Operator Manual

Real Time Scanning (RTS)

Document Number: RTS-102

Rev: 1B

Author: N. Baker Date: 18/12/2023

Reviewed: A. Wilson Date: 10/01/2024

MODIFICATIONS

Revision	Date	Modified by	Changes / ECR
1A	18/12/2023	N. Baker	First Release
1B	10/01/2023	N. Baker	Added 120Vac mains voltage to warnings

CONTENTS

1 GENERAL

1.1 Warnings and Cautions

Hazardous Voltage

The Test Consoles are supplied by 120/230V AC mains power.
Do not remove any panels or reach into the side/rear of the units at any time whilst the power is connected.

Moving Parts

The Test Console is fitted with a fan tray at the top and/or front of the unit.
Do not insert any items into the Fan Tray Vents

Heavy Units

The Test Console has a mass of up to 100kg
Ensure that the unit is placed on a stable and level surface with suitable load capacity for the unit.
Ensure that the castor breaks are fully applied.
Suitable manual handling procedures must be followed when moving the unit.

CAUTION

Cooling

Ensure that adequate airflow is available to cool the Test Console.
Do not place any obstructions under the base of the Test Console.
Do not block the Fan Tray Vents for the Test Console or Front Fan for the MCM.

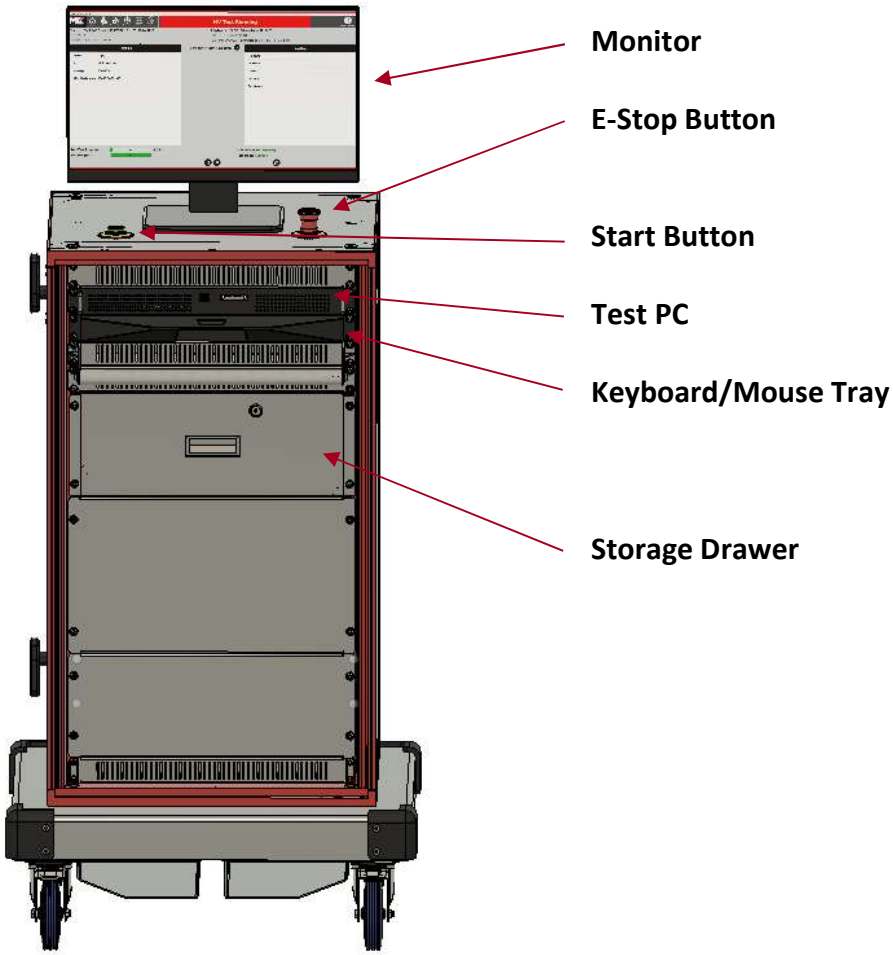
1.2 System Components

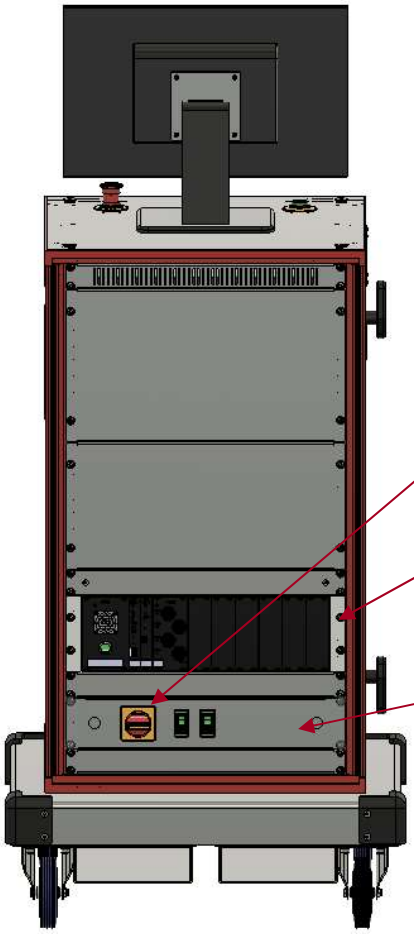
1.2.1. Test Console

The Station Console is the main hub of the RTS system. All measurement and processing is done at the Test Console with Umbilicals providing extension of the measurement bus out to each of the Micro Satellites (uSats) and Nano Satellites (nSats).

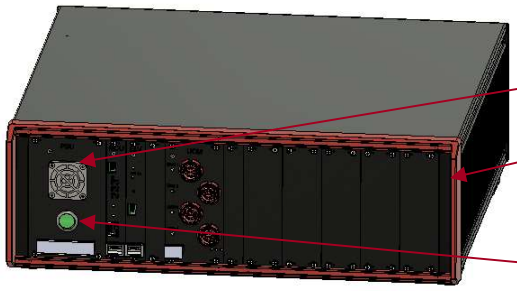
The Test Console hosts the Test Console PC (20U Standard option) that runs the MKAT Runner software. MKAT Runner is the main application for the RTS system and should be launched at the start of any testing.

20U TEST CONSOLE (STANDARD PC)





DESKTOP TEST CONSOLE



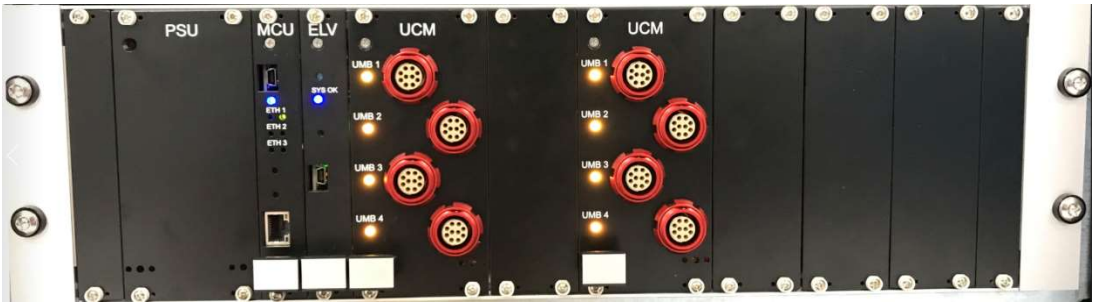
Fan Filter (Outlet)

Ethernet Connectors (RJ45)

IEC Mains Inlet and On/Off Switch

1.2.2. Main Control Module (MCM)

The Main Control Module (MCM) houses the electronic components for the RTS system. The MCM is fitted within the Test Console or Desktop Console variants.



The following indicators are shown on the front of the MCM for operator view:

System OK
Lit Solid = OK
Flashing/Off = Error

Ethernet 1
Green = OK 1Gbps
Yellow/Red = OK 100Mbps
Off = Disconnected

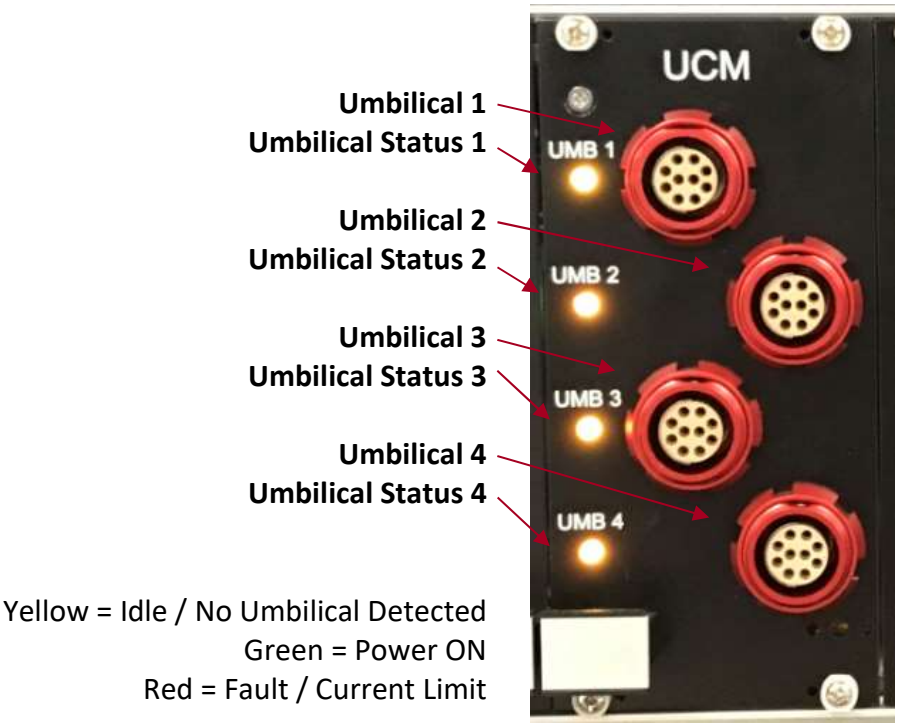
Ethernet 2
Green = OK 1Gbps
Yellow/Red = OK 100Mbps
Off = Disconnected

Ethernet 3
Green = OK 1Gbps
Yellow/Red = OK 100Mbps
Off = Disconnected

Ethernet 4
(MAINTENANCE USE ONLY)

Bus Selected
Red = Test in Progress
Off = Idle

System OK
Lit Solid = OK
Off = Error



1.2.3. UMBILICALS

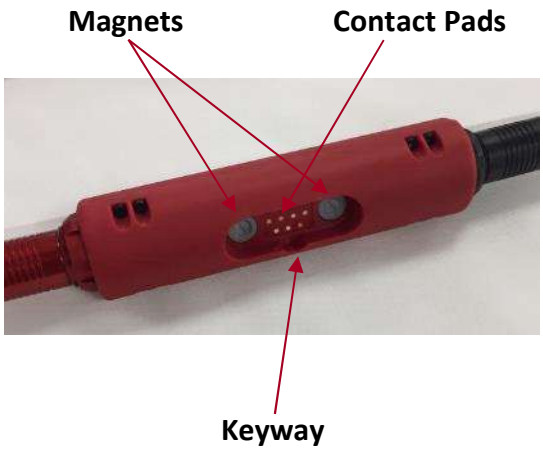
Umbilicals provide power, communication and measurement connections to all nSats, uSats and LRUs. The Umbilical sections are interchangeable as needed and have Red (Output) and Black (Input) connectors. Umbilical lengths have been fixed as the following: 0.3m, 0.5m, 1m, 3m, 5m, 7m, 10m, 15m, 20m, 30m, 50m.

