



RF GENERATOR AUTO-TEST SYSTEM USER MANUAL

RFG-ATS 01





RF Generator Auto-Test System User Manual

Table of Contents

Chapter 1 - Safety and Power Requirements	2
Chapter 2 - Accessories Included and Help Screen.....	3
Items Included.....	3
Help Screen.....	4
Chapter 3 - Specifications.....	5
Tests	5
Mechanical	5
Electrical	5
Chapter 4 – Power Up Procedures.....	6
Connections.....	6
Power	7
Chapter 5 – Touch Screen Navigation.....	8
Chapter 6 – RF Generator Tests	9
RF Generator Data Installation	10
Tests	12
Disclaimer	13
Chapter 7 – Data Interpretation	15
Interpreting the Data	14
Troubleshooting.....	21

Chapter 1 - Safety & Power Requirements



High Voltage Warning



Electric Shock Hazard



Warning



Non-Ionizing Radiation Hazard

Frontier Engineering LLC dba Frontier RF provides this information to ensure that individuals using this equipment do so safely and responsibly. Frontier Engineering assumes no responsibility for incorrect use of this equipment during after-sale operations or the safety practices of the owner-operator.

This equipment is used in conjunction with an RFG (Radio Frequency Generator) unit that produces high voltage, high current radio frequency energy. Potential harm could result from incorrect operation of this equipment.

Read this user manual before attempting operation of this test equipment. Failure to do so could result in damage to your person or equipment.

Chapter 2 - Accessories Included and Help Screen

The following items are included with your purchase:

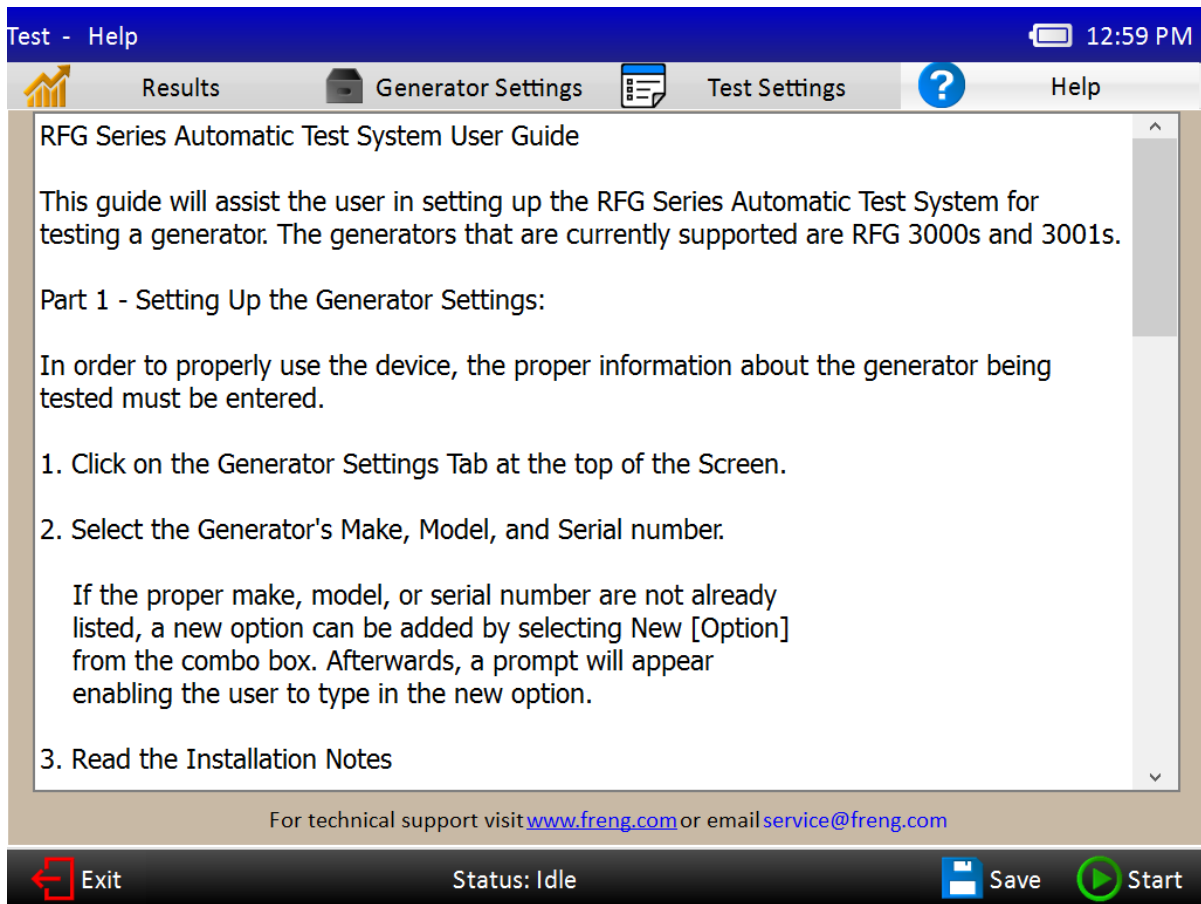
- 1 x RF Generator Auto-Test System
- 1 x N to HN RF cable
- 1 x 25 to 25 D-sub cable
- 2 x SMA to BNC cable
- 1 x Stylus and holder
- 1 x N female to HN male adapter
- 1 x Right-angle N female to N male adapter
- 1 x A/C battery charger (Input 120VAC 1A, Output 14.6V 4A).
The battery pack is fully charged once the LED turns green on the charger.



Note: If replacement cables are required, please contact Frontier RF. Do NOT substitute other cables to avoid errors in data capture or possible damage to the RFG-ATS 01.

2.1 Help screen

The help screen menu aids the user in the set-up of the RFG-ATS 01 unit and provides the set-up requirements for unit(s) under test. Refer to this 'Help' menu or the 'Troubleshooting' guide (section 8) if following the defined procedure does not yield the desired results (see the menu sample below).



- 2.2 If you have any questions or problems regarding this unit, please visit our website: www.freng.com or e-mail: service@freng.com

Chapter 3 - Specifications

3.1 Tests

- Pulse Test – Compares expected power levels to measured power levels. This test provides an indicator of the generators' calibration and power output.
- VSWR – Executes a measured 1.5:1 Impedance mismatch test.
- Phase Lock Loop Test – Evaluates the generators' ability to phase-lock its' oscillator within the OEMs' specified bandwidth.

