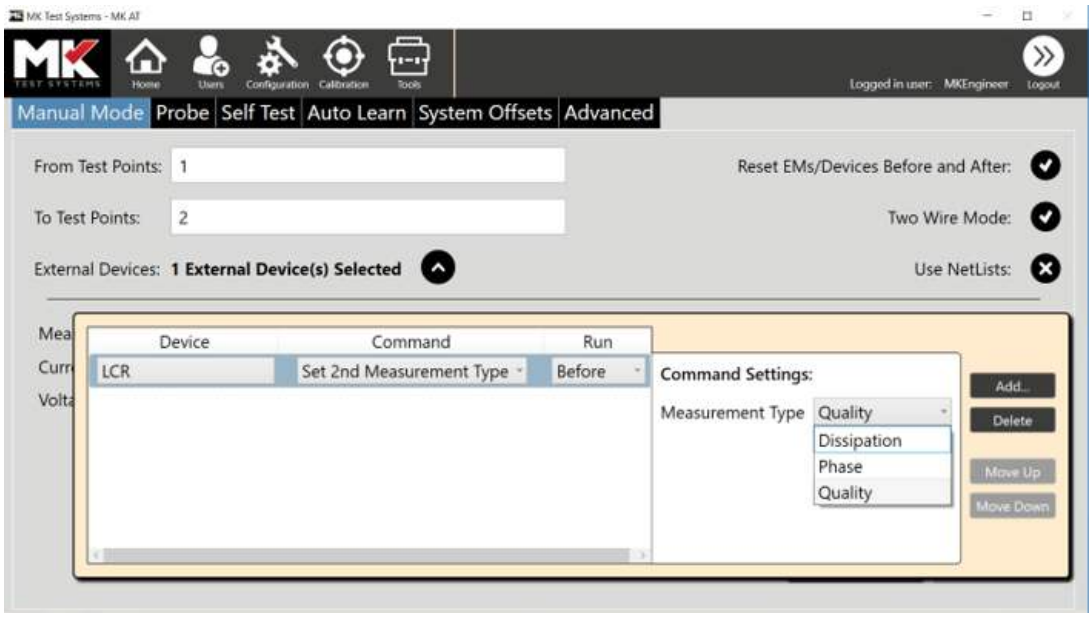
To set up the manual test, select a measurement type from the list and enter the *Current*, *Voltage Limit*, *Pre Dwell* and *Measure Time.* Click the *Start* button to begin the test. It will stop automatically after the measurement time period but can be terminated earlier using the *Stop* button.

For Internal LV tests, where the voltage reading is greater than 85% of the *Voltage Limit*, manual mode will report the *max measurable resistance*. The example below shows a manual measurement where the voltage limit of 30V is reached at 200mA:



External Devices:

If you wish to add an external device sequence, select the *External Devices* drop down. This will show the following screen where you can add the device commands you wish to execute:



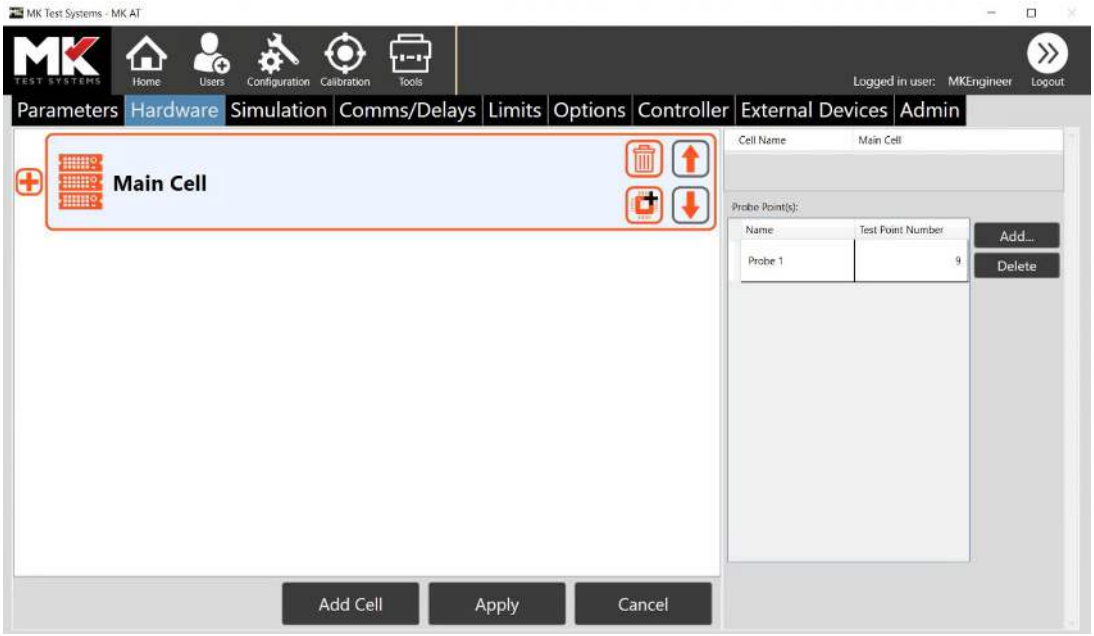
To add a device, select the *Add* button. Select a device from the list of available devices. A list of relevant commands will then be available from the *Command* menu for the chosen device. The command can be specified to run before or after the test.

If further command settings are available for the device, these will be shown in the *Command Settings* section. In the example above, the LCR has three possible *Set 2nd measurement types*, which can be selected from the drop-down list, as required.

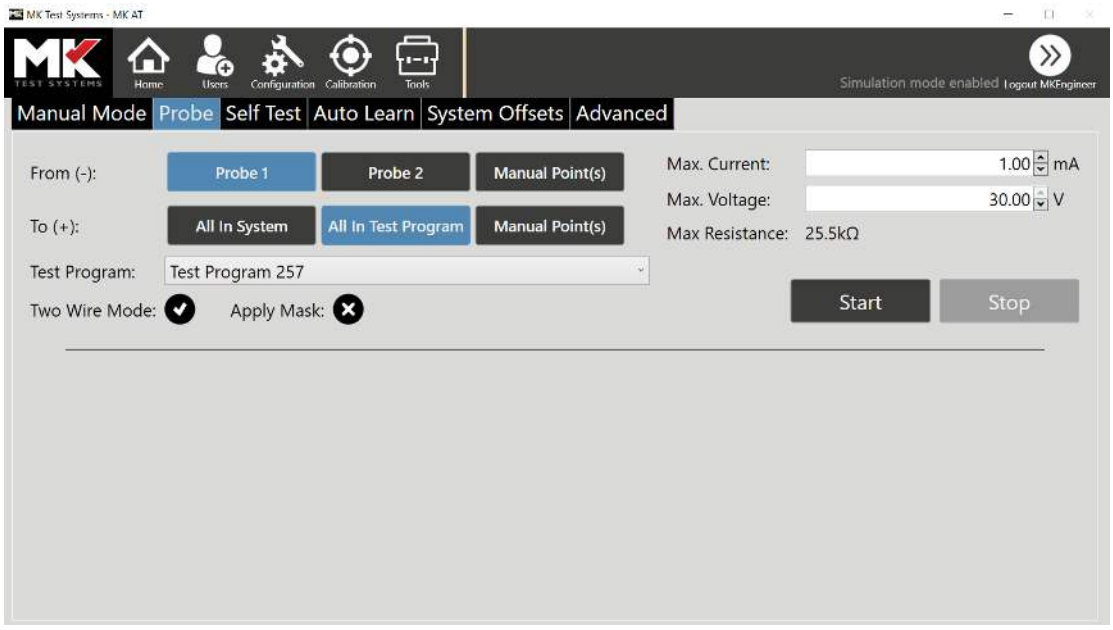
Further external devices can be added using the *Add* button. Entries can be removed using the *Delete* button. The *Move Up* and *Move Down* buttons can be used to reorder the entries.

