Certifying a Radian RM-XX Series Reference Standard with the RS703
Laboratory Calibration System

Hardware and Software Requirements

1) RM-10, RM-11, RM-12, or RM-15 Reference Standard (Device Under Test - DUT's)
2) RS703 Automated Laboratory Test System
3) 120V VAC Auxilliary Power Input Cable (Radian part no. 194015)
4) Insulated 4mm to Spade Adaptors (Radian part no.'s: 5300083 [black], 5300082 [red])
5) BNC-BNC Input Cable (Radian part no.'s RM-1C, RM-2C, RM-3C)

Any work with the RS-703A Automated Calibration System, RS-703A accessories, energized standards and energized meters can present the danger of electrical shock. The RS-703A and its accessories should be operated by qualified personnel. The information provided in this instruction set is intended to serve as a guide for properly qualified electric utility personnel. This instruction set is not intended to replace existing electric utility safety procedures and those listed in the Handbook for Electricity Metering.

Operation of the RS-703A should not be conducted if the work area is wet or damp. Operation should also not be conducted if flammable gases or fumes are present in the work area. When using the RS-703A never make voltage and current connections/disconnections when the system is live. For service or repairs to the RS-703A contact Radian Research, Inc. Do not attempt to service or make modifications to the RS-703A due to the risk of electrical shock.

Radian Research, Inc. assumes no liability for failure to comply with existing applicable safety precautions as well as those listed in this warning statement.

1. With the 703 System completely powered OFF, ensure the following:
   a) the external potential (BNC and LEMO connectors) and current (locking connectors) cables are securely connected to the RS-733 front panel
   b) the control PC's monitor, mouse, and keyboard are connected
   c) the 703's main power cable is connected to the power source

2. Make all the necessary hardware connections, as shown in the diagram below.
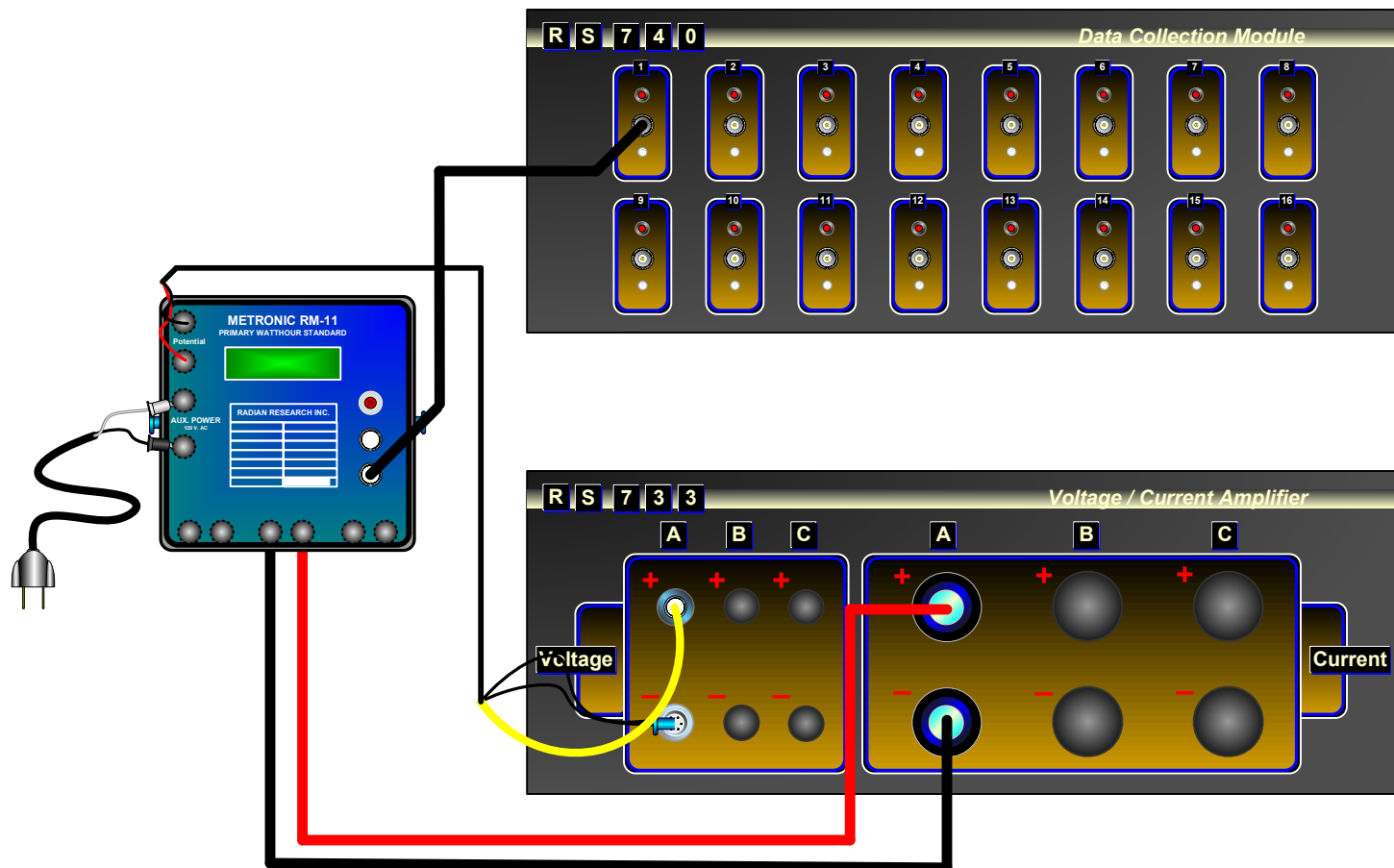
2.a. Using a 120V VAC Auxilliary Power Input Cable and Insulated 4mm to Spade Adaptors, apply 120VAC to the DUT's auxiliary power input.