Mechanical

- RFG-ATS 01 dimensions: W – 13 5/8" H – 11 7/8" D – 4 5/8"
- Weight (includes case, accessories and RFG-ATS 01) – 27LBS
- Charger dimensions: W – 5 3/8" H – 2 3/8" D – 1 3/8"
- Display size: W – 9 5/8" H – 7 3/4" (12.1" diagonal)
- RF port type – N connector
- CEX I/O type – BNC connector
- Computer interface – USB
- Control interface – 25 pin D-sub (f)
- Power switch – Illuminated rocker switch
- Charger connector – Coaxial (special) with threaded collar nut

3.2 Electrical

- Charger input voltage: 100-240VAC 1.8A max.
- Charger output voltage: 14.6VDC 4.0A max.
- Li battery pack: capacity nominal 12.8V at 9.6Ah (122.9Wh)

Chapter 4 - Power-up Procedures

Connections

Before powering on your RFG-ATS 01, ensure the following connections have been made between the tester and the RFG under test.

- 4.1 Plug the 25 pin D-Sub connector to the tester user port and in to the RFG user interface socket.
- 4.2 Connect the RFG RF power coaxial cable.
- 4.2.1 Connect the two CEX cables as per the information below:

	<u>RFG-ATS 01</u>	<u>RF Generator</u>
RED	CEX IN	CEX OUT (RH connector from front view)
BLUE	CEX OUT	CEX IN (LH connector from front view)



RFG-ATS 01 Cable Connections

- 4.3 Connect the AC input power cable to the RFG.
- 4.4 You **MUST AT ALL TIMES** supply coolant (water) to the RFG under test.



RFG Connections

Power

- 4.5 Turn on RFG-ATS 01 (blue power switch). The tester will take approximately one minute to initialize and display the 'Test Settings' screen. (The screen will remain blank until the self-tests are complete).
- 4.6 Turn the generator on.

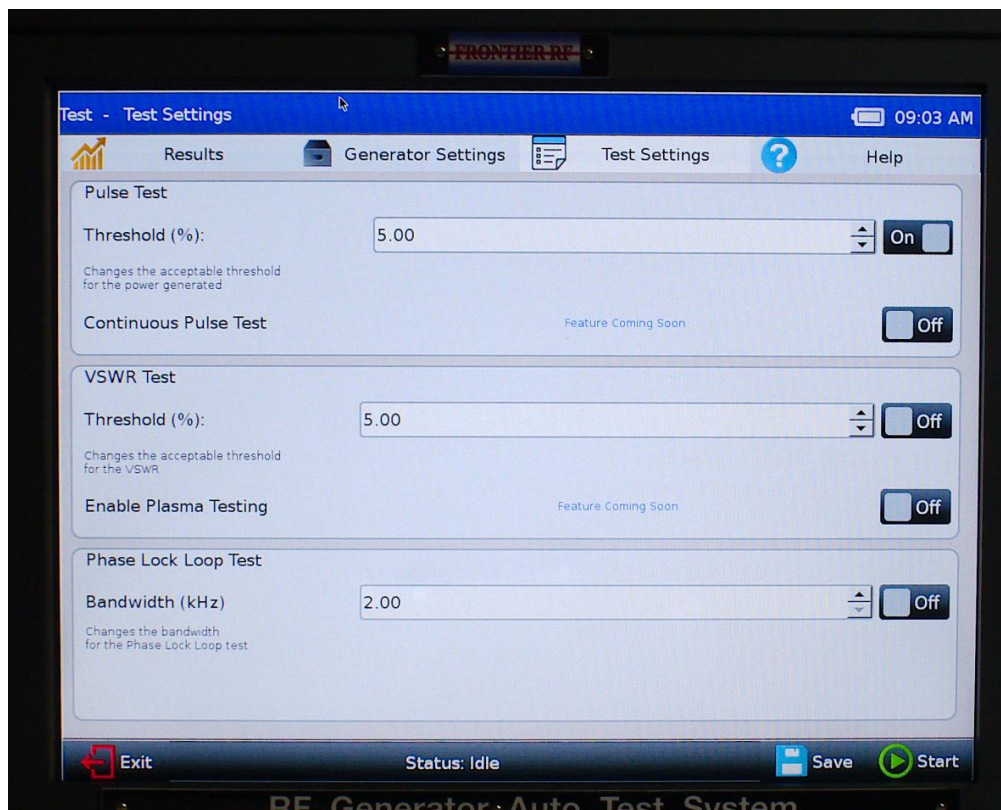
Chapter 5 - Touch Screen Navigation

- 5.1 All relevant information will be entered either by selection on a pull-down menu or popup keyboard entry.



Note: We recommend you use only the stylus provided to input data via the touch screen. The touch screen could be severely damaged by using other objects to input data.