3.7.2 PROBE

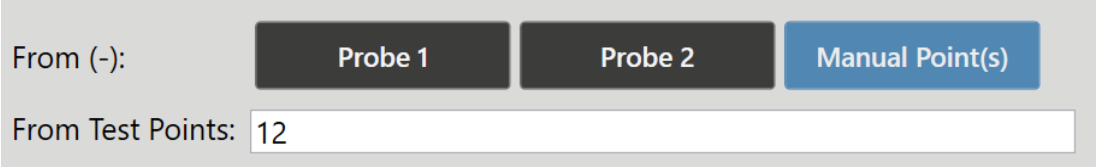
This section allows probe tests to be set up for diagnostic and fault-finding purposes. Probes are set up in the Hardware section of *Configuration,* where they can be added to the *Probe Point(s):* table, shown below.



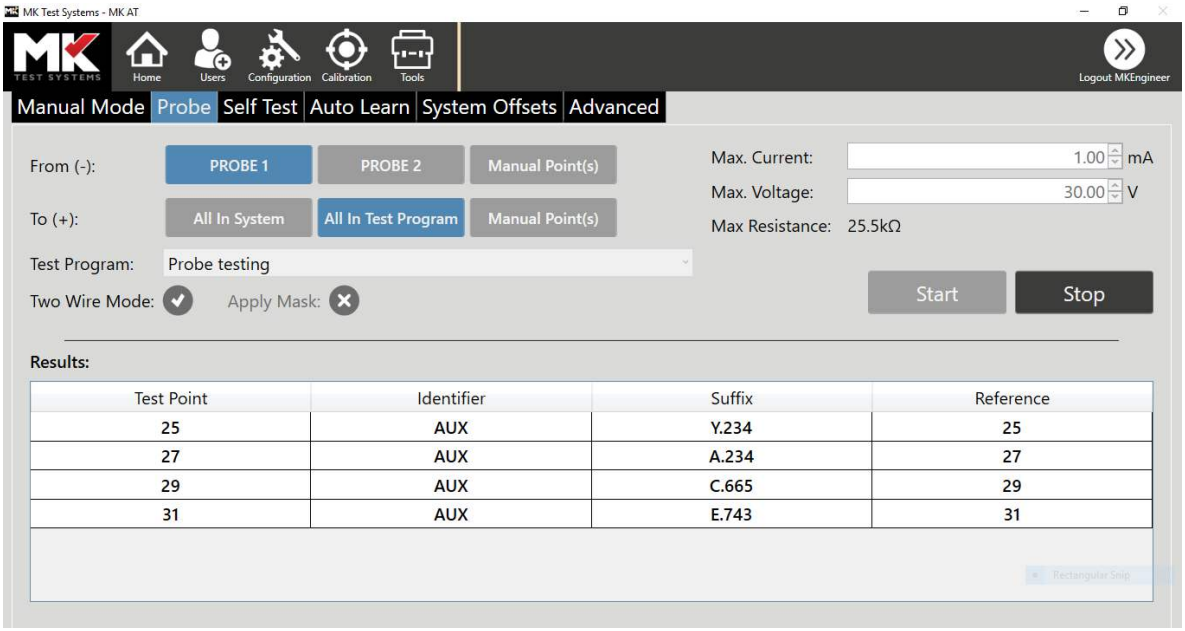
The Probe screen is accessed from the Tools menu:



- Any probe points that have been set up in the hardware configuration can be assigned to *From (-):*.
- Alternatively, test points can be assigned manually. Clicking the *Manual Point(s)* button opens the following field, allowing test points to be entered:



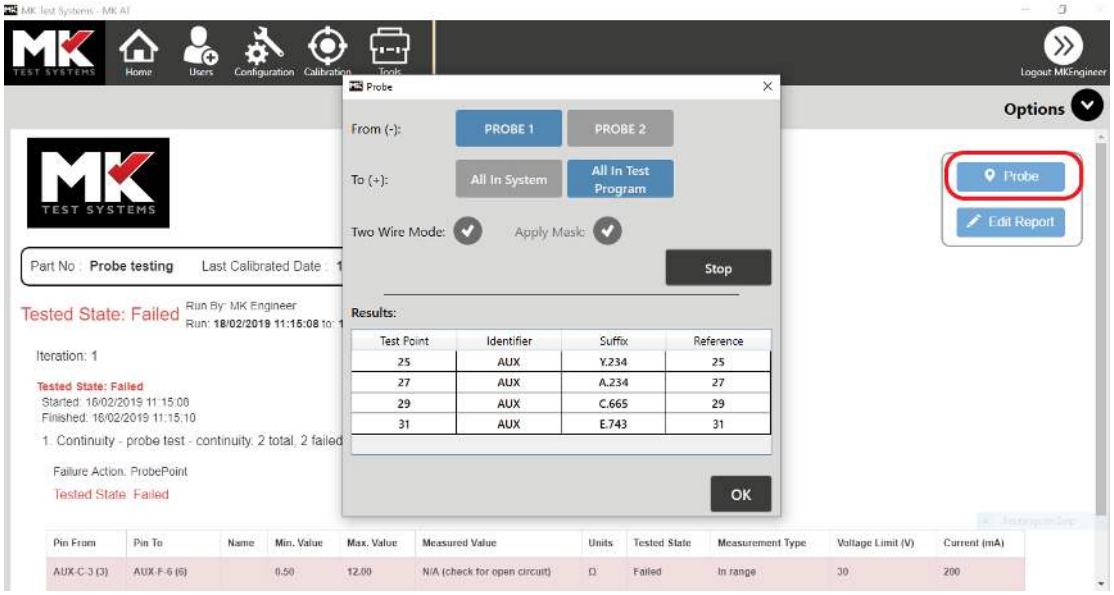
- *To (+):* can be set to:
    - ***All In System****:* The test will include all test points available in the system (excluding any system masked points). This is the default setting.
    - ***All In Test Program****:* The test will include all test points defined within the specified test program. Where this option is selected, the *Start* button will be disabled until a test program is specified.
    - ***Manual Point(s)****:* The test will include only the test points entered.
- The ***Test Program*** dropdown list will include all currently loaded test programs. If a test program is selected, the associated XRef data will be used when reporting the results. Where the ***All In Test Program*** option is selected, a test program must be selected to define the test point range to use. Note that if the specified program has any additional XRef data, this will also be included in the results.
- ***Two Wire Mode****:* toggles the system between 2 and 4 wire mode.
- ***Apply Mask****:* This option forces the probe test to exclude any test points that are masked in the specified program.
- The ***Max. Current*** and ***Max. Voltage*** can be entered on the right. The default values are 1mA at 30V giving an associated ***Max. Resistance*** of 25.5kOhm (30V / 0.001A * 0.85), as displayed below. Any connections with a resistance over this limit will be excluded from the results.