2.b. Using a BNC-BNC cable, connect the OUTPUT port of the DUT to channel one of the RS-740 front panel.

2.c. Using the External Potential Cable and Insulated 4mm to Spade Adaptors, connect the potential output to the DUT's potential input.

2.d. Using the External Current Cable, connect the current output to DUT's "B" current input.

3. Turn the system on by rotating the key switch $90°$ clockwise. The system will turn on and the cooling fan will start.

4. Turn on the computer by switching both the back and front power switches to the ON position.

Opening Application:

1. Open the 703 Control Software by double-clicking the application's icon, located on the computer's desktop. A pop-up screen will briefly flash on the screen, and a short delay will follow. The control application will then open and proceed with a self diagnostic routine.

2. Wait until the diagnostic routine is completely finished. The application opens with the *Channel Table* window open
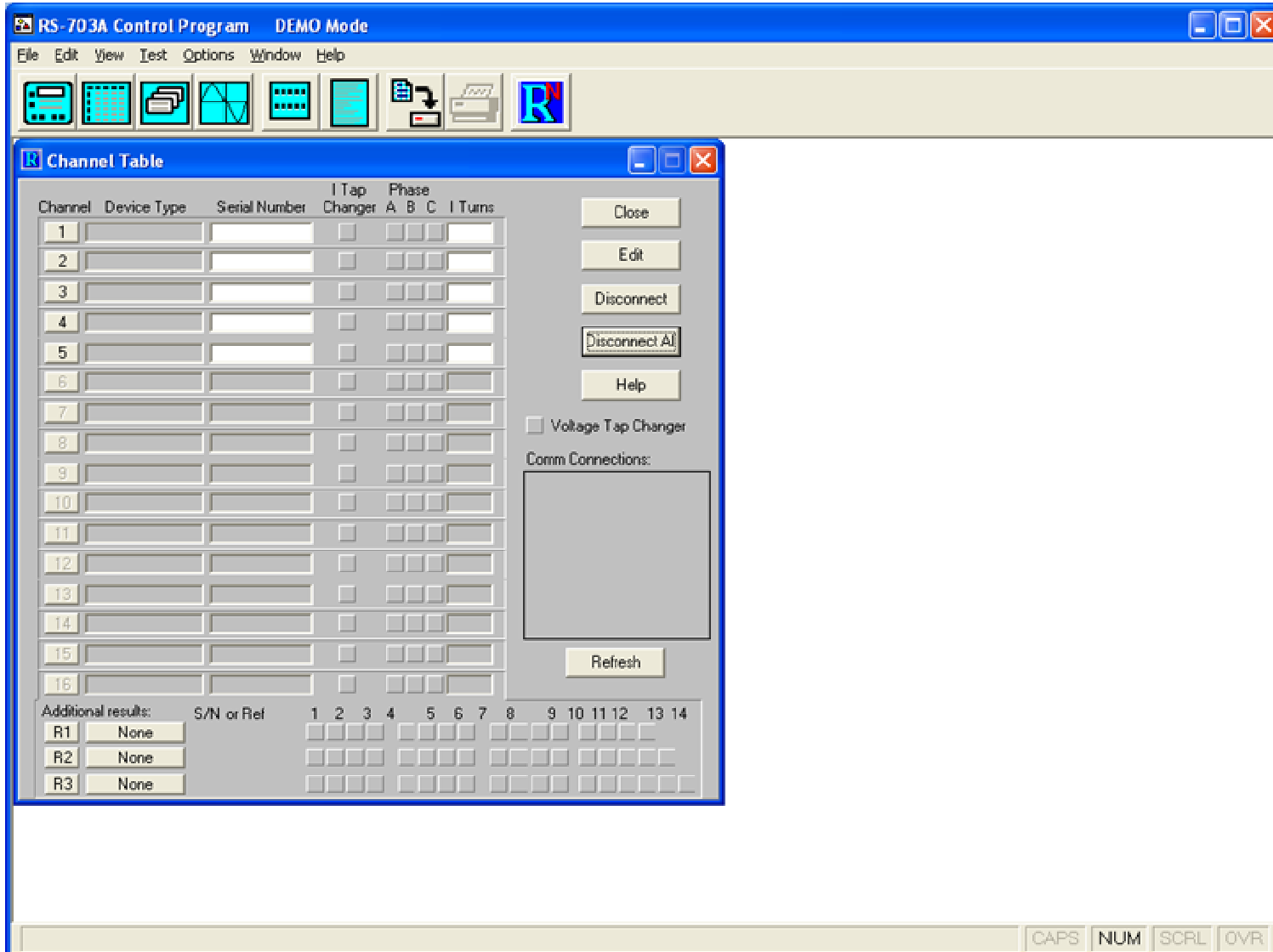
Associate DUT's to Channels:

1. Click on the *Channel 1* selection box. A *Select Device* window will appear.

From this window, select the applicable device name. (If one does not exist for the DUT to be tested, select *New* - Follow the process for creating a new device, located in Appendix 1.) Select *OK*. This action will associate the specific device type with Channel 1.
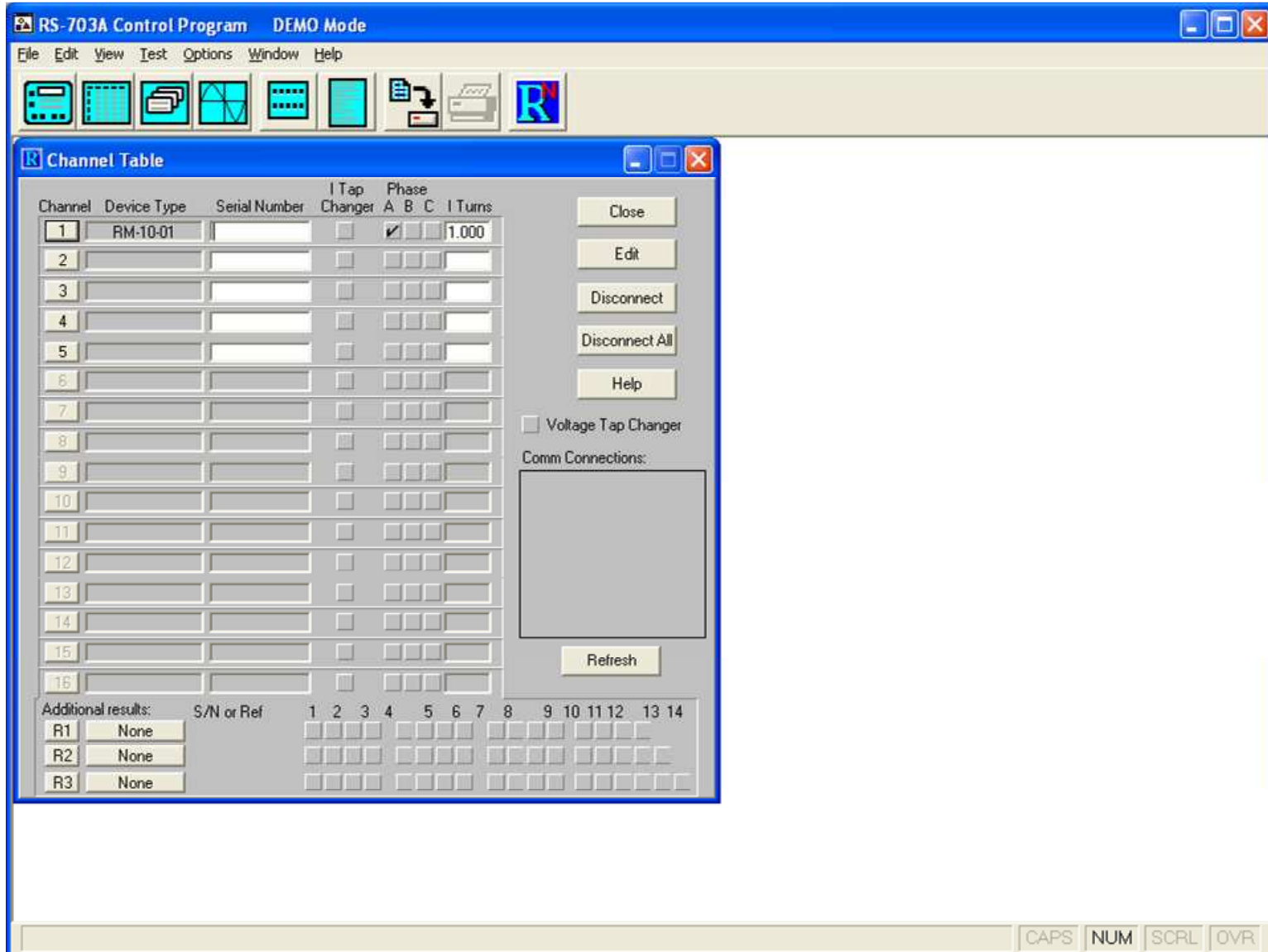
2. Re-click on the *Channel 1* selection box. The associated device's configuration card will be displayed. Ensure that the device is configured as follows:

Setup tab:
Device Type: Standard
Phases: Single phase
Min Pulse Count: 100
Testing Method: Pulse
Pulse Output Pullup: 150 Ohms (33ma)
Standard Options:
Ramp Rates (seconds): Up = 0.7, Down = 0.7

Ranges tab:
Current Ranging: Auto
Maximum Current: as specified by DUT's specifications
Current Burden: 0.0
Voltage Ranging: Auto
Maximum Voltage: as specified by DUT's specifications

Functions tab:
Function: select functions applicable to DUT's supported measurement parameters
Pulse Factor: 0.00001
Tolerance: as specified by DUT's specifications
Measurement Modes: check Wye only

3. Select *Close*. If prompted, save any unsaved changes.

4. Enter the DUT's serial number.
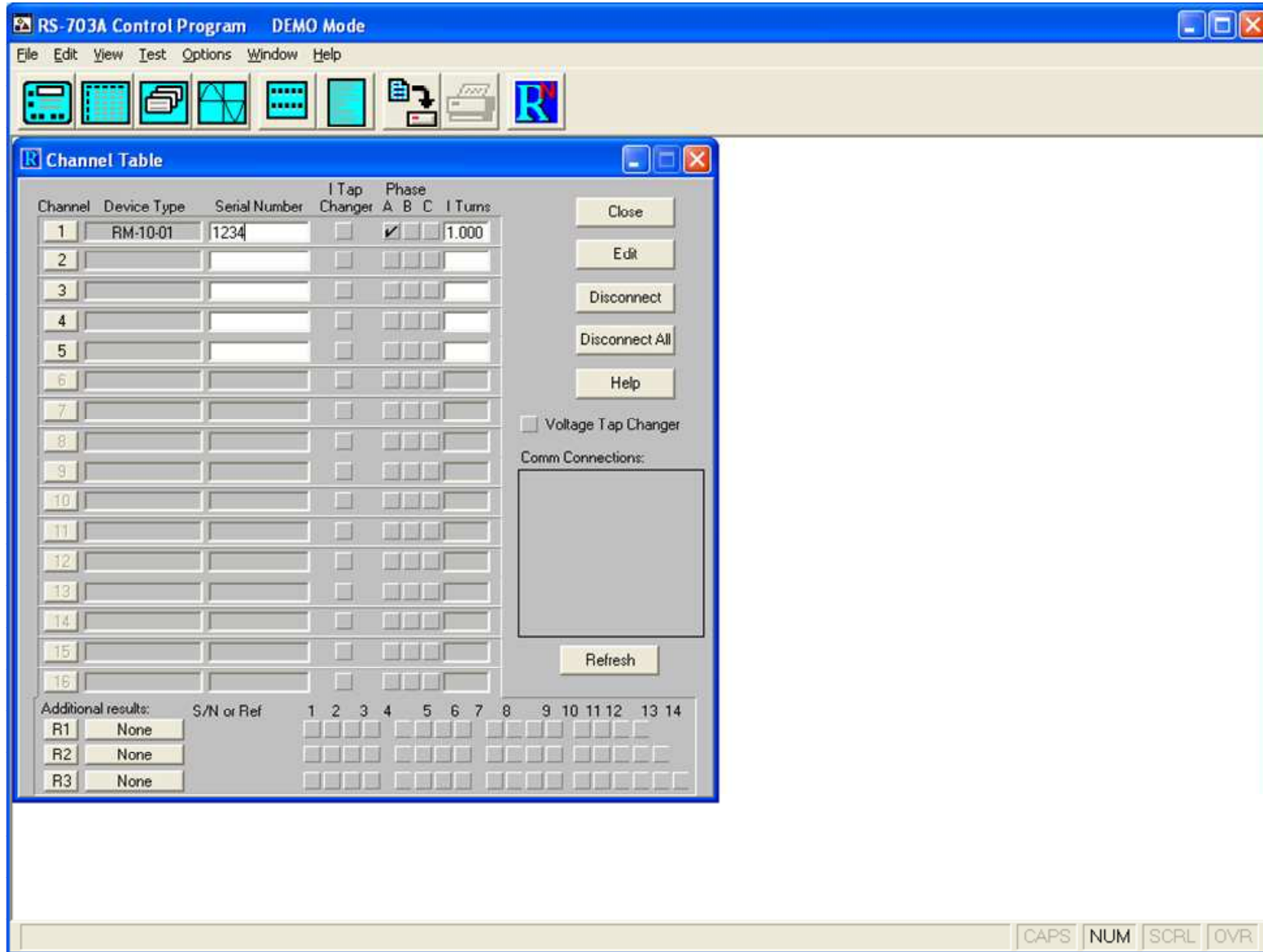
5. Ensure that *I Tap Changer* is unchecked, only *Phase A* is checked, and *I Turns* is set to 1.000.

Test Setup:

1. From the icon menu bar, select the *Open a Test* icon. A *Open* window will appear.
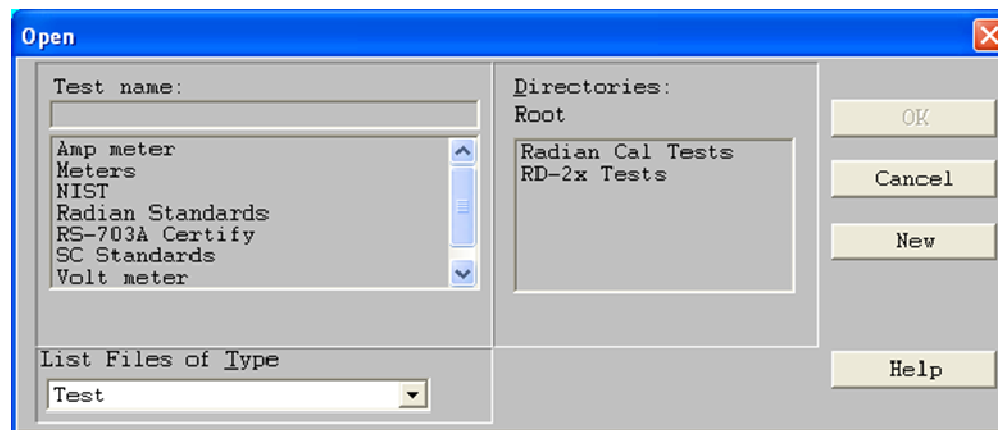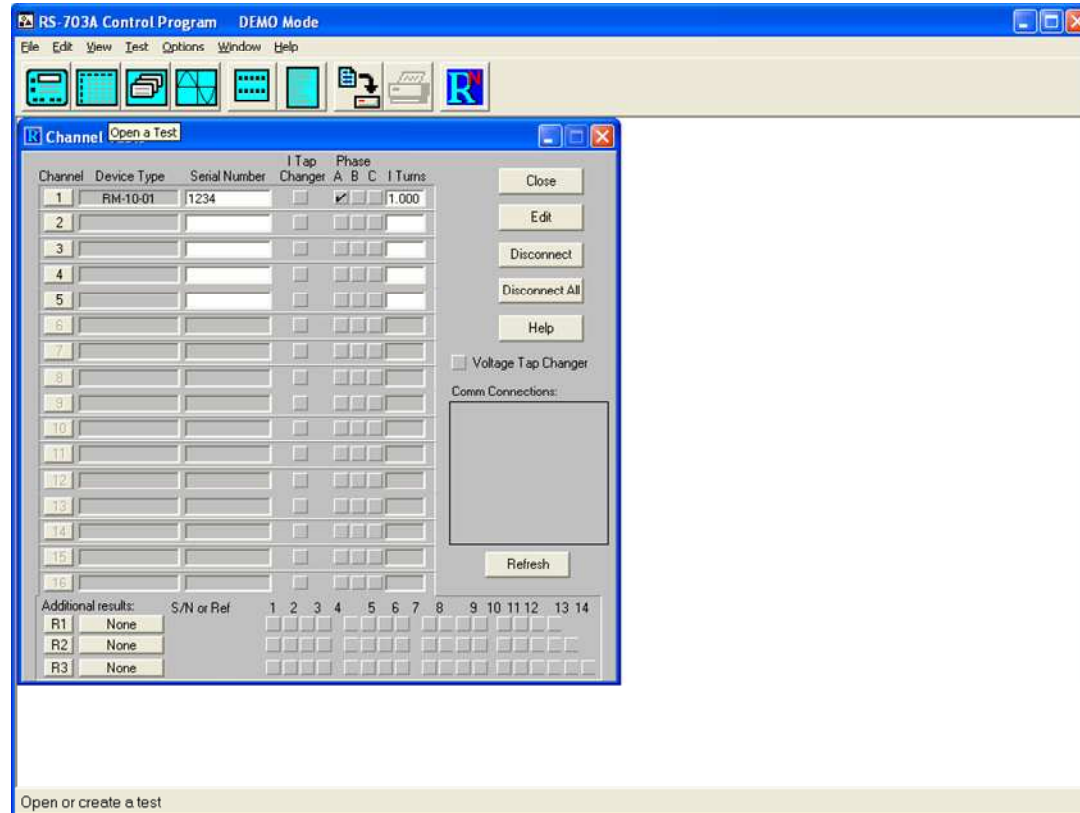
2. From this window, select *"Radian Standards"* from the list provided. Select *OK*. The selected *Test* window will appear, with the previously associated DUT's serial number listed on the right-hand tabs.