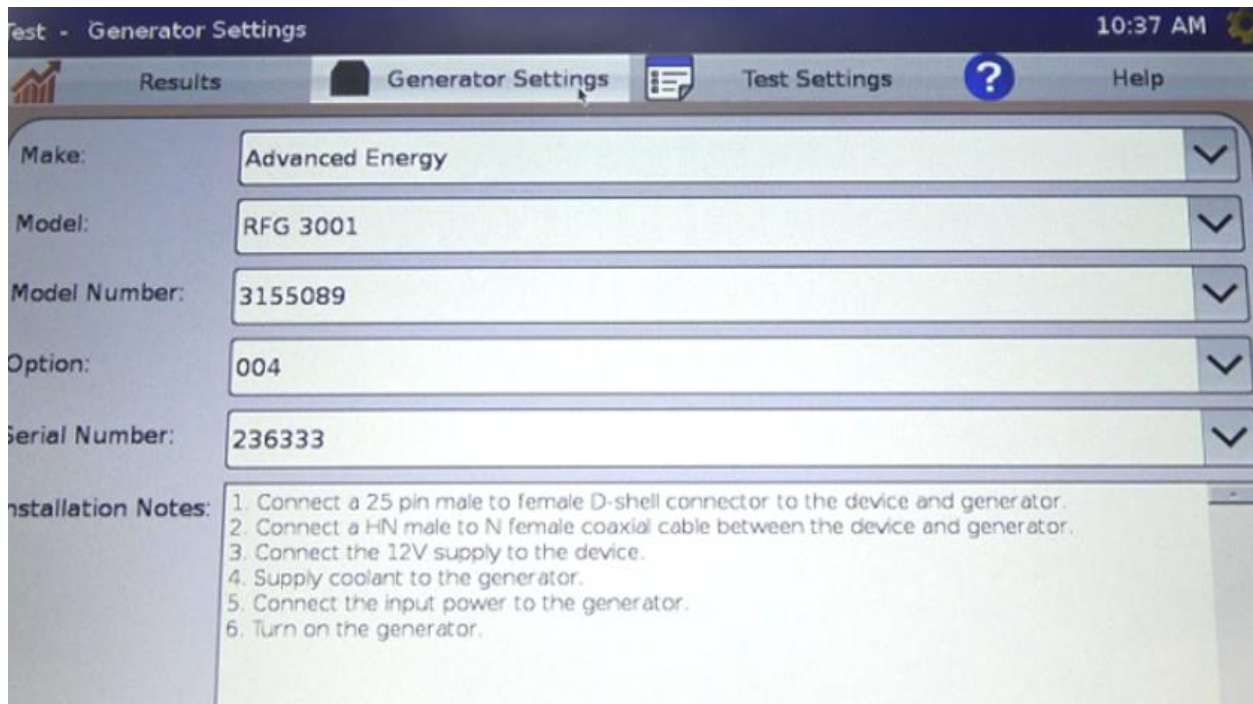
- 5.2 The four tabs located at the top of the screen (Results, Generator Settings, Test Settings, Help) are the input/output options.



- 5.3 The four touch buttons (Exit, Status, Save, Start) located at bottom of screen. Status 'Idle' will display if no test has yet been run.

Chapter 6 – RF Generator Tests

Click on the Generator Settings tab and complete the required information (see the example screen below).



Test - Generator Settings 10:37 AM

Results Generator Settings Test Settings ? Help

Make: Advanced Energy

Model: RFG 3001

Model Number: 3155089

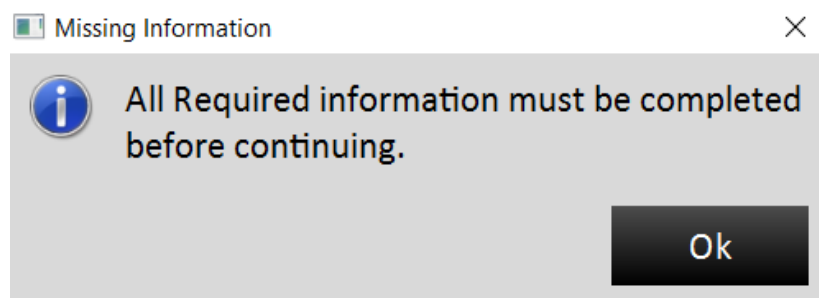
Option: 004

Serial Number: 236333

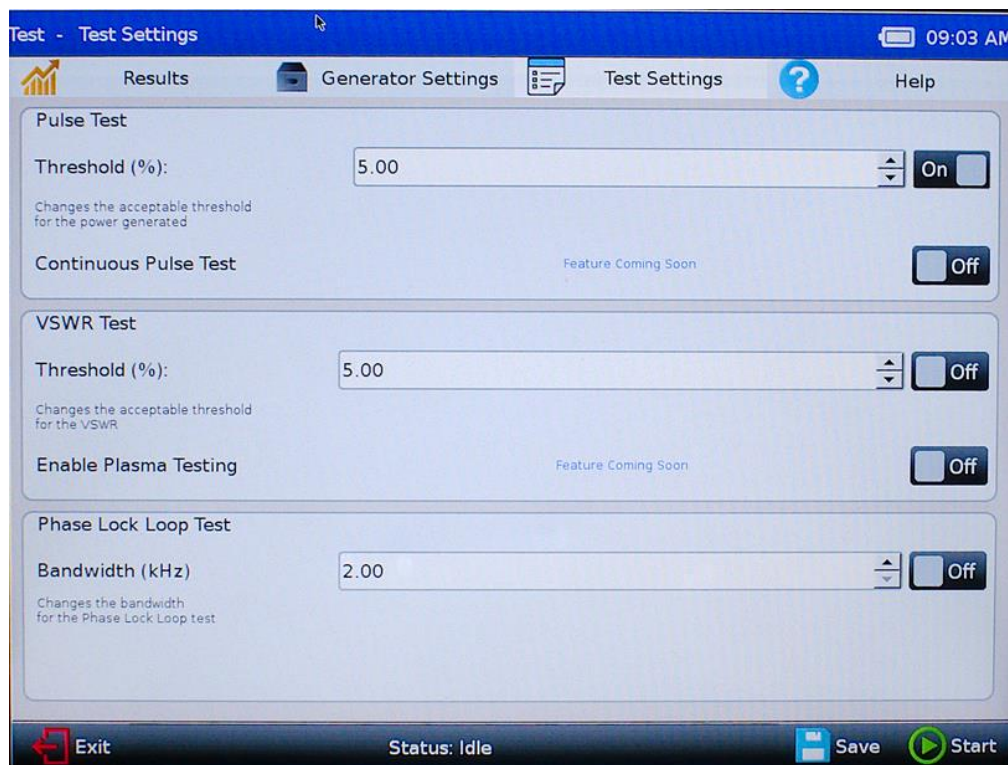
Installation Notes:

1. Connect a 25 pin male to female D-shell connector to the device and generator.
2. Connect a HN male to N female coaxial cable between the device and generator.
3. Connect the 12V supply to the device.
4. Supply coolant to the generator.
5. Connect the input power to the generator.
6. Turn on the generator.

All 'Generator Settings' fields must be completed sequentially for the test process to commence. If the information is not completed in all required fields, the following prompt will be displayed on the monitor.