- The results table displays the test points found along with the associated XRef data from the specified test program.

Probe from results report:

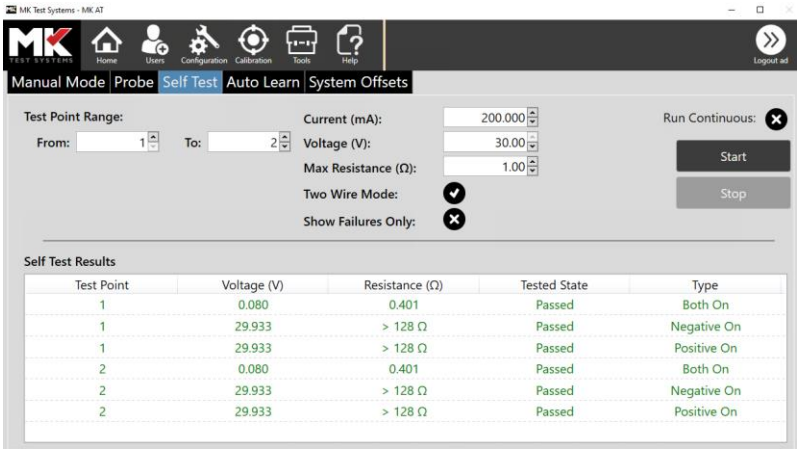
- The probe function is also available from the results screen following the execution of a test program. Once a test program is completed, the results report is displayed. A probe window can be opened by selecting the Probe button.



- If ***All In Test Program*** is selected, the probe test will automatically use the current test program for XRef data to display.
- If ***Apply Mask*** is selected, any test points that have been masked in the current test program will be excluded from the test.
- The ***Max. Current*** and ***Max. Voltage*** are taken from the values defined on the main Probe screen.

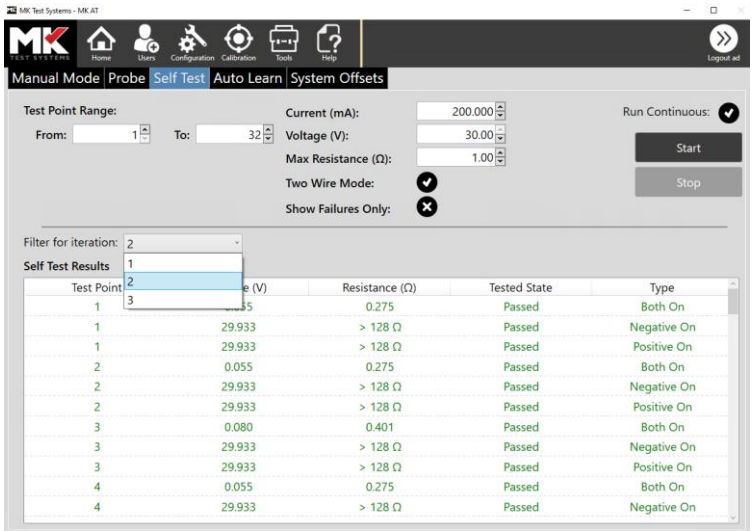
3.7.3 SELF-TEST

A *Self-Test* can be performed to check each of the test points in the specified range to ensure that they are working as expected. Three tests are performed for every test point. Firstly, both the negative and positive sides of the relay are switched on, and the measured resistance must be less than the *Max. Resistance* for the test to pass. Next, the negative side of the relay is switched, on and the positive side switched off. In this case, the measured resistance should indicate an open circuit for the test to pass. Finally, the positive side of the relay is switched on, and the negative side switched off, and again, the resistance should indicate an open circuit for the test to pass.



The test can be customised as required. *Two Wire Mode* toggles the system between two and four wire mode. *Test Point Range* specifies the test points to be included in the test. The *Current* and *Voltage* can be configured to suit the system, and the *Max. Resistance* determines the pass criteria for resistance where the test type is *Both On*. The *Show Failures Only* option can be used to filter out any results that have passed and display only failed results in the *Self-Test Results* pane. The test is started by selecting the *Start* button and will stop automatically when all test points in the *Test Point Range* have been checked. The test can be ended at any point using the *Stop* button, if required.

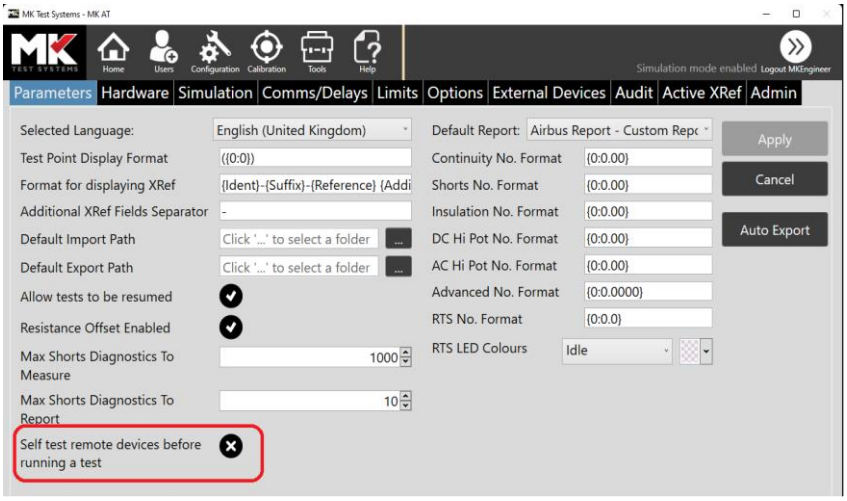
Self-Test can be run in continuous mode by selecting the *Run Continuous* option. When the test is stopped, the results of the final iteration will be displayed automatically. The results of all previous iterations can be accessed by selecting them from the *Filter for iteration* dropdown list, as shown:



Self test results can be exported to a TSV file using the ***Export TSV*** button on the right. The TSV file will contain information displayed on screen related to the current iteration selected and using the show failures toggle.