1.2.4. MAG CONNECTORS

MAG Connectors provide a quick connection/disconnection point for nSat and uSat peripherals. The nSat/uSat plug must be connected in the correct polarity with magnets and keyway to help guide the correct connection.

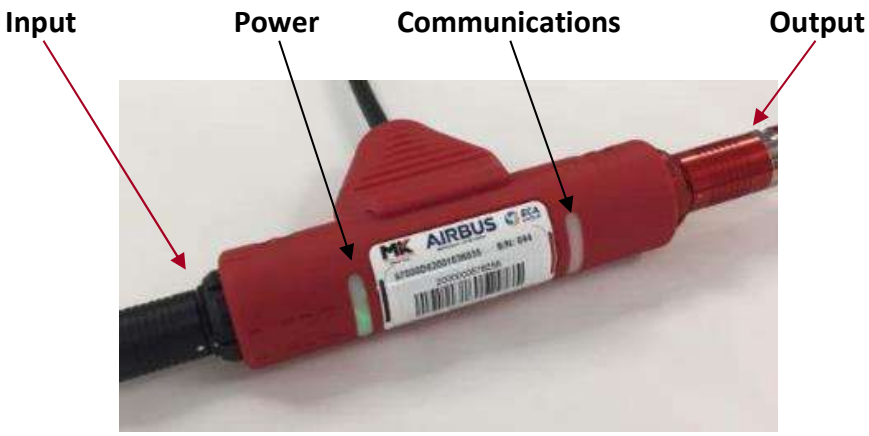
nSat/uSat PLUG

MAG CONNECTOR



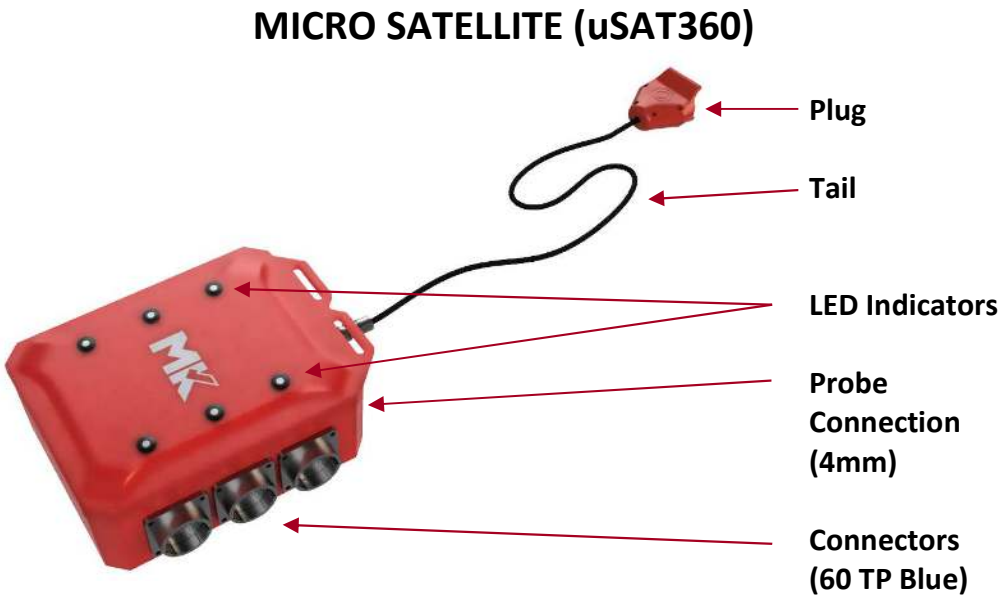
All MAG Connectors are identical so can be interchanged within the system as needed and any nSat or uSat can be connected to any MAG Connector.

The MAG Connector provides two Indicators to display the system function and a Black (Input) and Red (Output) connector to match Umbilical polarity.



1.2.5. MICRO SATELLITES (USAT)

Micro Satellites are small switching modules that provide the interface between the RTS system and the Unit Under Test (UUT) via an Interface Harness. All uSats have connectors suitable for 60 test point Interface Harnesses and are indicated with a Blue band on both the uSat and the Harness connector.



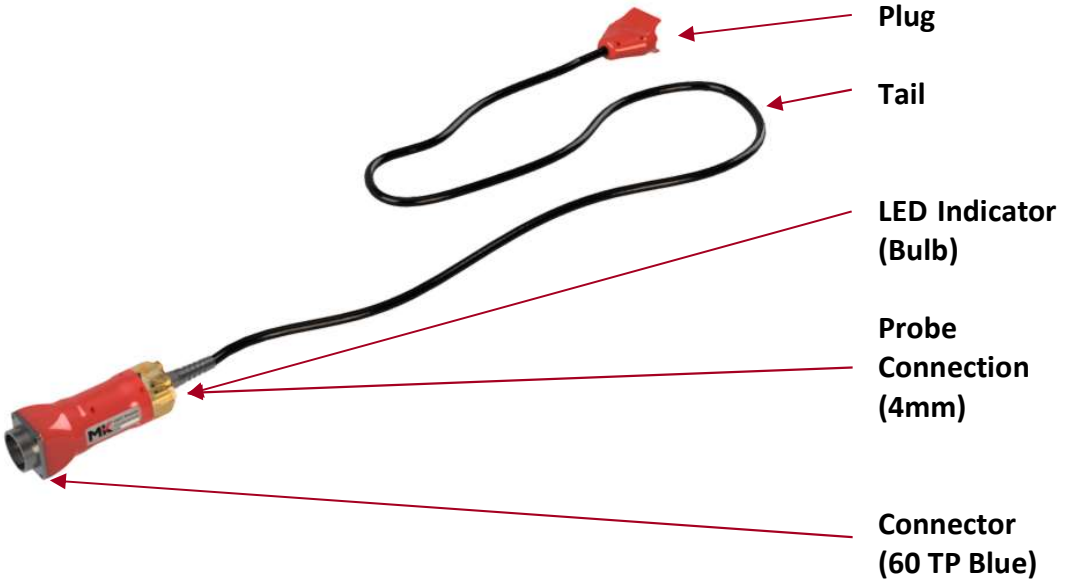
Each Micro Satellite (uSat) provides 2, 4 or 6 individual connections to the UUT. An LED indicator displays the status of each connection with Green indicating that all connections within that connector are passing the test.

The Tail of the uSat must be plugged into a MAG Connector and all nSat and uSat tails are identical so may be plugged into the nearest available MAG Connector. When power is applied correctly all LED indicators will initially be lit a dim white colour.

1.2.6. NANO SATELLITES (NSAT)

Nano Satellites are smaller versions of Micro Satellites with a single connection to the UUT. Each nSat has a single LED indicator at the back of the module (Bulb) to provide test status for that connection.

NANO SATELLITE (nSAT60)



There are 2 variants of nSat indicated by the Green or Blue coloured band behind the connectors. An nSat32 has a Green band and must be matched with an Interface Harness with the corresponding Green band. An nSat60 has a Blue band and must be matched with an Interface Harness with a Blue band.

nSat32

Green

nSat60

Blue

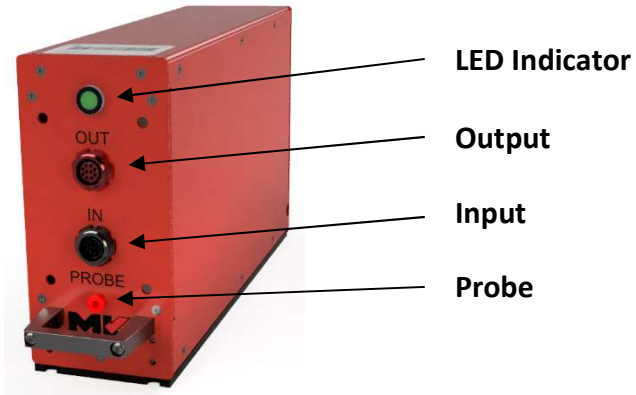
Each nSat is also fitted with a Blue power/status indicator. This indicator should be lit solid for normal operation

ERROR: Power/Status Indicator Flashing

Firmware update may be required.
Contact MK Test service team.

1.2.7. LRUs

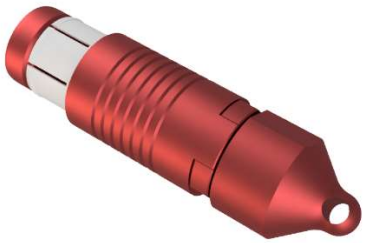
LRUs are designed to interface directly with ARINC standard connectors in place of a standard avionics LRU on an aircraft. Each LRU has been designed with a Black (Input) and Red (Output) connector on the front panel for connection of the Umbilical.



Each LRU is fitted with an LED indicator to provide test status for the LRU connections with Green indicating the LRU is currently passing the test and Red indicating that one or more connections at the ARINC connector are currently failing the test.

1.2.8. TERMINATOR PLUGS

Terminator Plugs are used to correctly terminate the Umbilical communications bus. Each Umbilical line must have 1 Terminator Plug at the end and can be connected to the last MAG Connector or LRU as appropriate for the system setup.



1.2.9. INTERFACE HARNESSES

Interface Harnesses create the connection between the UUT and the RTS system. Each harness is usually designed for a specific location within the UUT and must be connected to the correct UUT connectors as required. A list of required Harnesses for the current Test Program is displayed by the MKAT Runner software (See Section 2.5).

For connection to the RTS system, Interface Harnesses have two types indicated by the coloured (Blue or Green) band. Internal to the harness is a Unique Identifier (Active XRef) that is detected by the RTS system when connected. This means that harnesses may be connected to any nSat or uSat where the connector type is compatible (as shown by the Blue or Green band).

Setup of the RTS system is application specific, contact MK Test Systems for assistance in defining a recommended setup with suitable nSat and uSat locations to match the required Interface Harnesses.

The setup, however, is not mandatory and nSats/uSats may be interchanged if necessary to suit the available equipment.

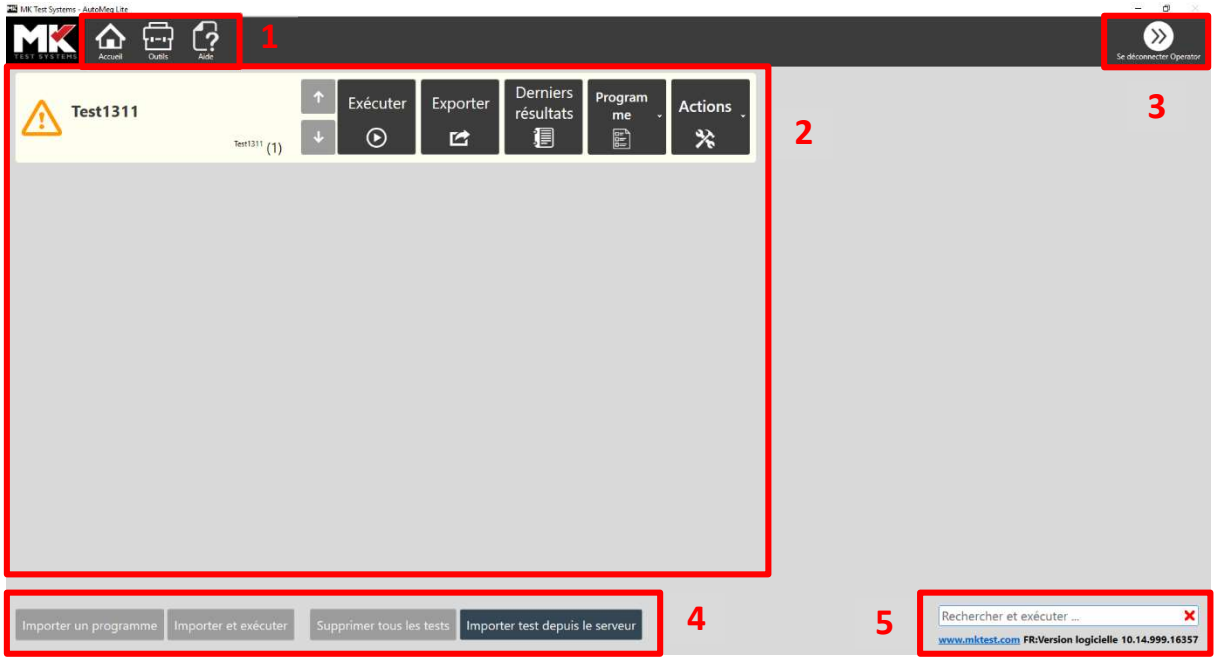
1.3 MKAT Runner Software Overview

NOTE: For full MKAT Runner User Manual click the help button in section 1:

1.3.1. Home Screen

When logged into the MKAT Runner software the Home Screen will be displayed. Any previously loaded Test Programs will be shown with their test status.