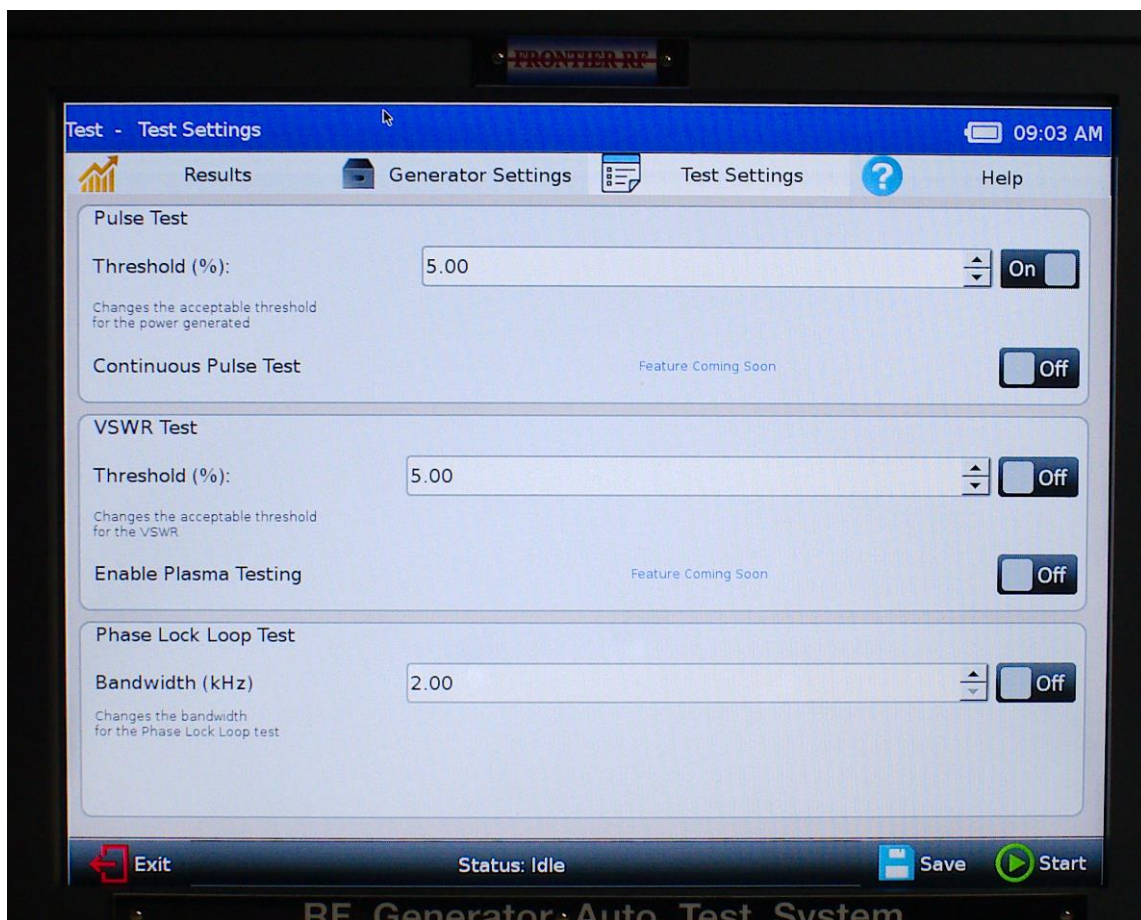


- The 'Installation Notes' menu will automatically be compiled when the correct information has been completed. Follow the 'Installation Notes' for the correct connection procedures between your RFG-ATS 01 and the generator under test. The 'Installation Notes' screen provides a step-by-step guide relevant to the generator you have chosen to test.
- Click **SAVE** at bottom of monitor. (Optional)
- The information entered is stored for this test run.
Note: Test routines must be allowed to complete before re-testing or changing generators.
- Click 'Test Settings' tab
 Test settings are pre-defined for the generator under test. They can be changed to an alternative model by clicking on the arrows (pull-down) and re-entering relevant data for a second test.



Toggle the 'ON/OFF' button on the right of the particular test(s) as shown on the screen above.

Increments relative to a test can be selected via pull down up/down button, alternatively they can be manually typed in. Select an increment or value for each selected 'ON' test. If a selected value is out of the test range, or an invalid value, the field will remain blank. A valid value must be selected. At least one test must be selected 'ON' for the unit to commence testing. Multiple tests may be selected to run in succession. All selected 'On' tests will be run to completion regardless if they provide a Pass or Fail notification.





REFLECTED POWER TEST

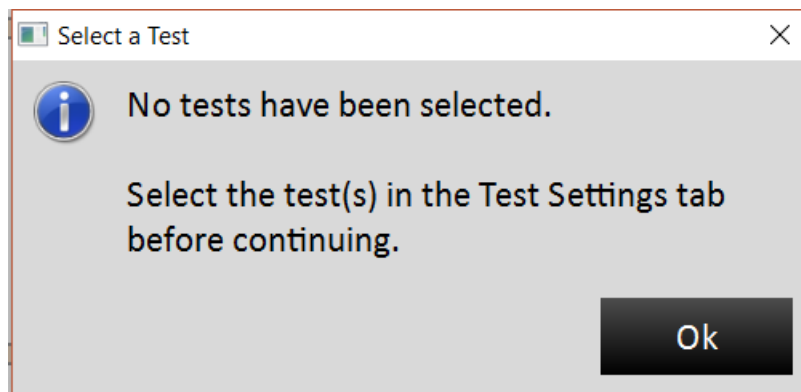
A warning dialog box will appear advising of possible damage to your generator if it does not have high VSWR protection.

With the selection of each test, a popup window will prompt you to confirm that you wish to run the test. Click OK to queue the test to start, or, click Cancel to exit this test. Repeat this procedure for the remaining selected tests.

The test process will commence when the START button at bottom of screen is selected.

The Test(s)

- Click the Start button – the program will run automatically until all the selected tests are complete. If no test(s) were selected during the previous step, the message shown below will appear.



If you see this message, go back to Test Settings (6.4 above) and follow the instructions.