Current (mA): 800	Voltage (V): 30	Max Resistance (Ω): 10	Two Wire Mode: True	
Test Point	Voltage (V)	Resistance (Ω)	Tested State	Type
1	8.894	11.118	Failed	BothOn
1	12.028	15.035	Failed	NegativeOn
1	12.028	15.035	Failed	PositiveOn
2	8.894	11.118	Failed	BothOn
2	12.028	15.035	Failed	PositiveOn
3	8.894	11.118	Failed	BothOn
3	12.028	15.035	Failed	NegativeOn
4	8.894	11.118	Failed	BothOn
4	12.028	15.035	Failed	NegativeOn
4	12.028	15.035	Failed	PositiveOn
5	8.894	11.118	Failed	BothOn
5	12.028	15.035	Failed	NegativeOn
5	12.028	15.035	Failed	PositiveOn
6	8.894	11.118	Failed	BothOn

In addition to running self-test when required a self-test can be run at the start of a test that uses RTS devices. This option is configured under the parameters section as shown below.

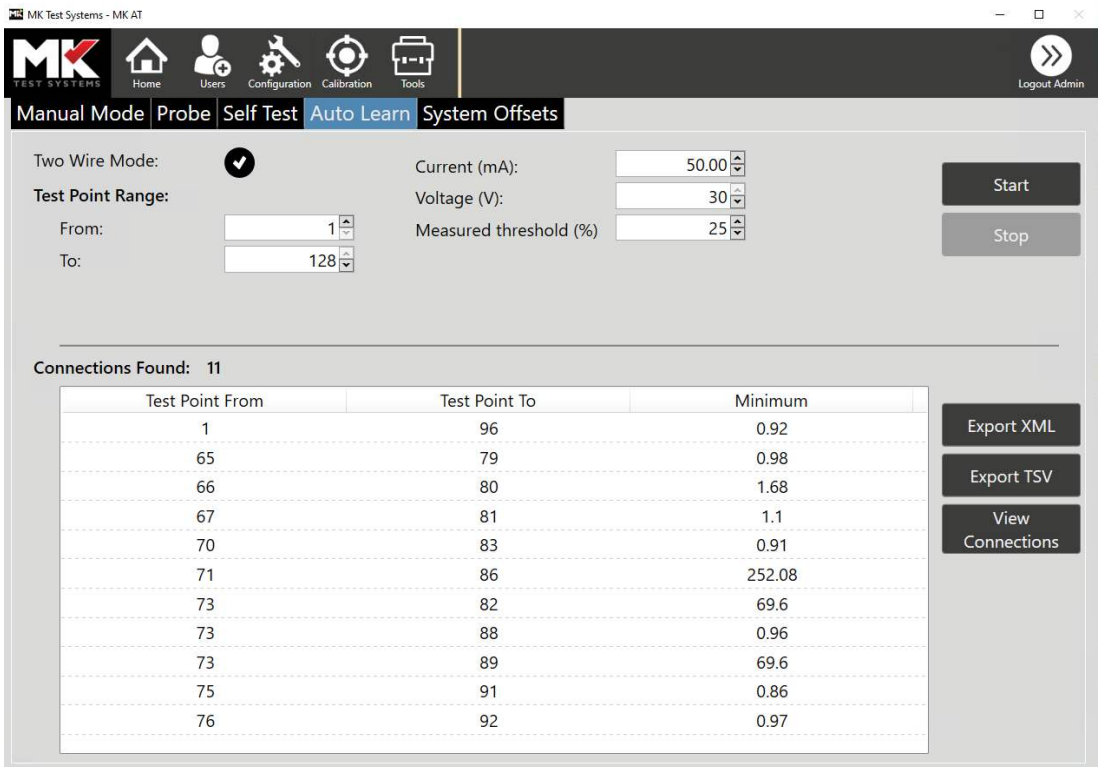


Unlike the manual self-test this is an RTS test type which will test all pins in all positions for any connected and powered RTS device.

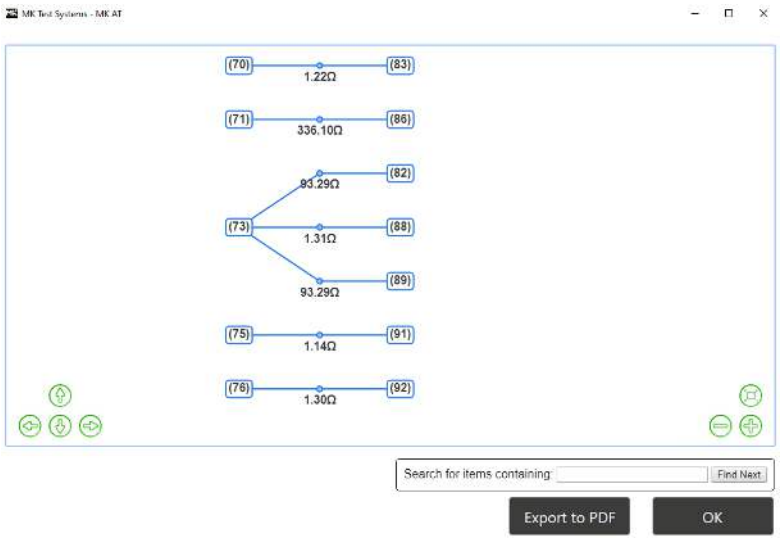
3.7.4 AUTO LEARN

The auto learn feature can be found under the *Tools* tab and can be used to generate a set of connections directly from a UUT. This may be helpful where a standard UUT exists that is known to be correct. The connections can be *learnt* using this standard, then exported from the Runner and imported into the Editor to create a continuity test suitable for testing all further versions of this UUT.

An auto learn test can be configured to suit the UUT. The test points to be included can be defined using a *Test Point Range* and the Current and Voltage can be set as required.