The areas of the Home Screen are shown below:



1 – Menu Options

 Home Screen

 Tools (Manual Mode, Probe, Self-Test

 Help (Software User Guide)

2 – Loaded Test Programs

3 – Logout

4 – Import Test Program(s)

5 – Search Loaded Programs & Software Version Information

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2 System Setup and Connection

2.1 Power On System

Use one of the following procedures to power on the RTS System depending if using the 20U Test Console or Desktop Console:

2.1.1. 20U Test Console

REAR PANEL

Ensure the AC power cable is connected.

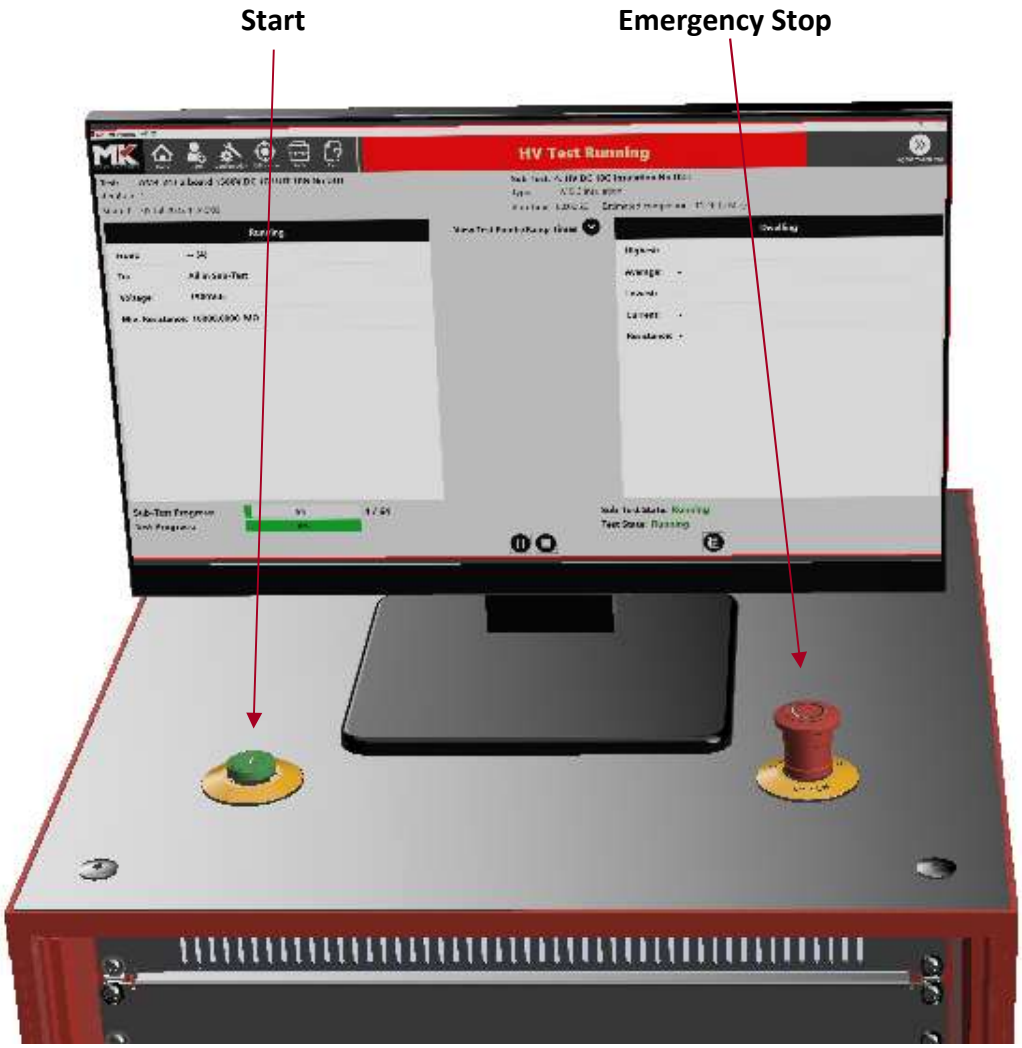
Ensure CB1, CB2, CB3 are in On (Down) position.

Set Mains Isolator to On (1) Position.

TOP PANEL

Check that Emergency Stop button not activated.

Press the Green Start button.



2.1.2. DESKTOP CONSOLE

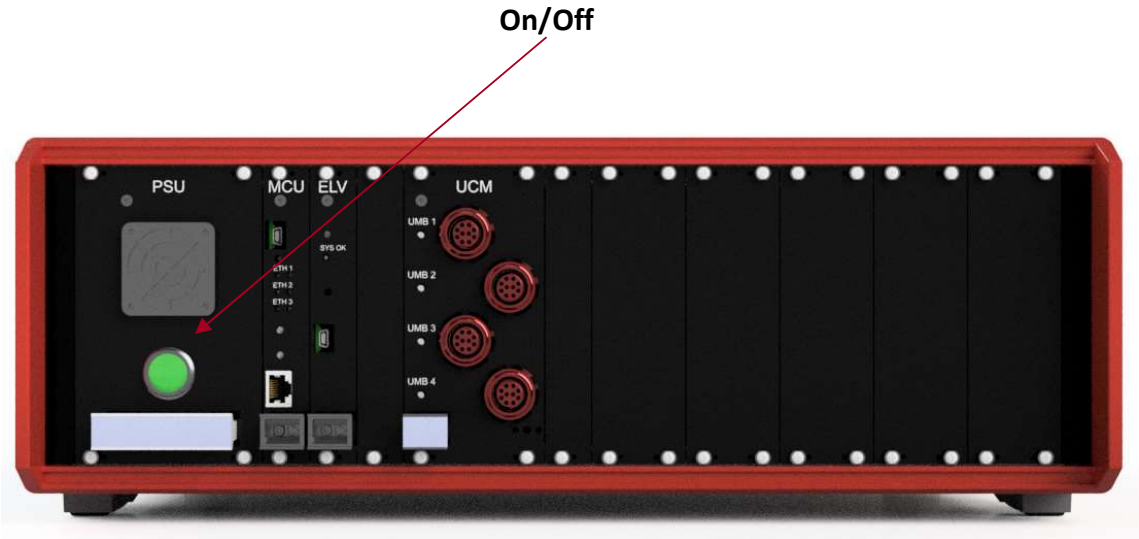
REAR PANEL

Ensure the AC power cable is connected to the IEC inlet.

Set the On/Off switch to On (Down)

2.1.3. MCM

PSU



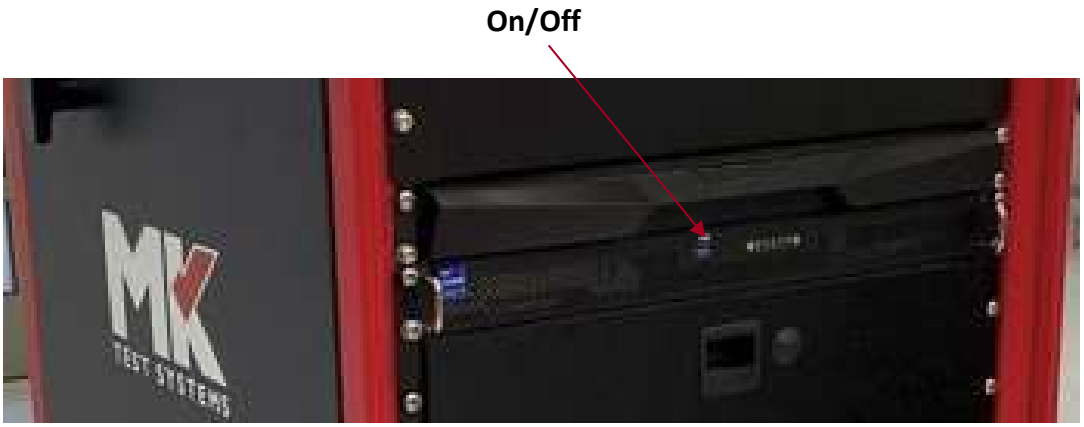
Set the On/Off switch to On (Down)

Ensure the Indicators are lit.

2.2 Start PC & MKAT Runner Software

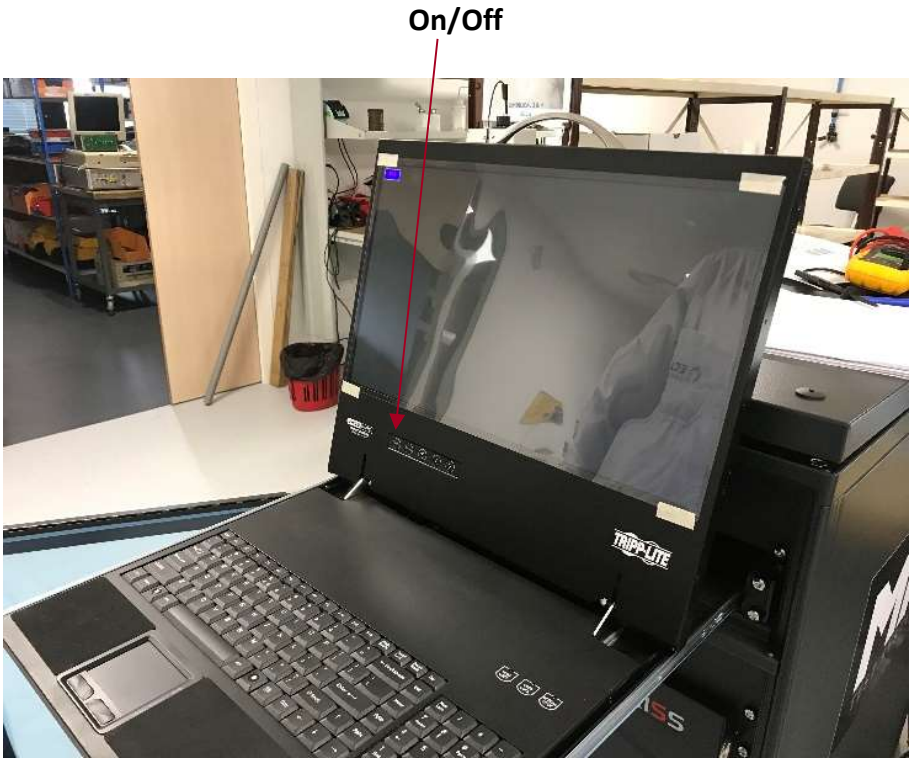
Test Console PC

Power On the Test Console PC if provided.