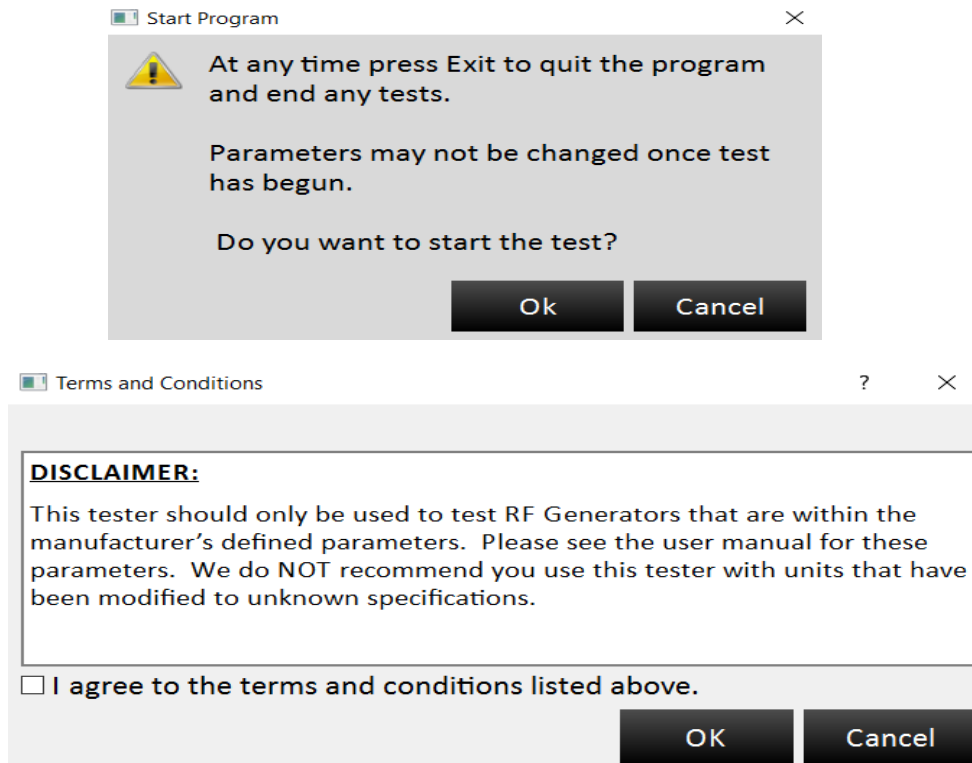
- A Dialog box will appear advising parameters cannot be changed once a test starts

- Click to confirm you wish to run the selected test(s)
- Click OK to start the test(s) or click Cancel to exit.

Please note that any data input or any data collected will be lost if you exit the program

Prior to the start of the test(s), two notifications will prompt you, in sequence, to confirm acceptance and responsibility for continuation of the selected test(s).

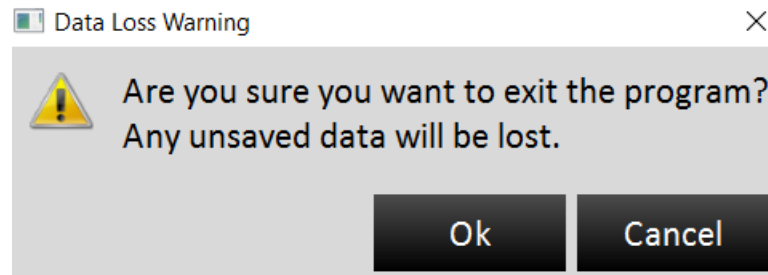
To start the programmed test suite, click OK.



To continue, accept the Disclaimer by clicking the Agree and OK boxes.

The test(s) will commence.

If at any time during the testing operation you wish to stop the process, click the **STOP** button. If you wish to end the test and exit the program, press **EXIT**. Please note, exiting the program will result in the loss of compiled data. To continue the test(s), and avoid exiting the program, click **CANCEL**.



- Green progress bar indicates the progress of the test(s). It will not reach 100% until all tests are complete.
- Orange progress bar indicates a soft failure. A soft failure is one that may not require immediate repair of the RF generator but should be compared to previous results to provide an early detection indication of a possible deteriorating component.
- Red progress bar indicates a failed test. However, a failed test will not stop tests that are set to be run in the same session.

Test time will vary depending on the number of tests run.

Average test durations

- **Initial Test** – 1 minute
- **Pulse Test** – 10 minutes
- **Reflected Power Test** – 2 minutes
- **PLL Test** – 2 minutes

Chapter 7 -Data Interpretation

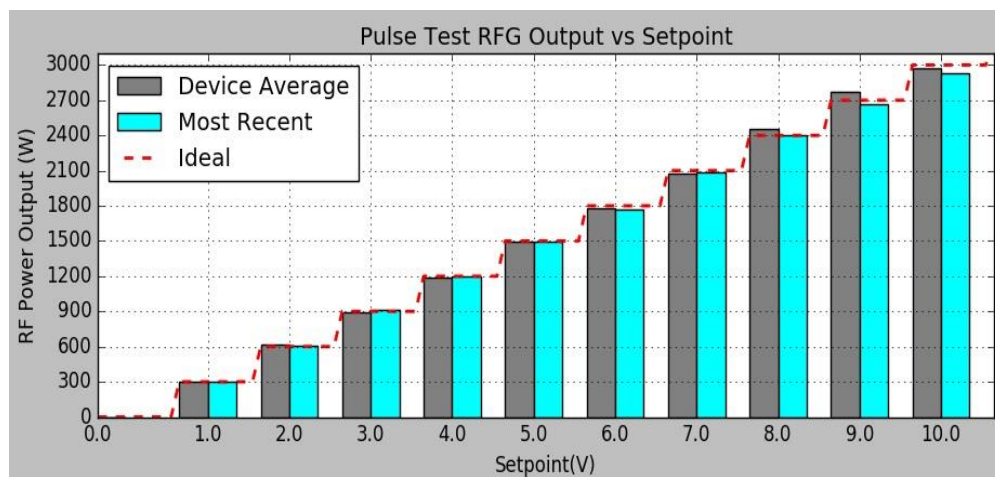
The test results screen will remain blank whilst awaiting the 'capture' of the test data.

The data will be compiled, compared, and displayed in table format.