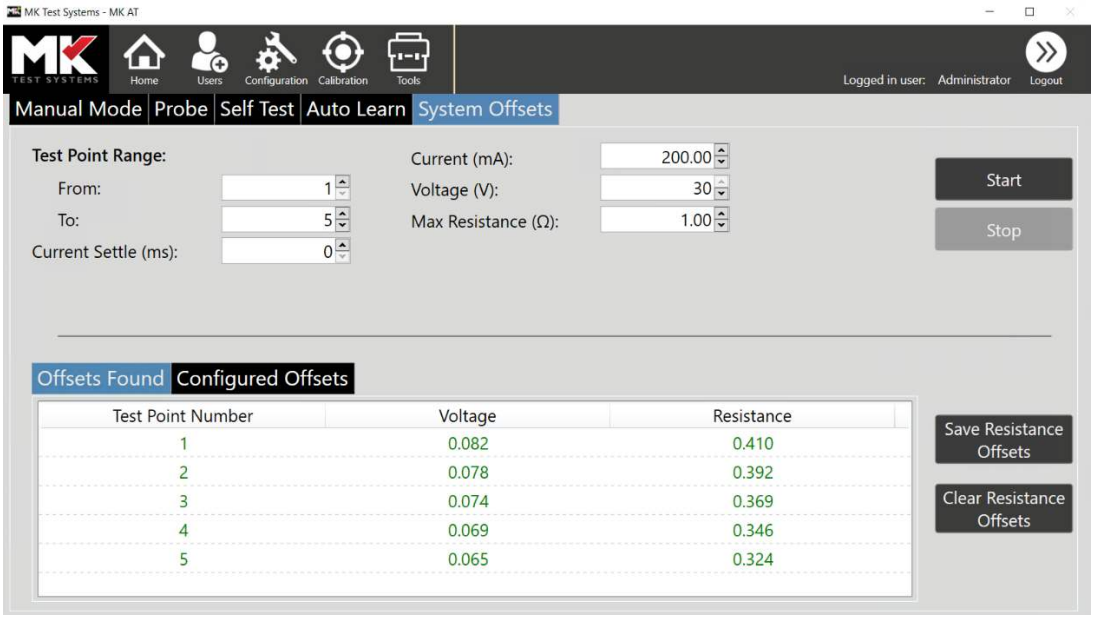
Selecting the *Start* button will run the test. Any connections found will be listed along with a resistance measurement. Once complete, the results can be exported in either XML or TSV format. The View Connections function can be used to generate a visual representation of the connections found, as shown in the example below.



3.7.5 SYSTEM OFFSETS

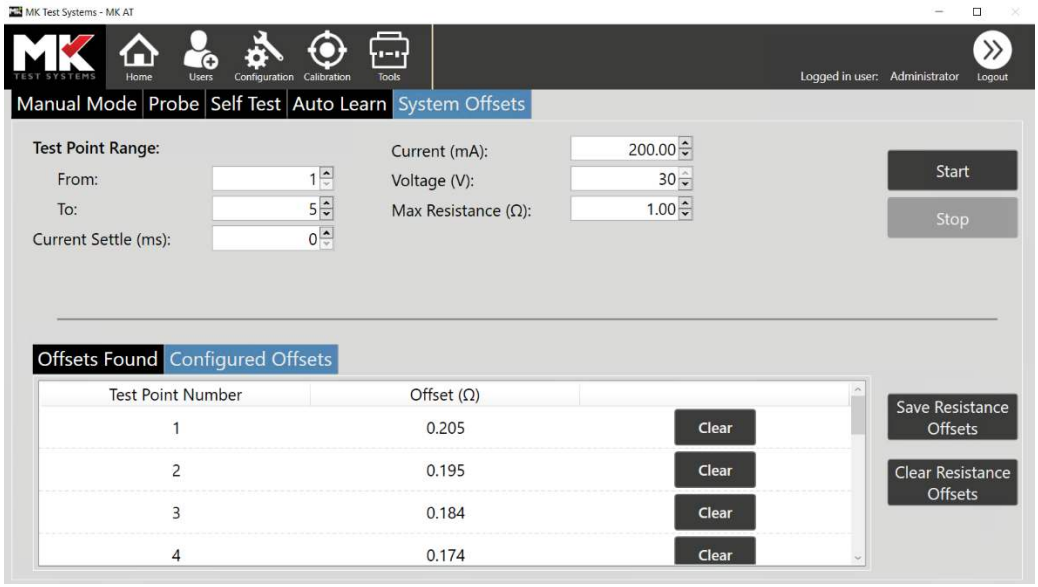
UUT must be disconnected before system offsets can be calculated

On some larger systems, there will be an *internal* system resistance before the interface connector. To ensure the best possible accuracy when measuring in 2 wire mode, the system needs to measure the offset of each test point. The system offset allows you to view and automatically gather / measure the system offsets for each point.



Test Point Range specifies the test points to be tested. The *Current* and *Voltage* can be configured to suit the system. Any resistance measurements that are greater than the specified *Max. Resistance* value are excluded from the *Offsets Found* results. The test is started using the *Start* button and will end automatically once all the test points in the range have been checked. The test can be stopped at any time using the *Stop* button if required. The offset values can then be saved using the *Save Resistance Offsets* button.

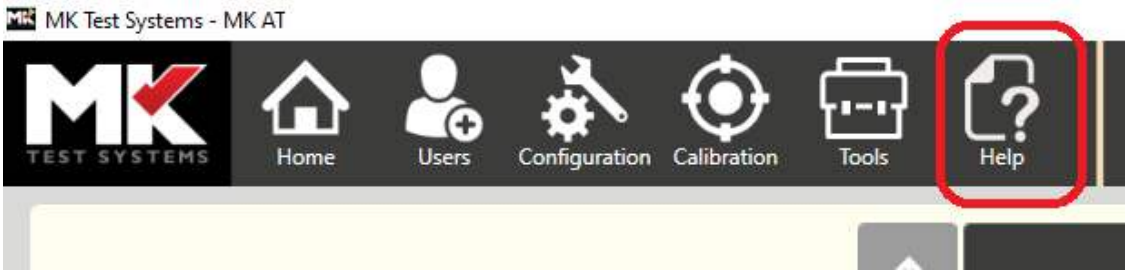
The saved resistance values can be viewed in the *Configured Offsets* tab, as shown below.



The saved offset values can be removed individually if necessary, using the *Clear* button, or they can all be removed using the *Clear Resistance Offsets* button.

3.8 Help Files

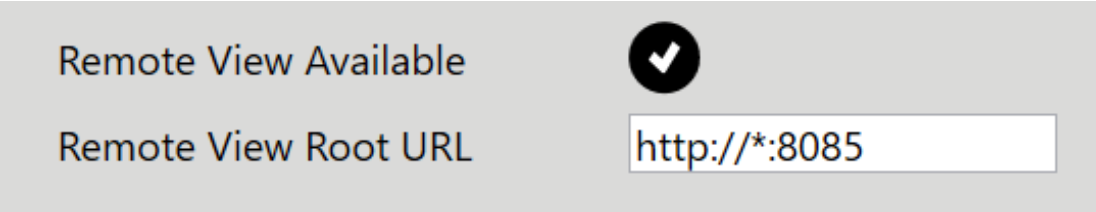
Software manuals are installed in the executable folder and can be accessed from with the application by selecting the help button from the tool bar.