MONITOR

Pull out and open the Keyboard/Monitor tray. Power On the Monitor.



Log into Windows using your company login.

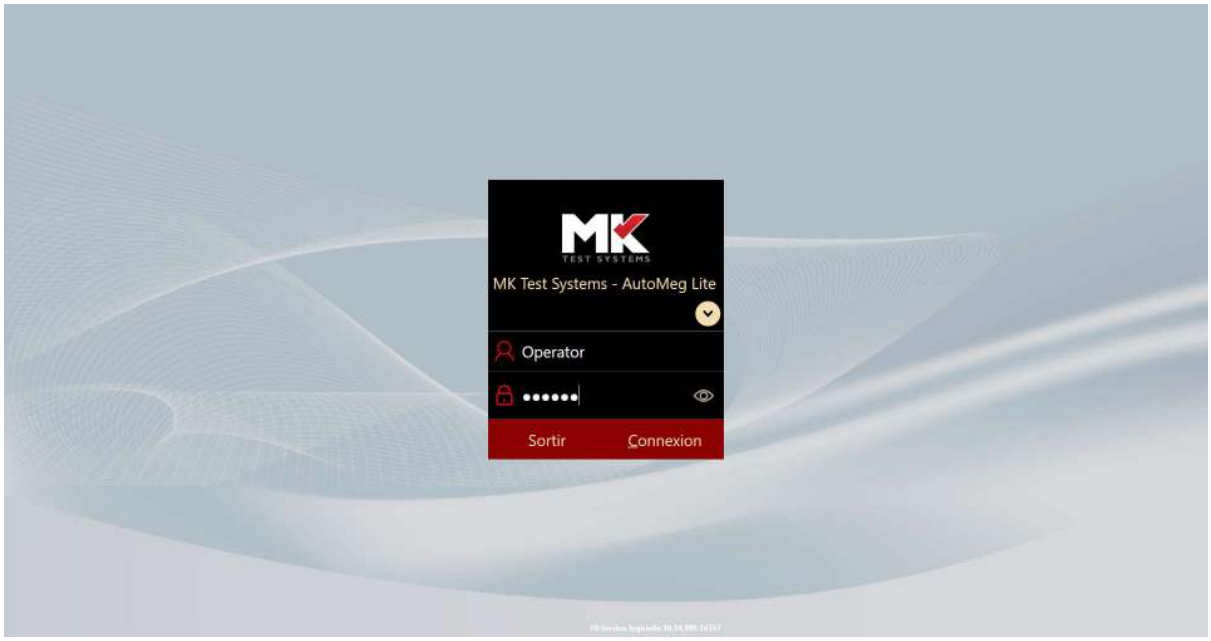
From the Desktop, double-click to launch the MKAT Runner application.

2.3 Logging in to MKAT Runner

Log in to the MKAT Runner software using your provided user account, or if enabled, your company domain login:

Username: **Operator/Administrator**

Password: *******

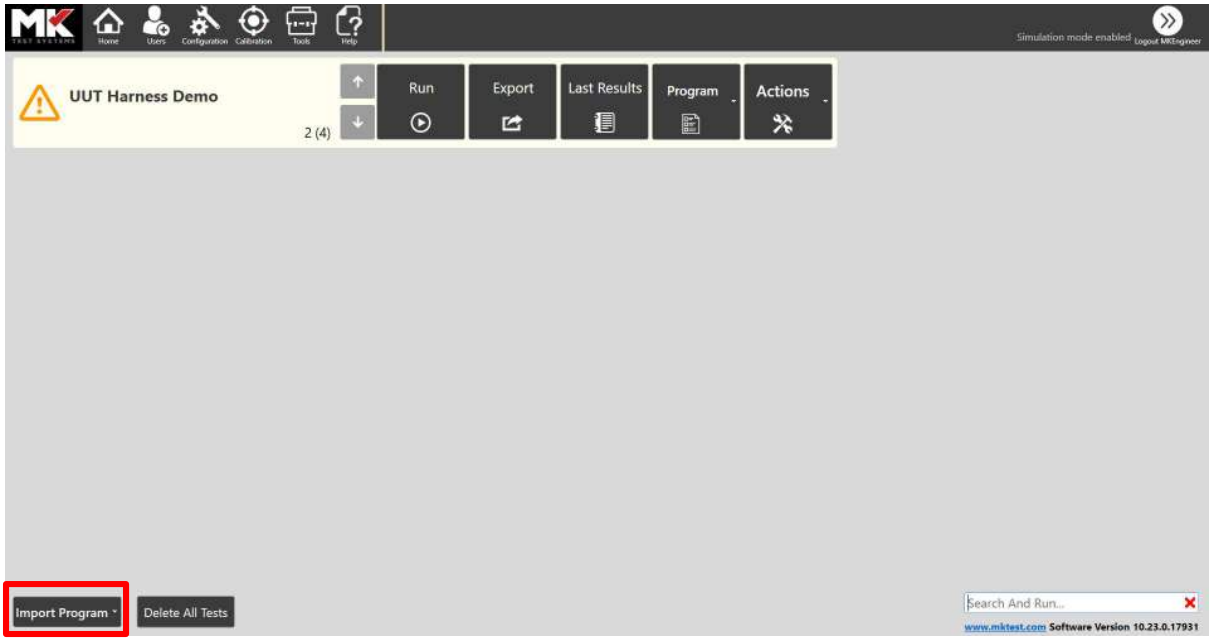


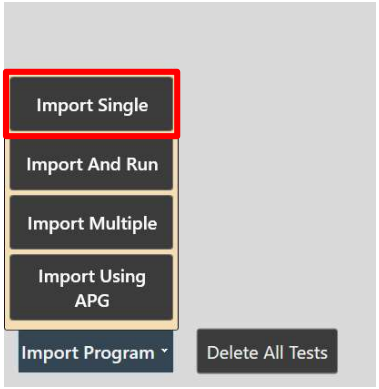
2.4 Loading Test Programs

NOTE: By default an Administrator level login is required to load test programs

2.4.1. LOAD PROGRAM FROM FILE

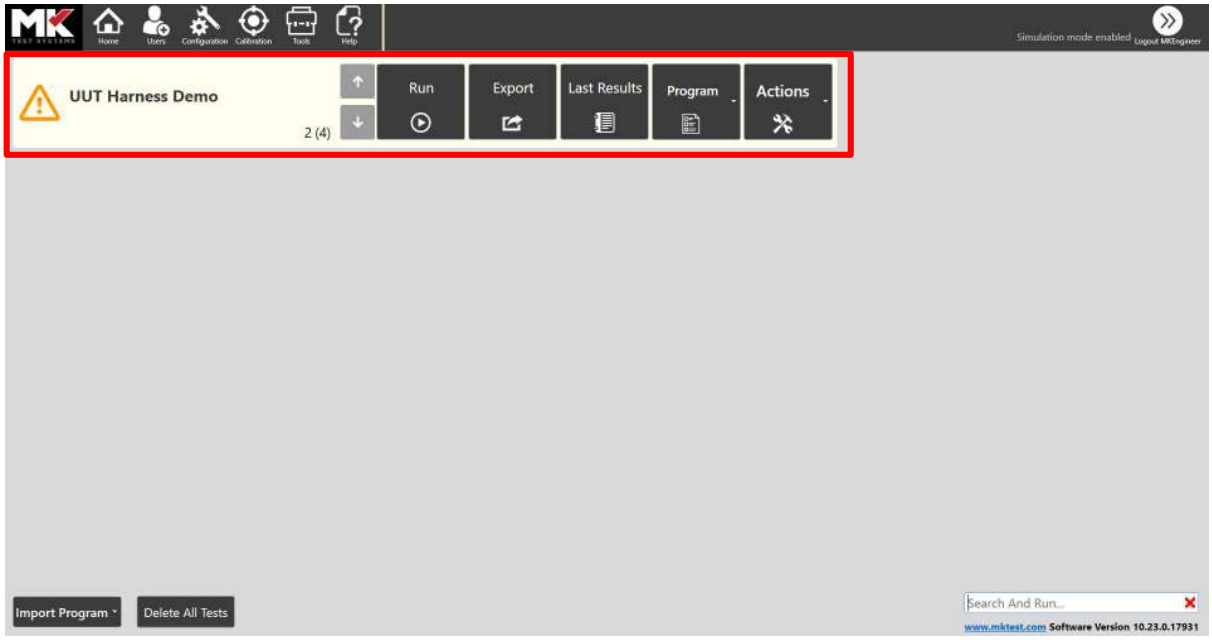
To load a test program select “Import Program” from the bottom right of the home screen and “Import Single”



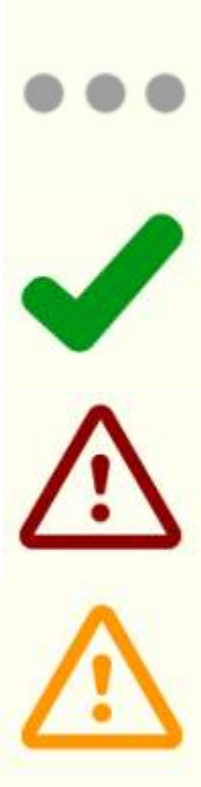


Depending on the size of the Test Program(s) import may take a few minutes.

The home screen will be displayed with new test programs loaded.



2.4.2. TEST STATUS SYMBOLS



Program Loaded (Untested)

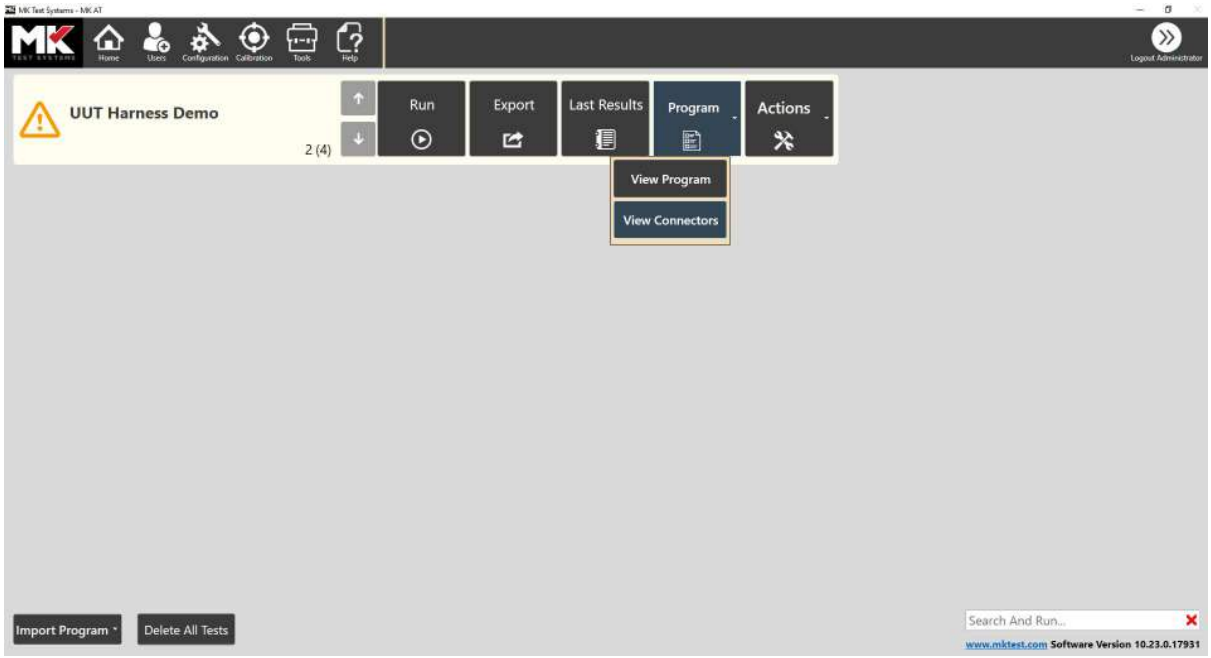
Program Run (PASSED)