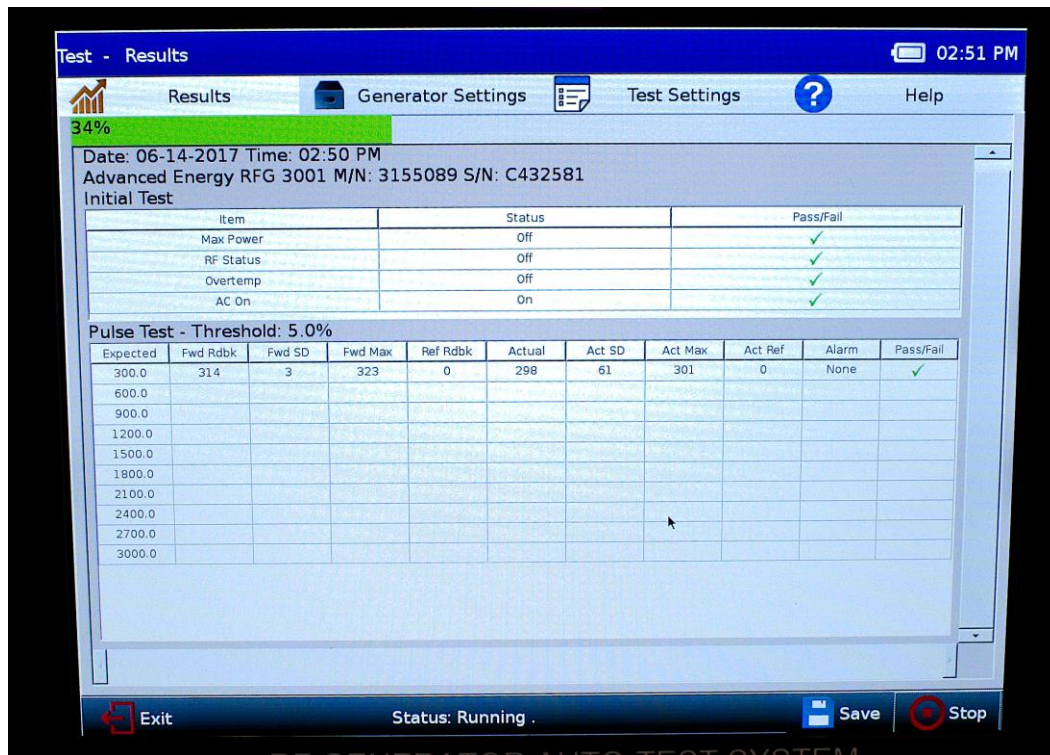
- **Pulse Test** – This data is used to determine if the generator under test is operating correctly.

Standard deviation and maximum power – This data allows the user to view the results of the current test, compared to previous test data.

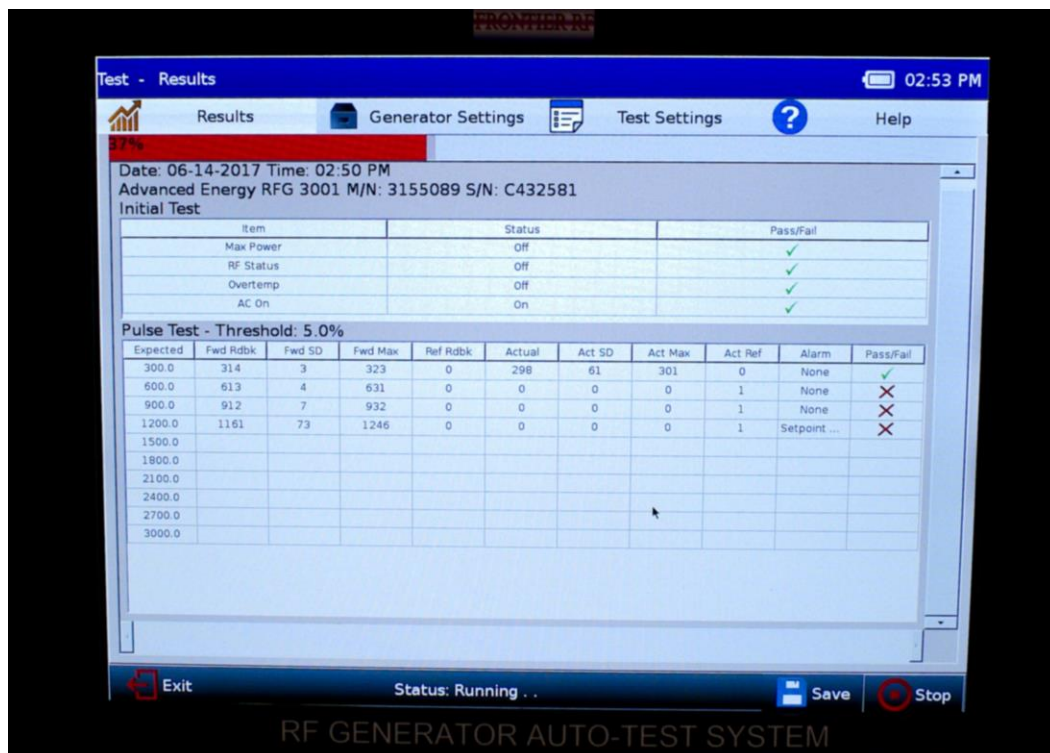
- **Running average** – The RFG-ATS 01 retains results from the previous tests on the same generator, thus producing an historical running average of performance. If the running average deviates from the red line on bar graph, it indicates there could be a performance issue that should be investigated to avoid major damage.



- **Reflected / VSWR test** – Ensures the unit is correctly limiting Forward Power (fold-back) by executing a 1.5:1 Impedance mismatch test.



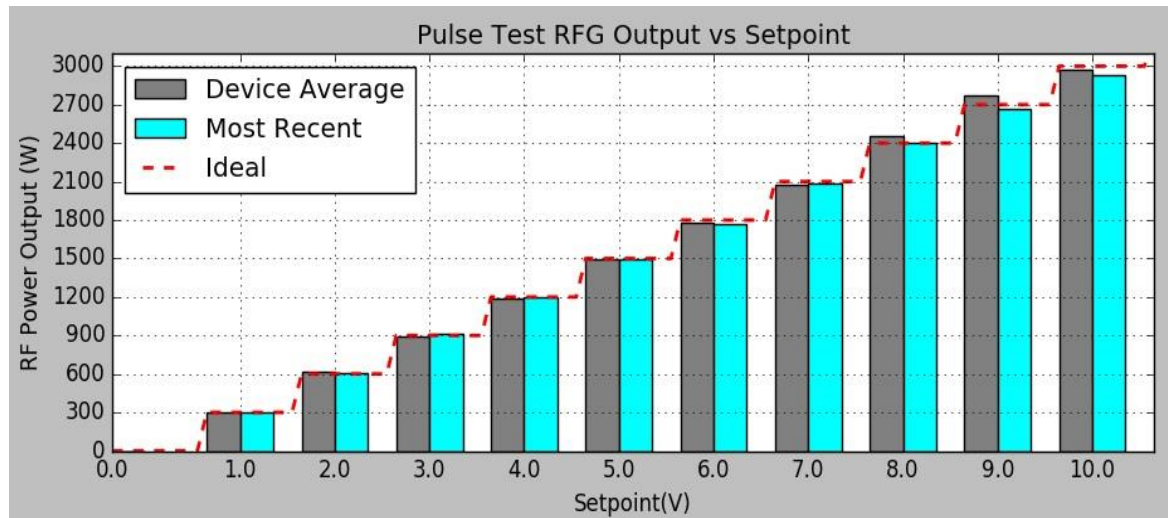
Green ✓ = Test has passed
Red X = Test has failed