4 REMOTE VIEW

Remote view is a browser-based interface designed to be accessed by a remote computer or tablet. The MK AT runner software acts as the *Server* and can be accessed by any suitable device with a browser (dependent on configuration).

4.1 Setup



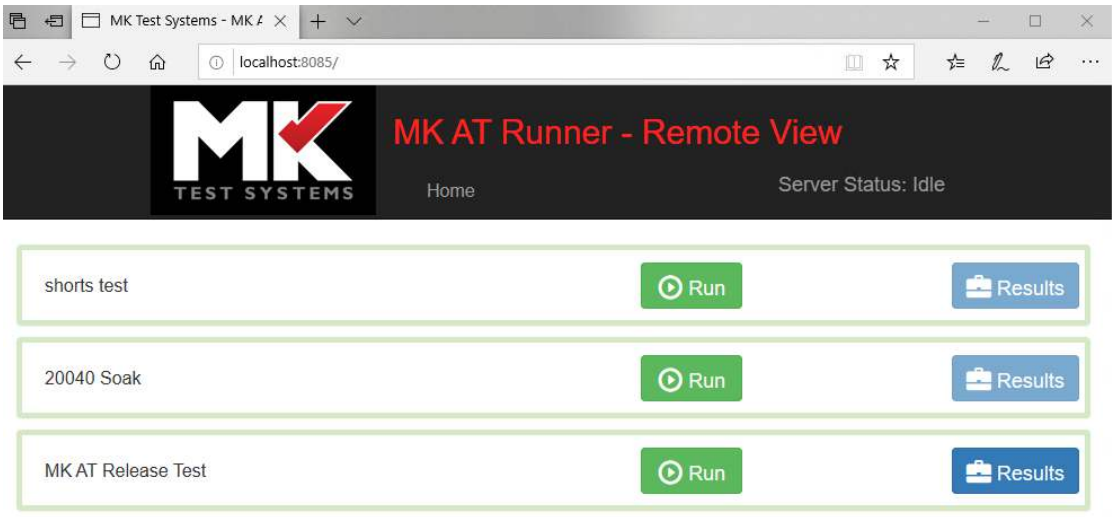
The settings for the remote view can be found on the admin tab of configuration, in the runner software. *Remote View Available* option toggles the remote view on and off. The *Remote View Root URL* is the location used to access the remote view. The * is used to indicate the IP address of the machine running the software. You can also set it to localhost if you only wish to access the remote viewer on that machine.

It is advised that you speak to your IT administrator, as ports may need to be configured to allow connections. You may also need to run MK AT as an administrator for the remote view to work correctly, depending on your IT policy.

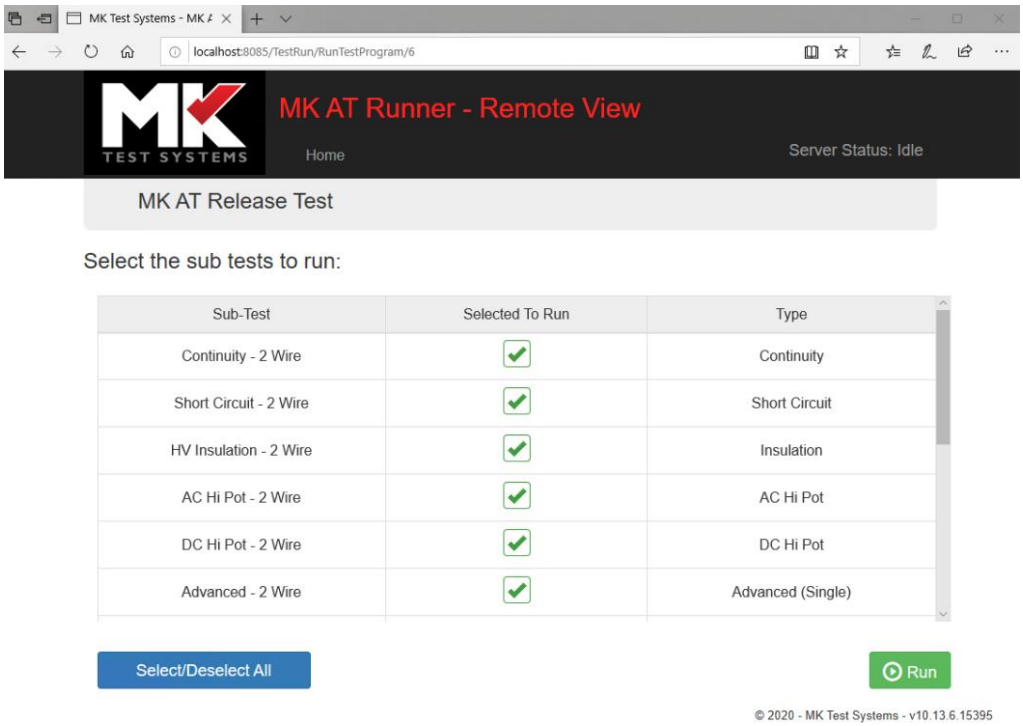
4.2 Running remote view

The remote view is accessed via your browser. You must enter the root URL created during setup. For example, if you entered the above setup you should enter this URL in the browser

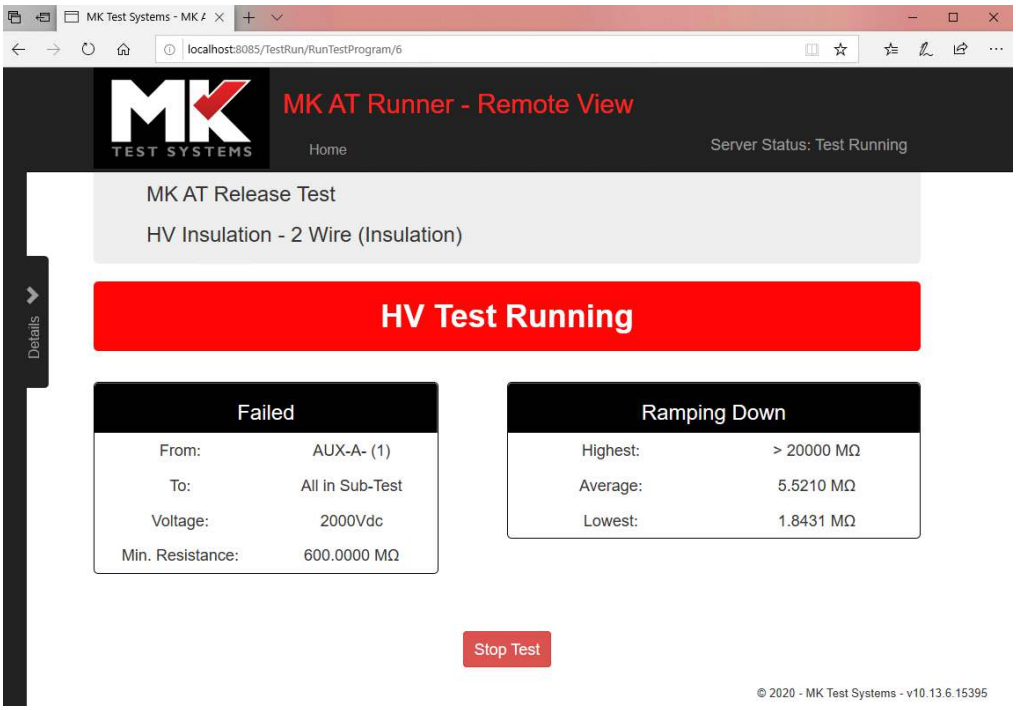
and replace *YourIPHere* with the IP of the machine your MK AT Runner software is running from. The browser will now display the home view as shown below:



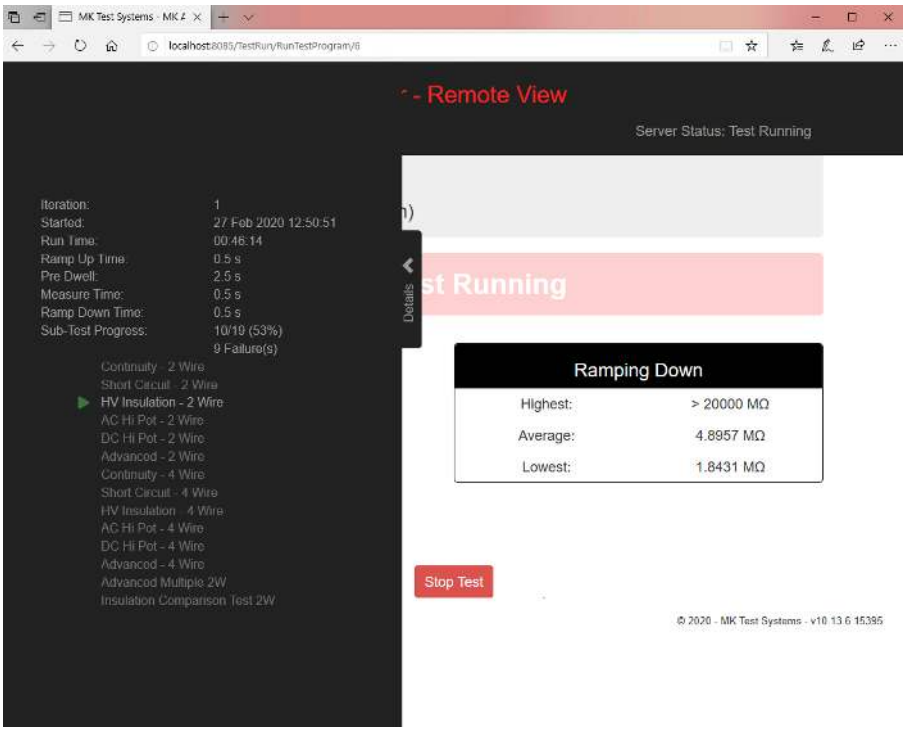
This is a cut down version of the original desktop Runner Software and allows an operator to run a test program or view the test results. The sub test selection screen is displayed when running a test program as shown below:



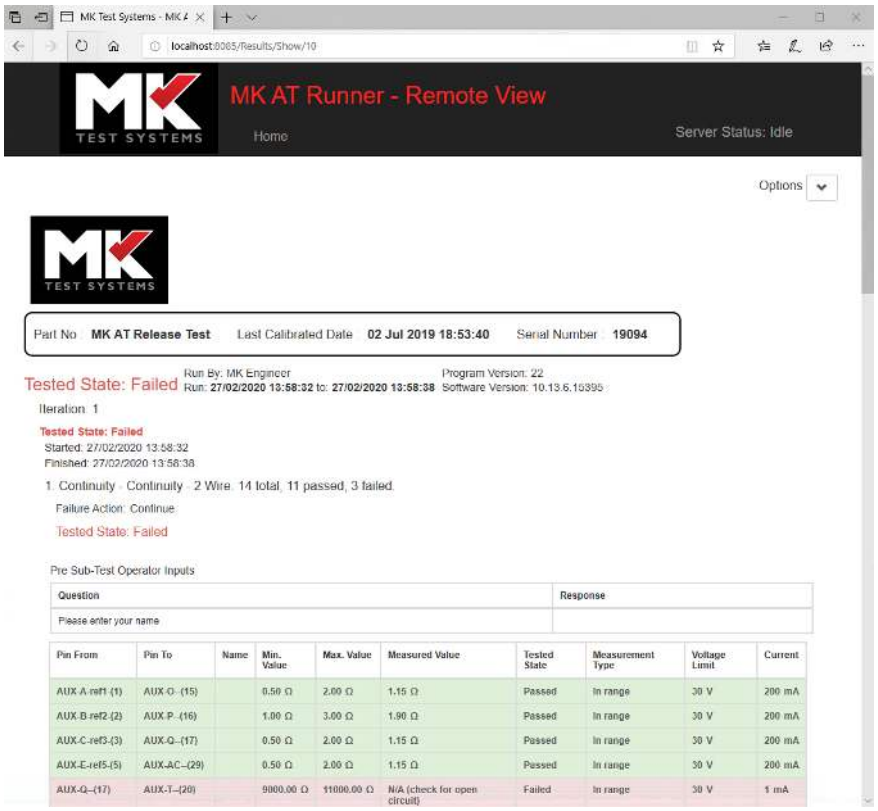
Subtests can be selected or deselected to run, as required. Clicking the *Run* button will commence the test. During testing, a run screen will be displayed, as shown below:



Further test information can be viewed by clicking on the *Details* tab, as shown in the example below:



Once the test program is complete, the test report is displayed automatically. Report templates can be selected from the *Options* menu



Pin From	Pin To	Name	Min. Value	Max. Value	Measured Value	Tested State	Measurement Type	Voltage Limit	Current
AUX-A-ref1-(1)	AUX-O-(15)		0.50 Ω	2.00 Ω	1.15 Ω	Passed	In range	30 V	200 mA
AUX-B-ref2-(2)	AUX-P-(16)		1.00 Ω	3.00 Ω	1.90 Ω	Passed	In range	30 V	200 mA
AUX-C-ref3-(3)	AUX-Q-(17)		0.50 Ω	2.00 Ω	1.15 Ω	Passed	In range	30 V	200 mA
AUX-E-ref5-(5)	AUX-AC-(29)		0.50 Ω	2.00 Ω	1.15 Ω	Passed	In range	30 V	200 mA
AUX-Q-(17)	AUX-T-(20)		9000.00 Ω	11000.00 Ω	N/A (check for open circuit)	Failed	In range	30 V	1 mA