Program Run (FAILED/ERROR)

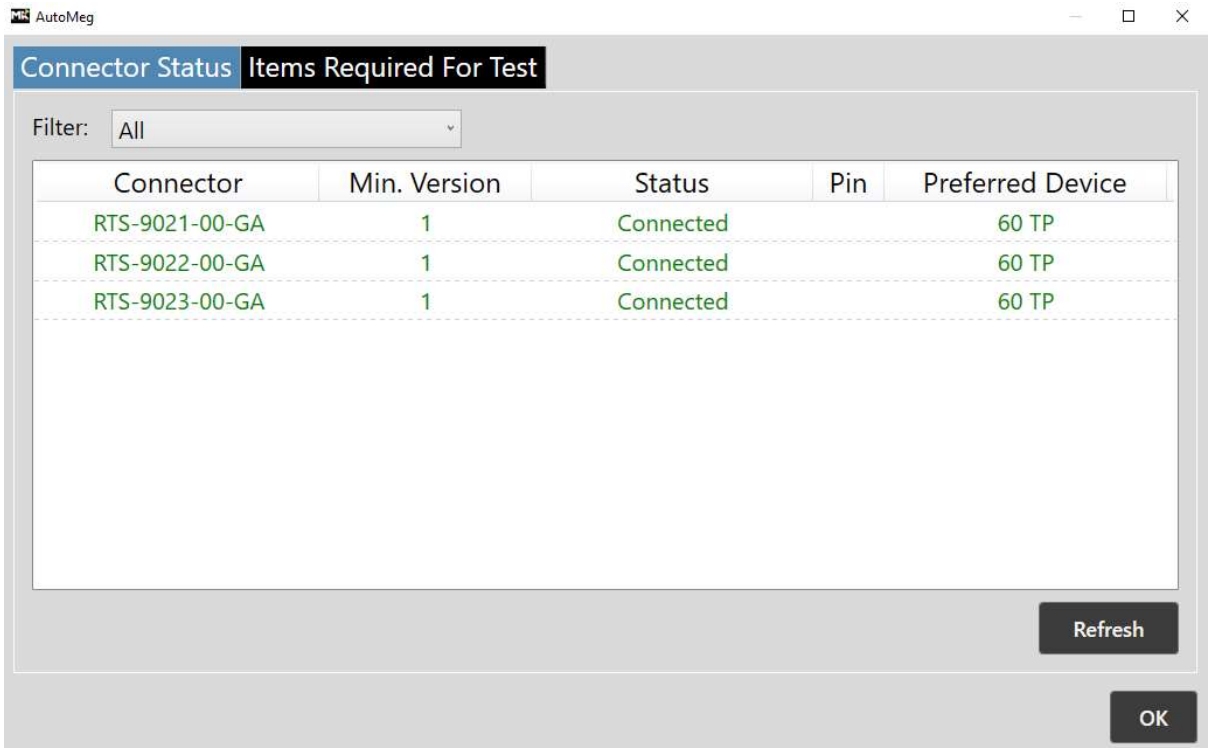
Program Run (PARTIAL/ABORTED)

2.5 View Connectors

Before starting a Test Program, a check can be done on all connected Interface Harnesses using their Active XRef IDs.



To view a list of required Interface Harnesses select “Program” and “View Connectors”.



Each Connector (Interface Harness or LRU) is displayed with the following details:

1) **Minimum Version** – This is the version of Harness or LRU that is required for the test program
2) **Status** – This shows if the Harness or LRU has been detected by the system. This can take the following values:
    a) Connected
    b) Not Connected
    c) Incorrect Version
    d) Missing from Config
3) **Preferred Device** – The recommended device that is used for connection. This value is used to populate the “Items Required for Test” screen.

The Filter drop-down list at the top of the screen can be used to filter the screen for any of the Status’ shown above.

Error: Not Connected

Connector	Min. Version	Status	Pin	Preferred Device
RTS-9021-00-GA	1	Connected		60 TP
RTS-9022-00-GA	1	Connected		60 TP
RTS-9023-00-GA	1	Not Connected		60 TP

For Interface Harnesses:

- Check that the Interface Harness has been connected to an nSat/uSat correctly.
- Check that the nSat/uSat has been connected to a MAG Connector and has power applied.
- Check that the Part Number of the Interface Harness is correct.

For LRUs:

- Check that the LRU has been connected to an Umbilical and has power applied.
- Check that the Part Number of the LRU is correct.

Contact the System Administrator and/or Maintenance if the error cannot be resolved.

Error: Connectors Missing from Config.

Connector	Min. Version	Status
RTS-9021-00-GA		Missing From Config.

Check that the Active XRef ID for that harness is available in the Active XRef Config.
Contact the System Administrator to ensure the Configuration is correct.

Error: Connector Pin Not Found.

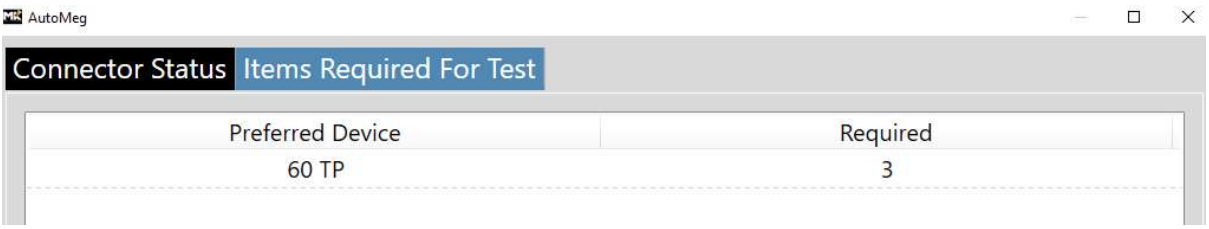
Connector	Min. Version	Status	Pin
RTS-9021-00-GA		Connector Pin Not Found	_n

Check that the correct Interface Harness version has been connected to the system.
Contact the System Administrator to ensure the Configuration is correct.

Error: Hardware Not Detected.

Check that the MCM power is applied and front panel indicators are lit.
Check for fault on the MCU and if necessary power cycle the Test Console.
Contact the Maintenance to check the Test Console and connections.

Switch to the “Items Required for the test” tab to see a list of the recommended equipment needed to complete testing.



2.6 System Hook-Up

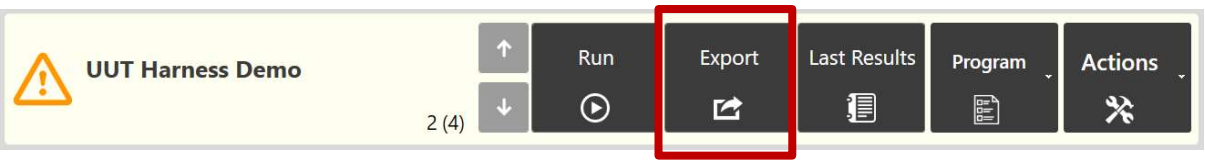
Connect all equipment to the UUT. During hook-up the “View Connectors” (See Section 2.5) function can be used to check that the system has detected the Harnesses and LRUs.

All equipment should be connected to the UUT as required for the Test Program. At any point an RTS test mode can be started to get an early indication of the Pass/Fail status of the test. Observe the LED indicators on the nSat, uSat and LRUs.

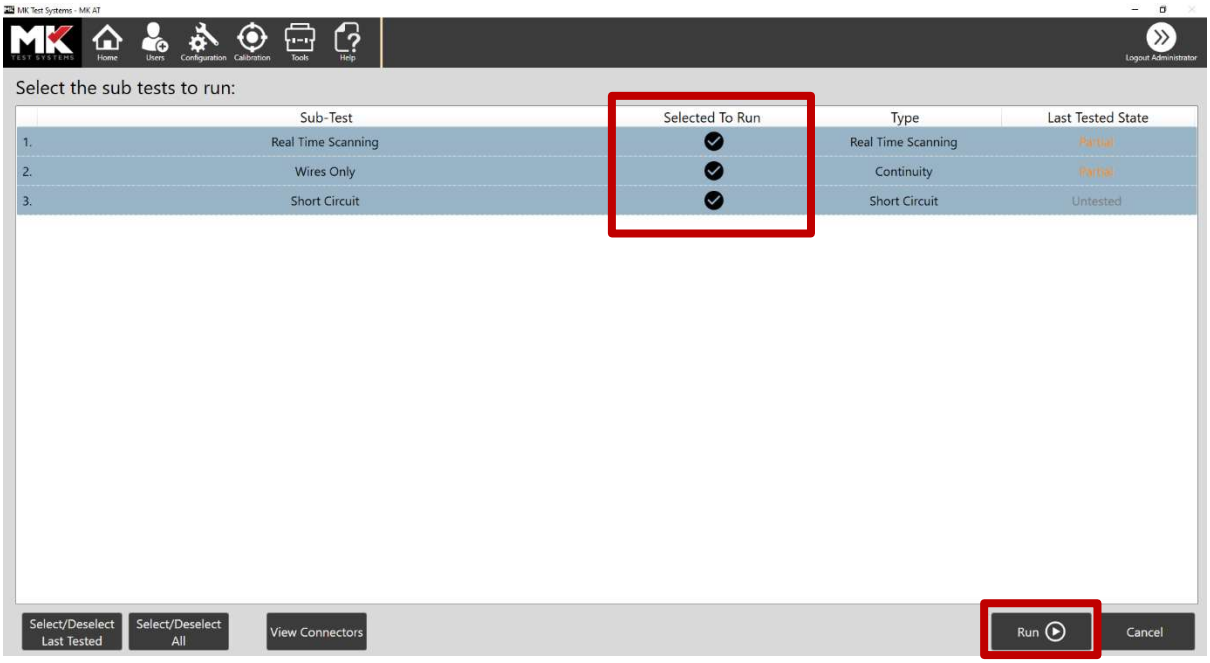
NOTE: The RTS system uses a low voltage (5V DC) test stimulus so all parts may be added/removed whilst an RTS test mode is running. All system setup should be stable whilst a Continuity test mode is running.

3 RUNNING TESTS

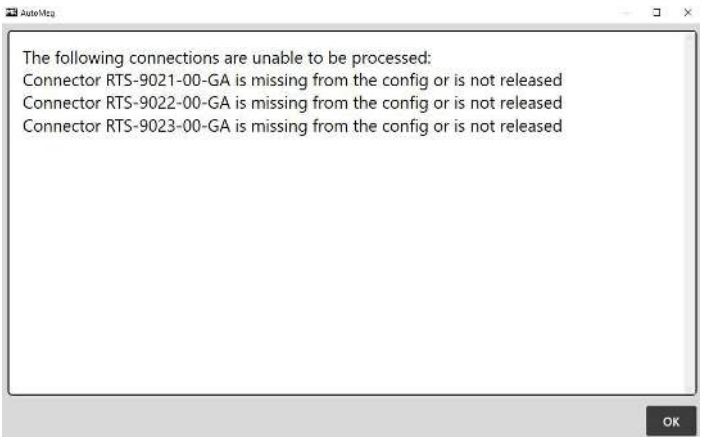
To run a Test Program select the Run button from the Home Screen



The Select Sub-Test screen will be displayed. From this screen you can select to run the RTS Test Mode, Continuity Test Mode, Short Circuit Test Mode or All. Make the selection and press the Run button to start the test.