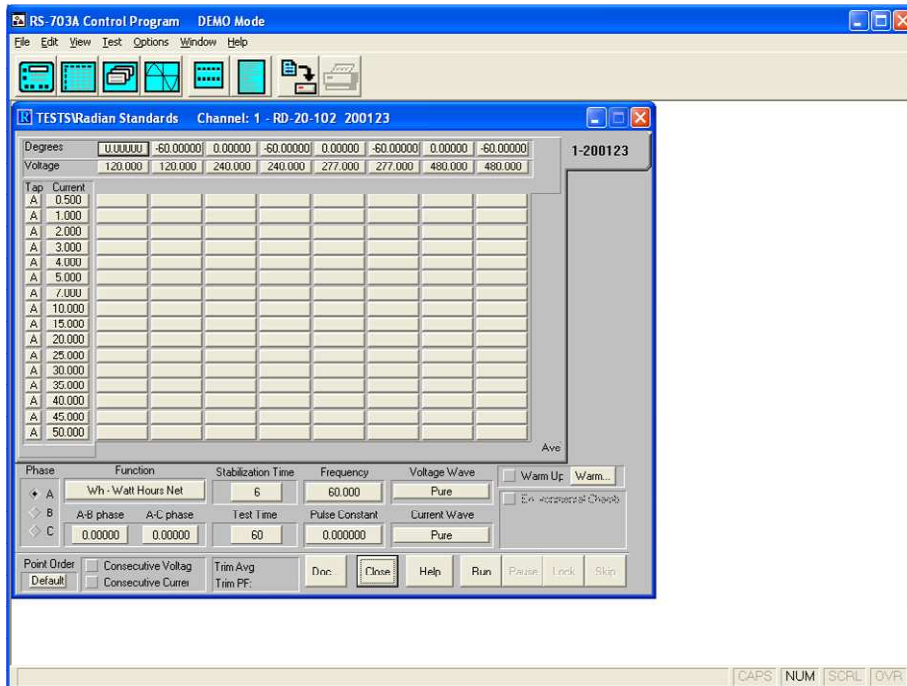
3. This *Test screen* will include all the test points to be executed. Any of the Current, Voltage, and/or Phase values can be modified by clicking on that particular value.
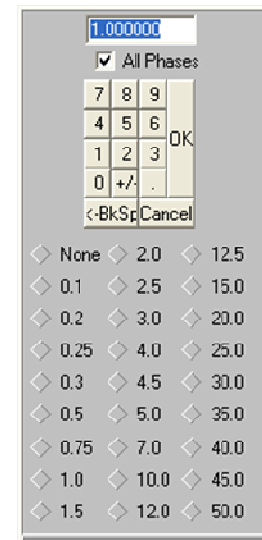
4. Ensure that the test options are configured as follows:

Phase: A
Point Order: select per user's preference
Function: Wh - Watt Hours Net
A-B phase: 0.0
A-C phase: 0.0
Consecutive Voltage: unchecked
Consecutive Current: unchecked
Stabilization Time: select per user's preference
Test Time: select per user's preference
Frequency: 60.000 (US); 50.000 (International)
Pulse Constant: 0.00001
Voltage Wave: Pure *see Appendix 3
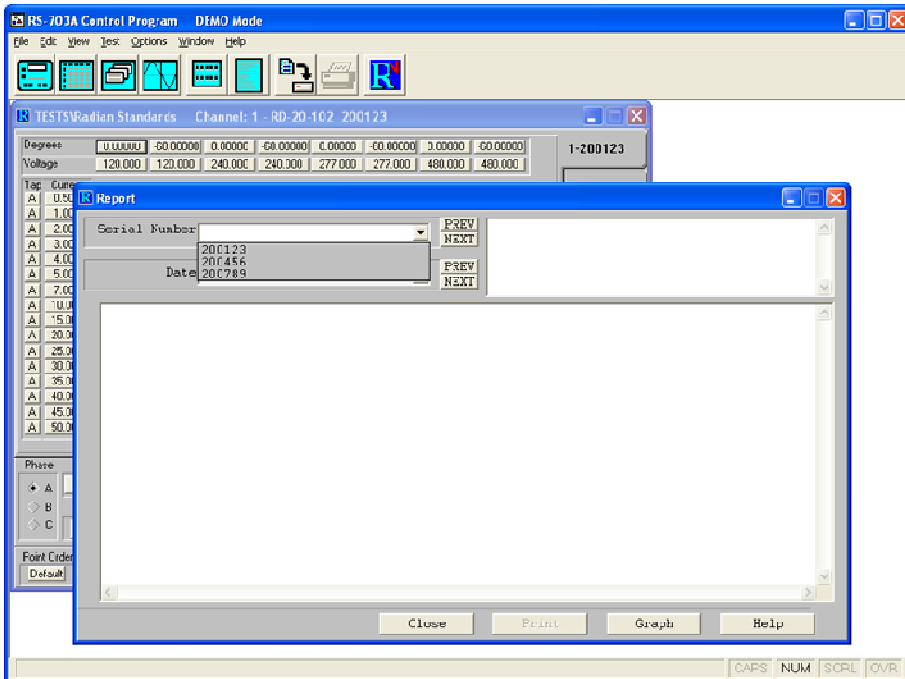Current Wave: Pure *see Appendix 3
Warm Up: unchecked

1. Select *Run*. The test will automatically start with the first test point and continue until all test points have been executed.

1. Once the test is complete, the resulting test data will automatically be saved in the 703's results database.
2. To view the results data, select the *View test results* icon. This will open a *Report* window.

2.a. From the *Serial Number* drop-down menu, select the desired serial number.

2.b. From the *Date* drop-down menu, select the desired date. The desired results data will appear.

3. To export the data into an Excel spreadsheet, use the mouse to highlight the entire test results grid. Copy the data by simultaneously pressing the [Ctrl] key and the [C] key.