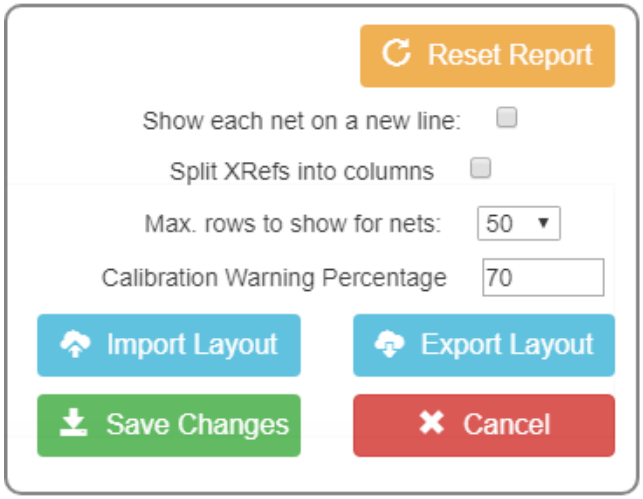
5 CUSTOMISATION

5.1 Editing Reports

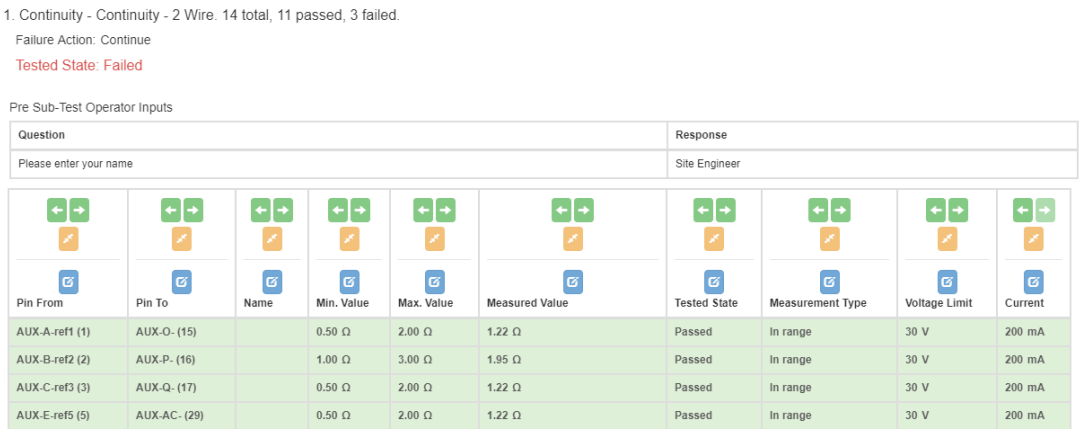
The *Edit Report* function can be selected when viewing a test report. This allows the report layout to be modified and additional data can be added to the header and footer, if required.

5.1.1 CUSTOMISING REPORTS

When viewing a report, an *Edit Report* button is visible in the top right of the viewing pane. Select this button to begin editing. The panel below will appear and the user will now be able be able to see regions which are editable.



The example below shows a report in edit mode:



1. Continuity - Continuity - 2 Wire. 14 total, 11 passed, 3 failed.

Failure Action: Continue

Tested State: Failed

Pre Sub-Test Operator Inputs

Question	Response
Please enter your name	Site Engineer

Pin From	Pin To	Name	Min. Value	Max. Value	Measured Value	Tested State	Measurement Type	Voltage Limit	Current
AUX-A-ref1 (1)	AUX-O- (15)		0.50 Ω	2.00 Ω	1.22 Ω	Passed	In range	30 V	200 mA
AUX-B-ref2 (2)	AUX-P- (16)		1.00 Ω	3.00 Ω	1.95 Ω	Passed	In range	30 V	200 mA
AUX-C-ref3 (3)	AUX-Q- (17)		0.50 Ω	2.00 Ω	1.22 Ω	Passed	In range	30 V	200 mA
AUX-E-ref5 (5)	AUX-AC- (29)		0.50 Ω	2.00 Ω	1.22 Ω	Passed	In range	30 V	200 mA

 Reposition the data column

 Hide the data column

 Edit the data column heading

For sub-tests that have large nets, the ***Show each net on a new line*** option can be used for clarity, along with the ***Max. rows to show for nets*** option, which limits the number of rows displayed to the specified number.

The ***Split Xrefs into columns*** option can be used to display the components of the XRef, (the Ident, Suffix and Reference) in separate columns. *Note, the reformatted XRef data is not displayed until the changes are saved.*

There is also provision for the addition of a custom header, sub-header and a footer. These show as free text areas, with basic formatting. Once the changes are saved, the formatting buttons disappear so that just the newly formatted text is shown.

5.1.2 SAVING AND EXPORTING CHANGES

Once editing is complete, the layout changes can be saved using the *Save Changes* button. The changes will then be applied automatically whenever this report template is used.

Report layouts can be exported using the *Export Layout* button. The layout is exported as a text file in .json format and can be saved to a suitable location on the test console or remote server as a backup.

Exported layouts can be imported to another report template or another test console using the *Import Layout* button. To Import a saved layout, click the *Import Layout* button, navigate to the location of the exported layout file and select *Open*.

Changes made to the report layout can be reset to the original layout using the *Reset Report* button.

5.1.3 IMPORTANT NOTES

Report layout customisations are saved to the report template, not to a test program or set of results. This means every report using the specific report template will have the changes appear, where appropriate.

Report layout customisations will be applied for all users of the test console PC, not just the user that made the changes.

5.2 Custom Reports

Custom reports can be added to the MKAT system if required. These are supplied as a report folder and installed in the following location on the test console:

C:\ProgramData\MK Test Systems Limited\Reports

A custom report can then be set as the default report by either selecting it on the Parameters screen of the Runner or by selecting it as a test program option in the Editor.

5.3 Customising the login screen

You can replace the background image on the login screen by placing a new *.png* image in *C:\ProgramData\MK Test Systems Limited.* This image must be called *LoginBackground.png* and should ideally be a high-resolution image sized for the screen it's being viewed on.

5.4 Adding logos to the report

You can add a logo to the report by placing the image in *C:\ProgramData\MK Test Systems Limited\Reports\Logos*. This image will need to be called CustomerLogo.jpg and should be around 180px wide and 110px high.

5.5 Log files

Both the MKAT runner and editor write log files to the log files located at

C:\ProgramData\MK Test Systems Limited\AutoMeg Lite\Log\

Depending on local IT policy the ProgramData folder maybe hidden by default. To access the folder the user can type the path directly into Windows file explorer

Audit data is held in a database which is backed up to the folder specified in the configuration.