Error: The Connectors are missing from the configuration



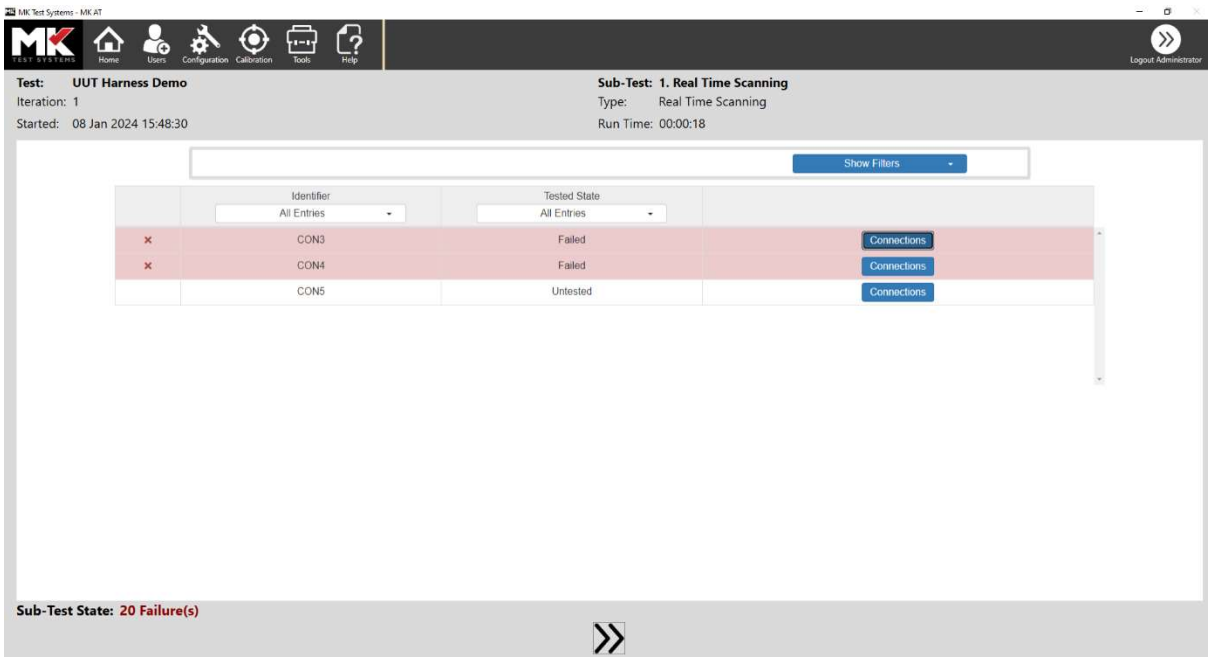
Check that the Active XRef ID for that harness is available in the Active XRef Config. Contact the System Administrator to ensure the Configuration is correct.

3.1 RTS Test Mode

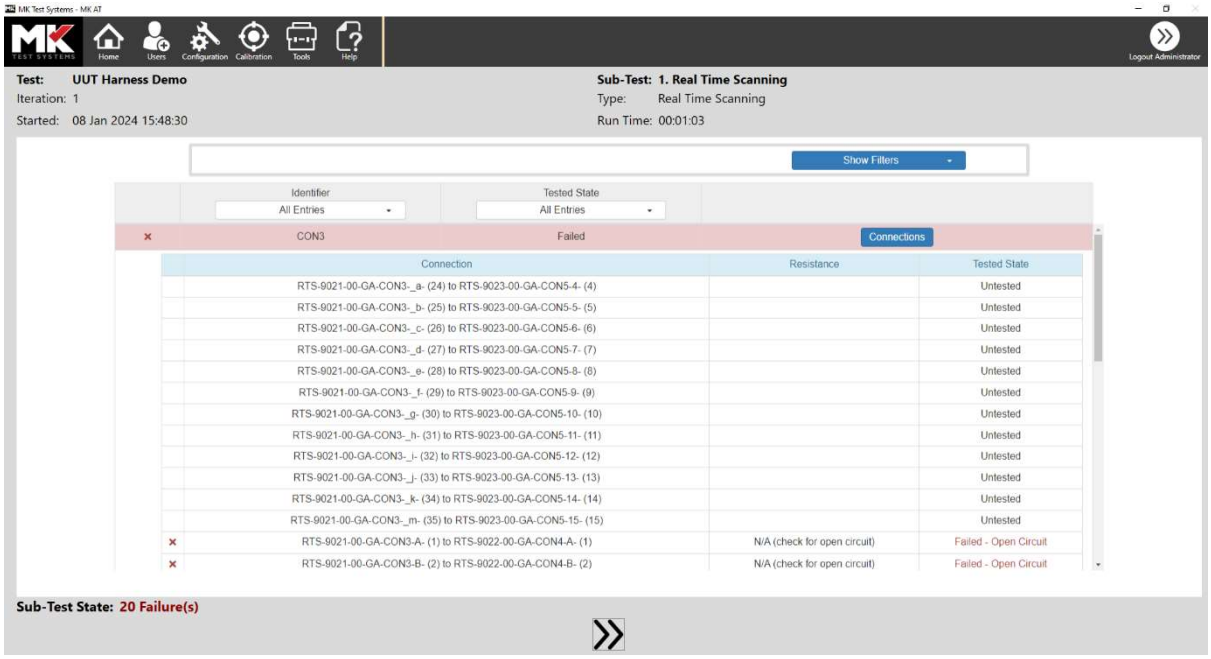
The RTS Test Mode has been designed to give an early indication of the test result for the program. In RTS Test Mode the RTS system will perform a full scan of the UUT, testing for Continuity, Insulation and Resistance (C,I,R) continuously and as fast as possible. Results are displayed immediately and the LED Indicators on each module (nSat/uSat/LRU) are updated to show the overall status for that connector.

The RTS Test Mode screen is displayed at the start of the test. All connections are grouped by Connector Identifier with the overall Pass/Fail status for that Connector shown. The following status and associated colour are possible:

Untested	Unable to test. Check equipment is connected and operating.
Failed	One or more failures.
Error	One or more Errors have occurred.
Partial	No failures detected but one or more connections are Untested
Pass	All connections have Passed



To view the details for a single Connector, press the Connections button.

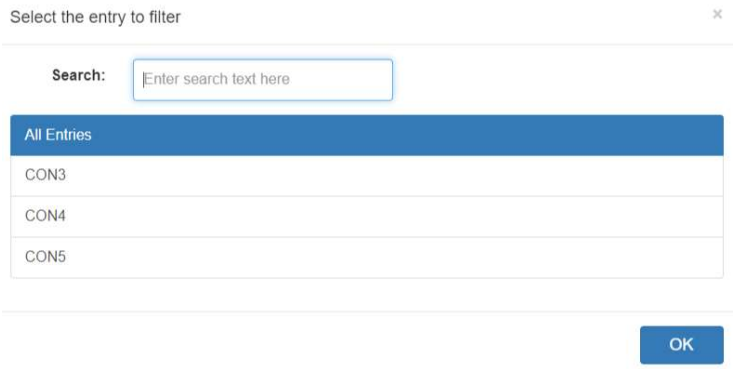


Each line represents a single connection within the UUT with the From and To CON/PIN combination shown. The associated information such as Drawings and Wire Number / Types can be shown to help in fault location and diagnostics.

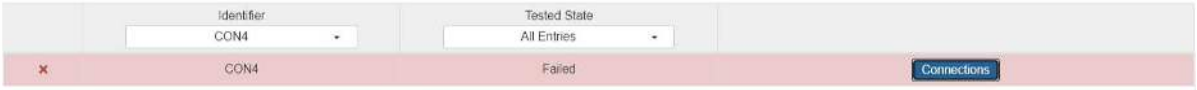
For each line, the measured resistance is displayed along with the Status of the connection. This can be one of the following:

Untested	Unable to test this connection. Check equipment is connected and operating at both sides of the connection.
Failed	A valid resistance has been measured outside of the required range.
Failed – Open Circuit	An open circuit condition has been detected.
Measured – Outside Range	No failure detected but RTS Test mode is unable to validate a Pass due to the range of the requirement.
Errored	Errors have occurred.
Passed	Pass with valid resistance displayed.

The RTS Test Mode screen can be filtered to quickly locate a single Connector Identifier within the UUT. Click the “Identifiers” drop down list to bring up the filter screen.

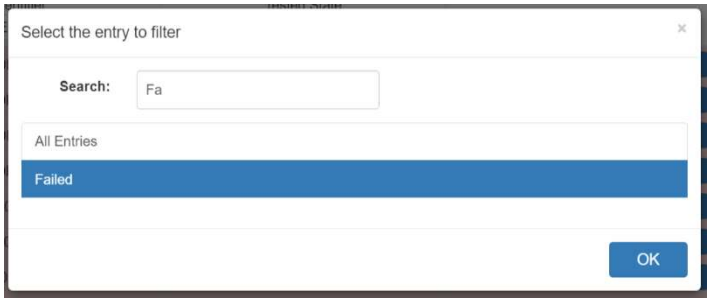


Click “OK” to enable the filter:

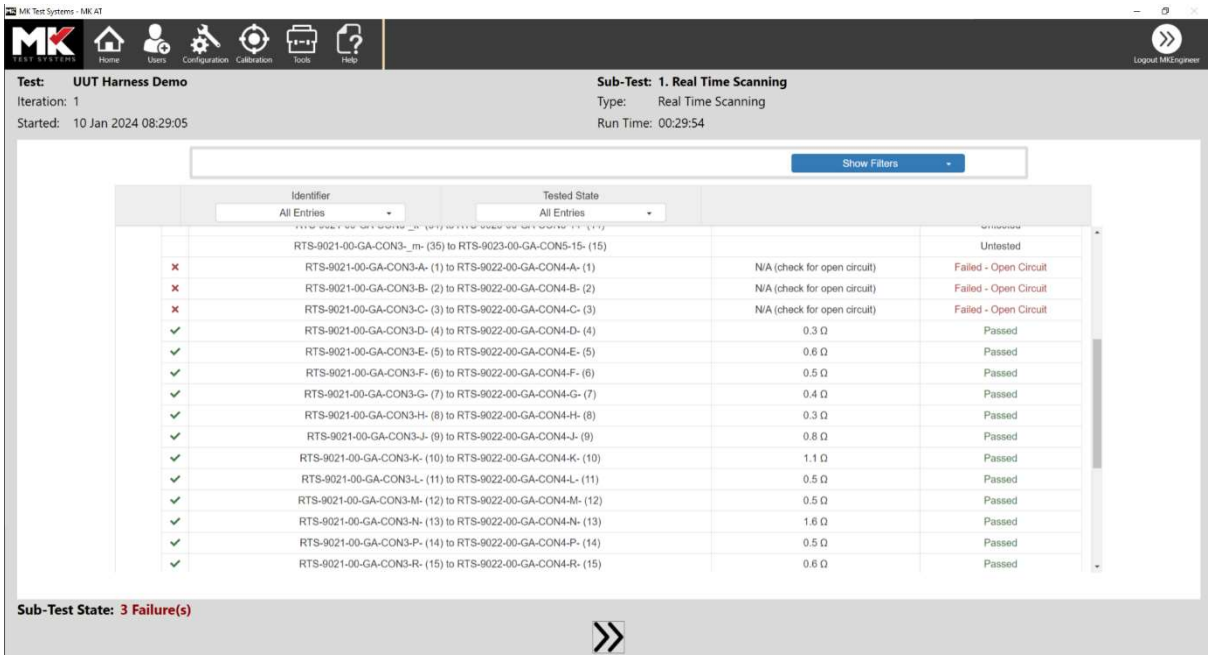


The filter can be removed by clicking the “Identifiers” drop down list and selecting “All Entries”.