➤ Test Results

Bar graph

The bar graph below is one of two charts that displays after the Pulse Test is complete.



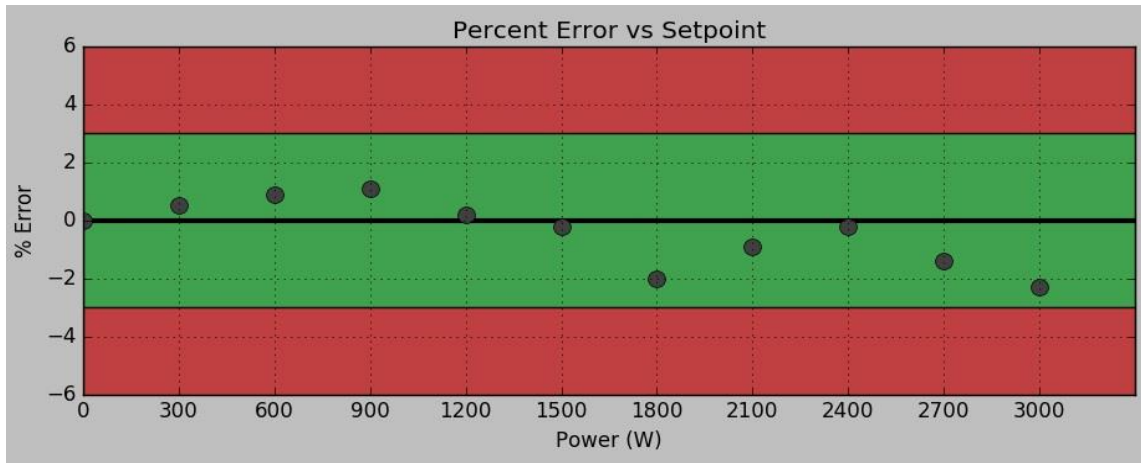
The grey bars show the generators' mean power output as a running average of all the pulse tests run on this device. The light blue bars show the average power for the current test. The red dotted line is the ideal power output for each Set-Point.

The Device Average helps to show the overall health of the generator and any deviation should be considered an indicator of imminent failure.

The historical data provides a very good record of unit performance which can be used to develop and implement a robust preventative maintenance strategy.

Percent Error Chart

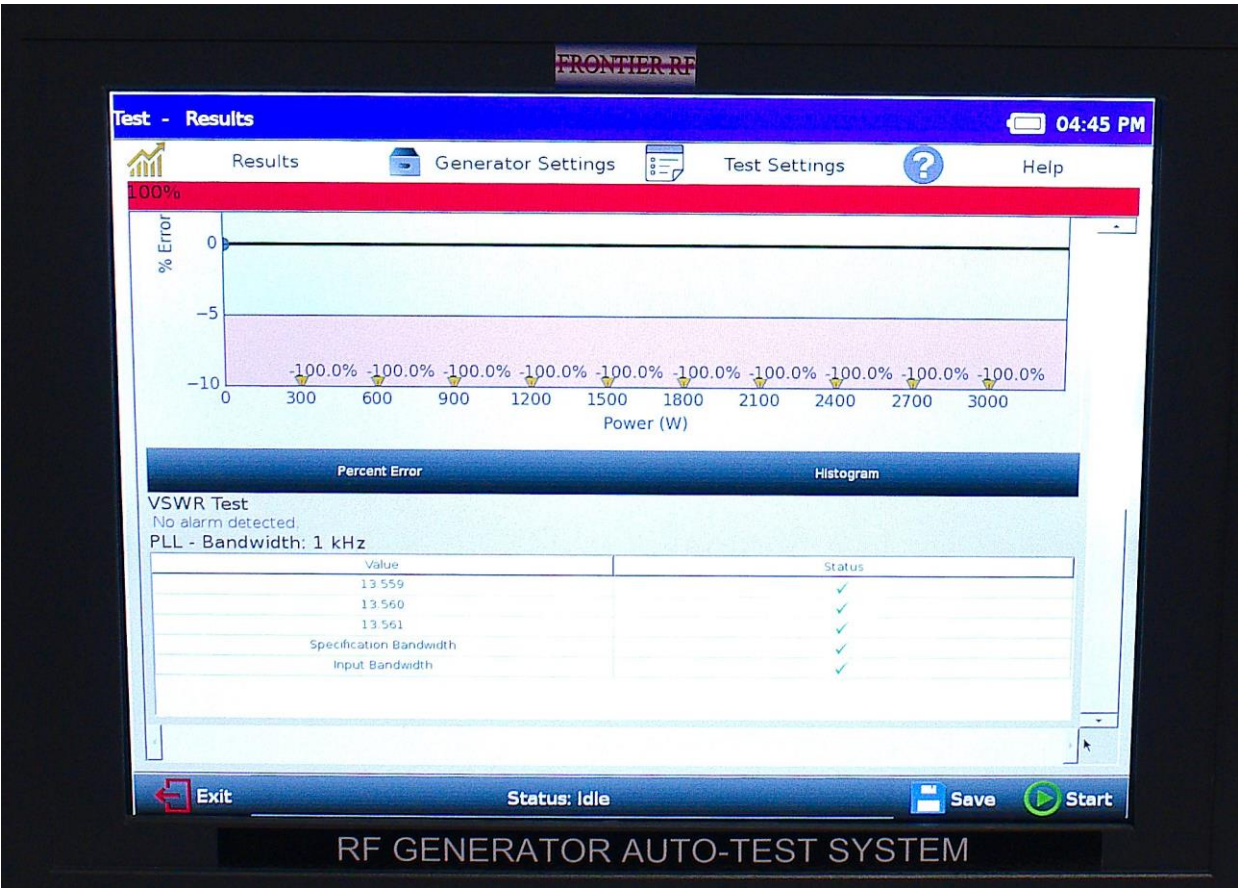
The percent error versus set-point chart is another graph the monitor displays after the pulse test has completed.