The RTS Test Mode screen can also be filtered by test status. To do this, select the “Test Status” drop down menu and select from the options.



RTS Test Mode can test between 0Ω and 20Ω so any valid measurement in this range will be shown as Pass and the resistance displayed.

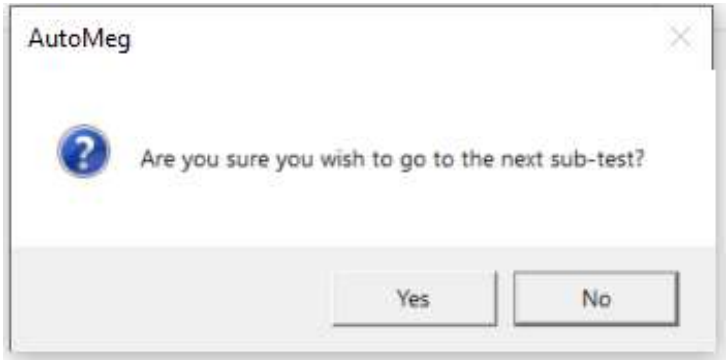


In the case of Insulation (I) tests and Resistance (R) style tests, the RTS Test Mode will display Fail if the resistance is measured < 20Ω and this outside the requirement.

If the resistance is measured but outside the capable range for the test >20Ω then the display will state Measured – Outside Range.

The expected state for all connections should be Pass or Measured – Outside Range. If any connections are marked as Untested or Failed then these should be investigated before continuing.

Once RTS Testing has been completed, proceed to the next sub-test using the button.

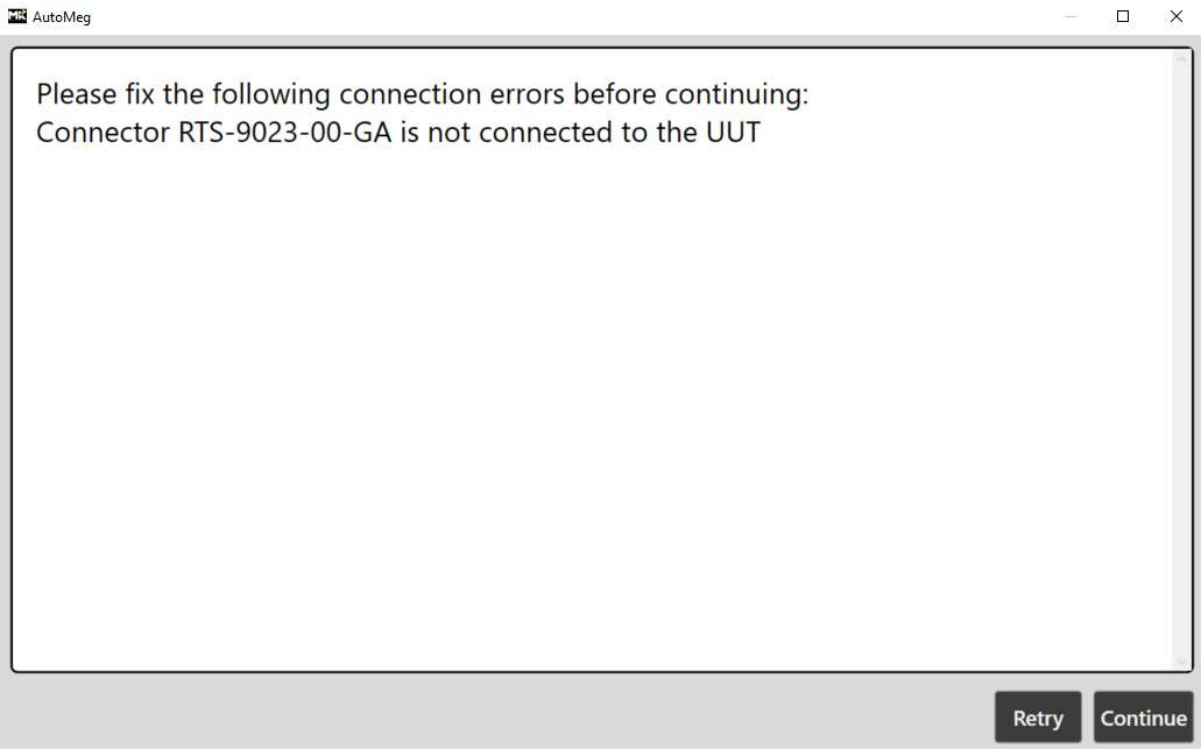


3.2 Continuity Test Mode

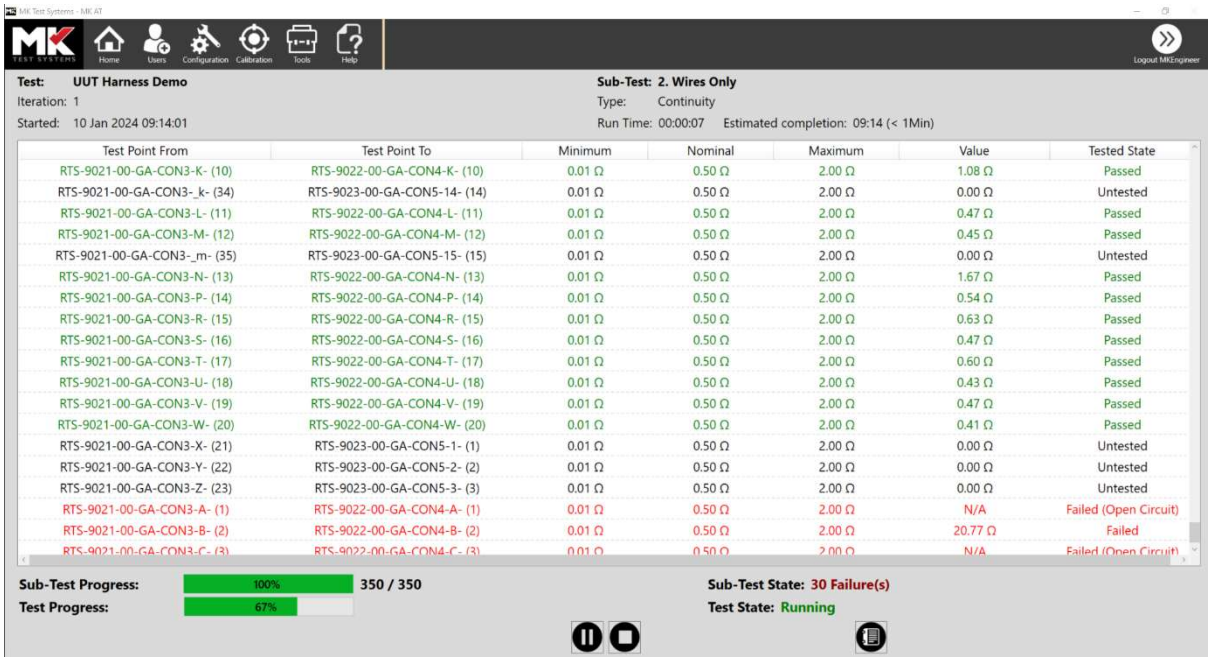
The Continuity Test Mode is used to perform the full test of the UUT including all measurements for C, I and R type tests. This test mode is a single run with a full test report produced at the end.

At this point in testing, it is expected that any likely failures have been resolved using the RTS Test Mode.

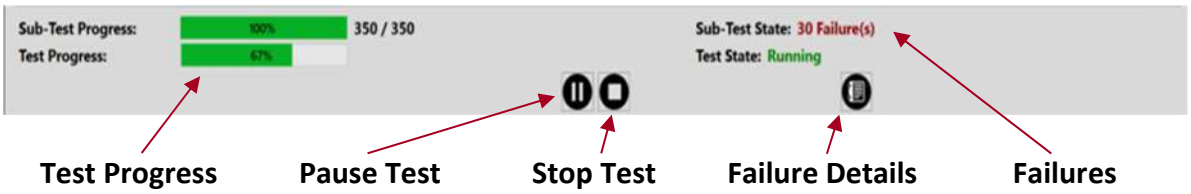
It is essential that all equipment is connected to the UUT and detected by the RTS system. If any required connectors are not detected at the start of the Continuity Test Mode a pop-up screen will be displayed. These items should be fixed before continuing.



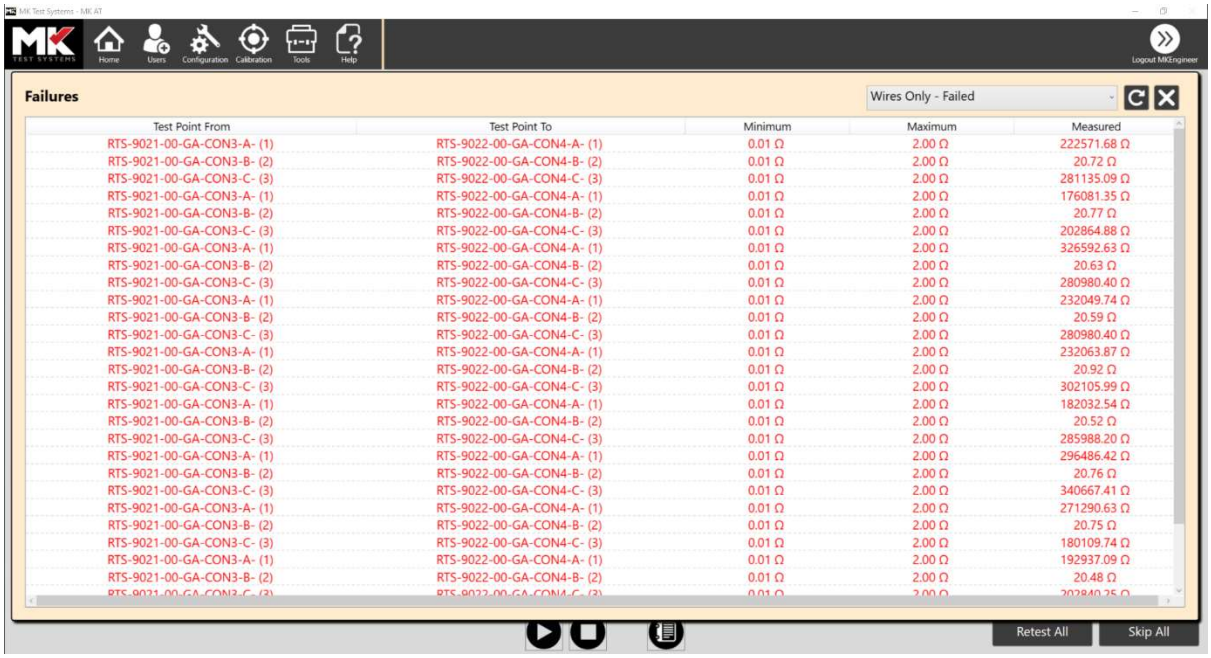
During the test execution, results are displayed on the screen with colour indication of Pass/Fail/Untested.