This screen shot shows the percent difference (error) between the power from the generator under test and the power measured by the RFG-ATS 01.

- Dots represent the percent error at each set-point.
- Green section represents the passing threshold (the value is provided in the 'Test Settings' page.) Values within this range indicate acceptable performance.
- Red section of the chart represents any value outside of the passing threshold. Values in this range indicate a failure.
- Any value that would lie outside of the chart are indicated with an orange triangle and the percentage error is displayed.

The PLL test are displayed at the bottom of the 'Results' screen.

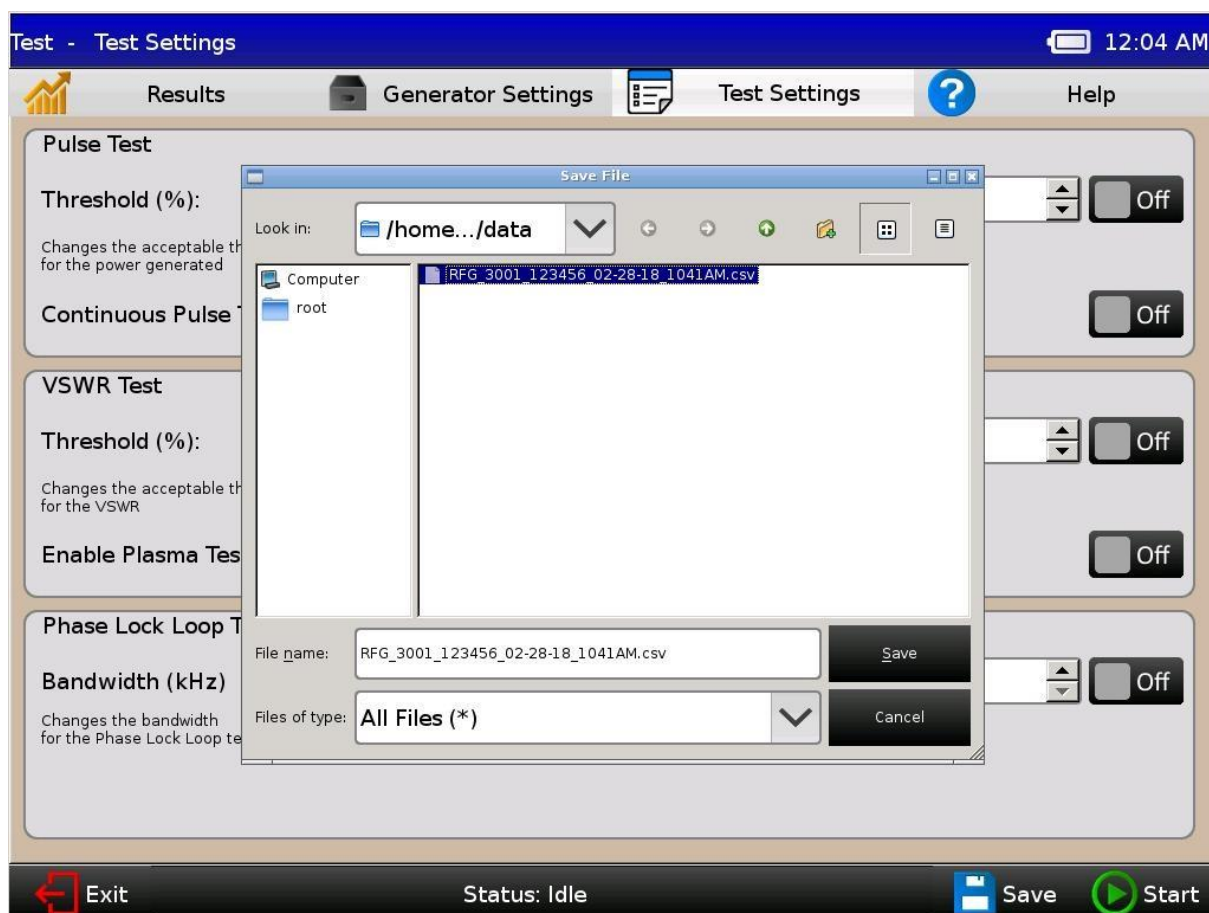


The results of the test(s) are accumulated and automatically saved in a .csv file.

The format of the file name will be [make]_[serial number]_[model number]_[date]_[test number].csv.

This filename and path can be changed by the user if desired by changing the filename at the save file screen.

The saved .csv files can be accessed by exiting the application, clicking on the lower left icon on the Desktop, selecting Accessories, then PCManFM File Manager, and then the Data folder.



Troubleshooting

Troubleshooting Guide

Date:170511D

Problem:	Cause:	Remedy/Comments:
Dark monitor screen and not in 'idle' Mode	Tester not A/C powered or Power switch off	Check A/C power cable connected and Rocker Switch on or battery requires charging
Repeated monitor Popup- Missing Information-	Generator Settings not completed	See Chapter 5 of User Manual Verify Serial # and Tech Name fields have been filled in via Keyboard. There should be no blank fields in Generator Settings display
Repeated monitor Popup- Select a Test- Test(s) not selected	Test(s) not selected	See Chapter 5 of User Manual. At least one test must be selected. At least one radio button must be to 'ON' position and valid value selected for %-W-kHz variable.
Monitor display in 'Idle' Mode after Test Settings entered	Start button not pushed.	Verify Start Button has been pushed
Status Returns to 'Idle' shortly after pressing START button.	Bad or misconnected cable.	Shut down system and generator. Disconnect auto-test system from generator. Check power supply to ensure 12V@1.5A supply. Reconnect the auto-test system and DUT and retry.
All tests fail	Not all mechanical cable connections made or RFG Failure	See Chapter 3 of User Manual Send RFG to Frontier RF for repair