The information at the bottom of the screen shows the progress of the test and the number of failures.



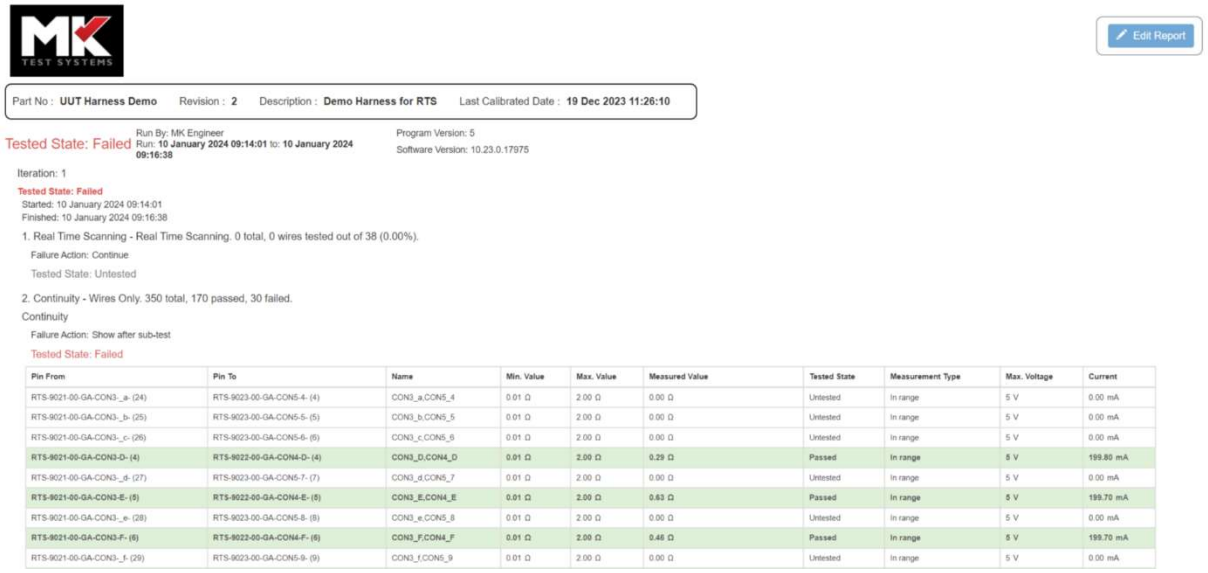
The Failure Details screen can be used during the test execution to begin analysis of failures. This screen provides a list of failures along with their measured value and requirements.



Once the test run is complete the MKAT Runner software will automatically generate the test report if no error has been detected. Otherwise, a pop up will be displayed showing all detected failures and proposing a re-run (full error re-run feature must be enable to select all failures).

4 REPORT GENERATION / ANALYSIS

The MKAT Runner software creates a full report for the Test Program on completion.



This screen should be analysed and any Failures noted for investigation.

To save the Test Report, select “Options” -> “Export to PDF”. A Save File dialogue will be opened and PDF file can be saved for records.

To close the report, select the 

button.

NOTE: You can return to the Report screen at any time by selecting the “Previous Results” button from the Home screen.

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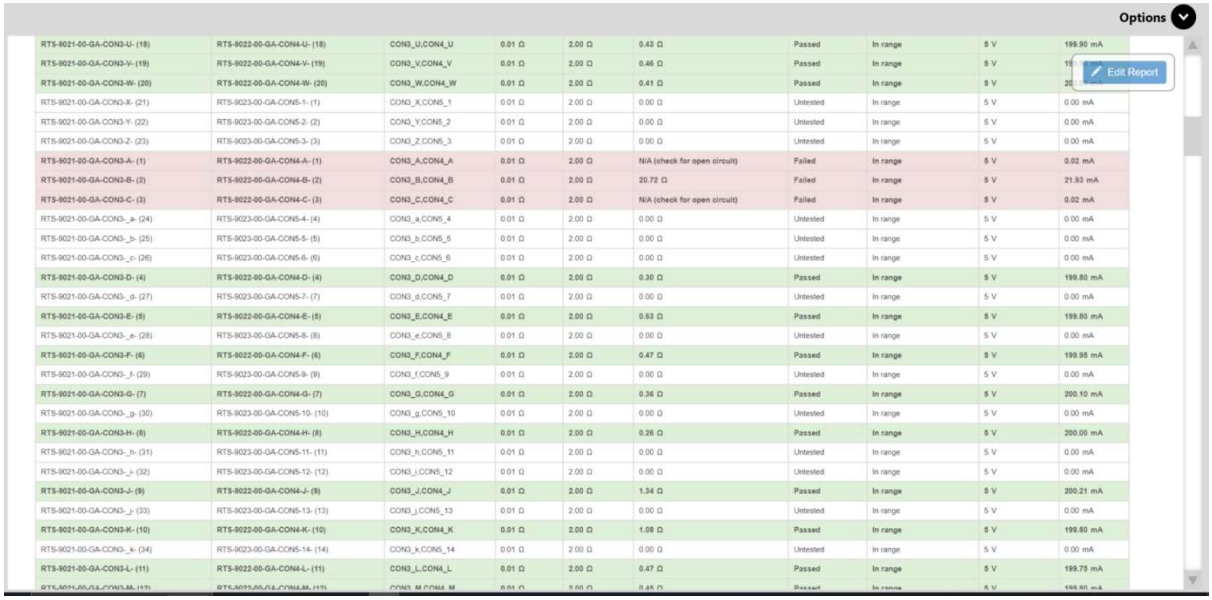
5 FAULT FINDING

The Test Report displays any failures at the top of the report with information needed for fault finding within the UUT.



At the end of the test execution, any failures will be highlighted immediately with the opportunity to re-test immediately.

If possible any failures should be corrected and re-tested before proceeding to the test report.

A number of support tools are available to assist in fault finding:

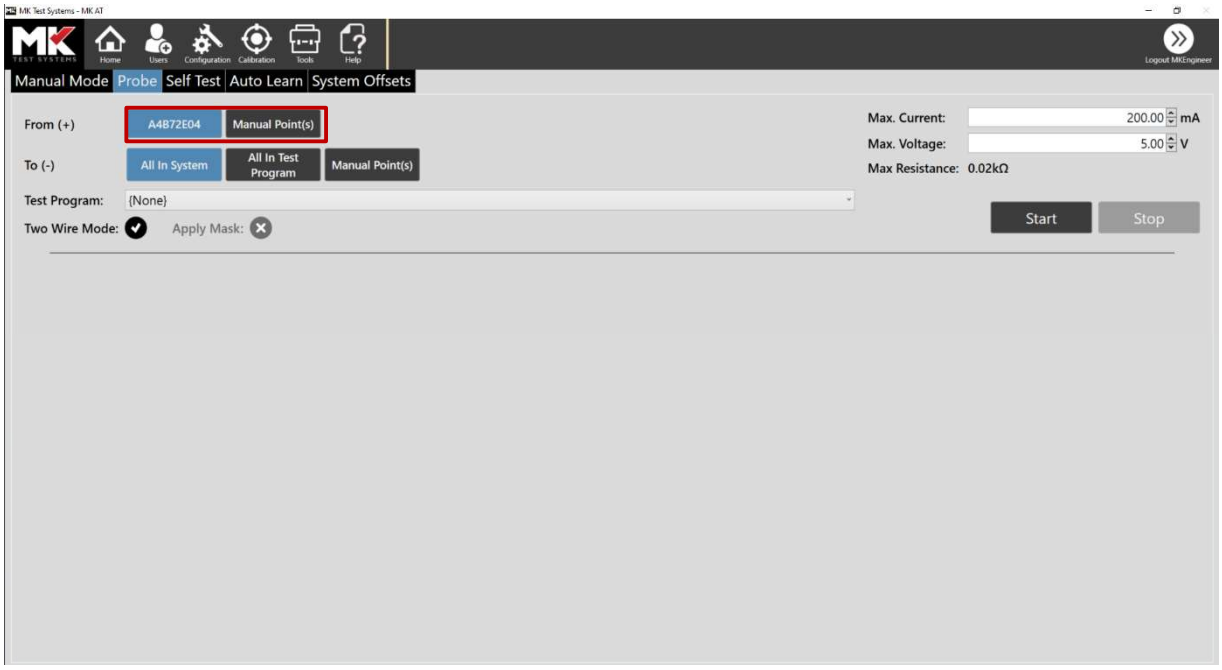
1) Probe Test
2) Manual Test (see Maintenance Manual)
3) Self-Test (see Maintenance Manual)

Select the tools 

button.

5.1 Probe Test

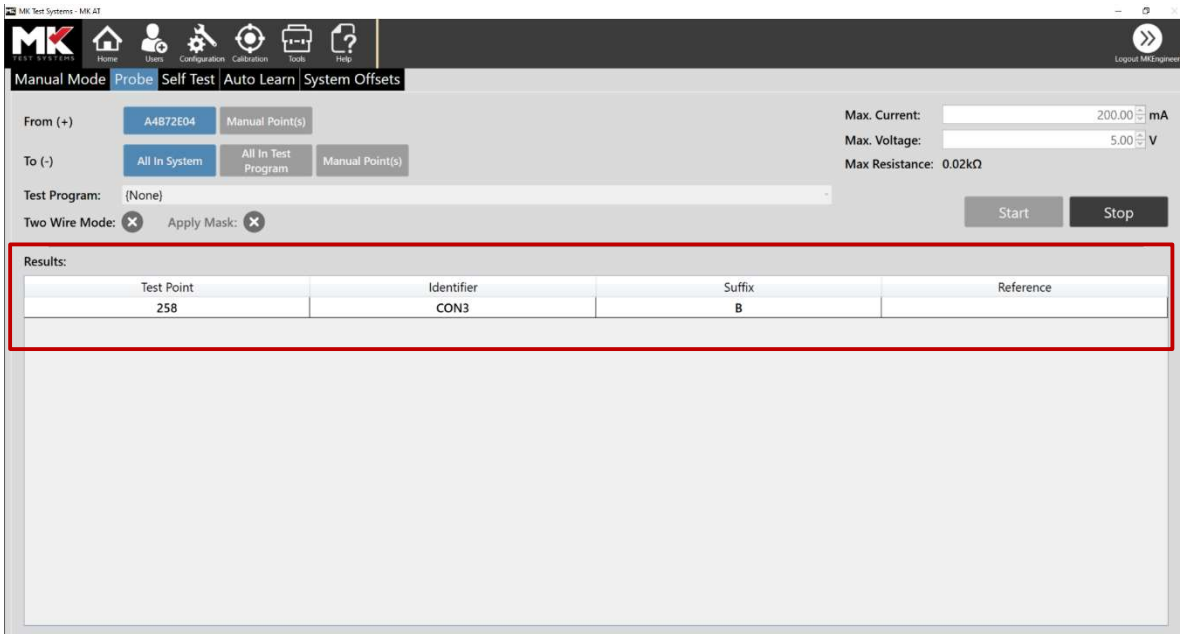
Select a module from the “From+” section. The selected module (nSat/uSat/LRU) will be highlighted in the system with a blue LED indicator. Connect the 4mm probe to this module.



Check that the Current is set to 200mA and Voltage set to 5V. Start the test with the “Start” button.

When the 4mm probe is connected to a valid point in the UUT, the following parameters will be displayed in the “Results” section:

1) Test Point – test point number for the module (See Administrator for details)
2) Ident – Connector of the connection
3) Suffix – Pin of the connection



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