4. Open a new Microsoft Excel spreadsheet.
5. Paste the data by simultaneously pressing the [Ctrl] key and the [V] key.
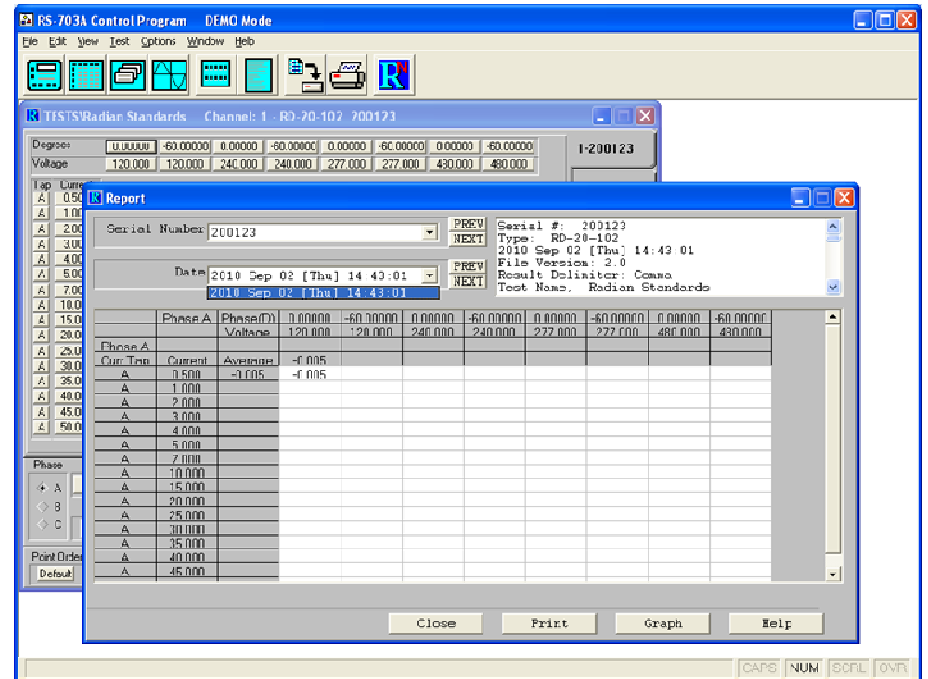
1. To create a new test device, click on the *Channel 1* selection box.
A *Select Device* window will appear.
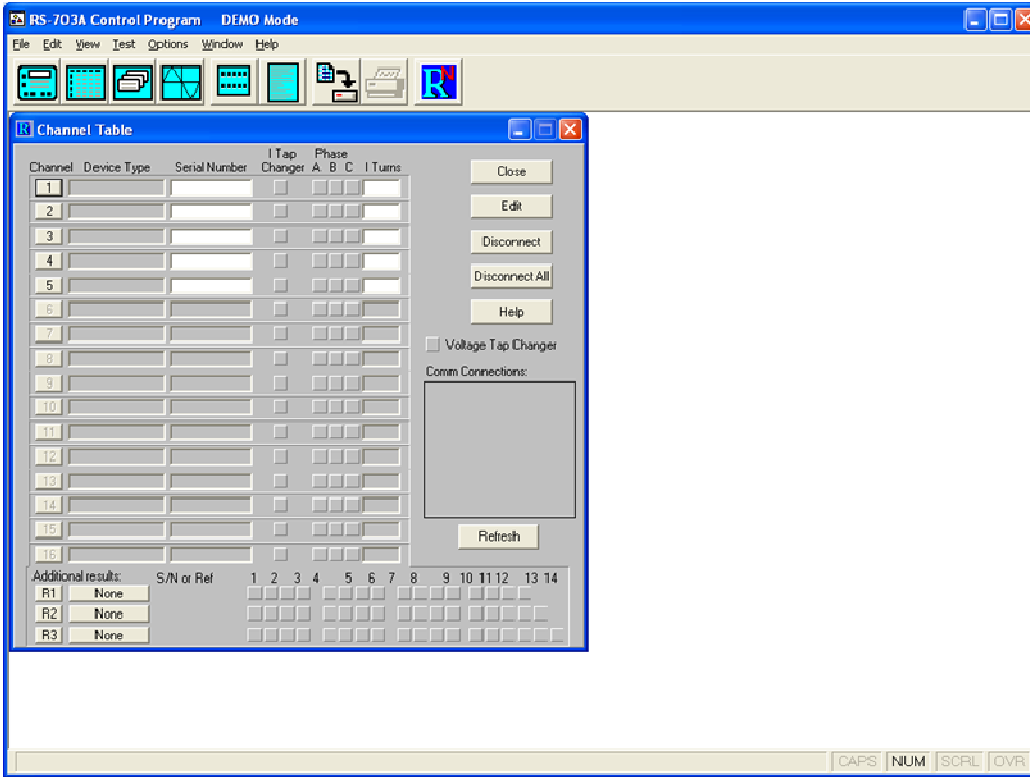
2. From this window, select the *New* button. A *new device* configuration window will appear.
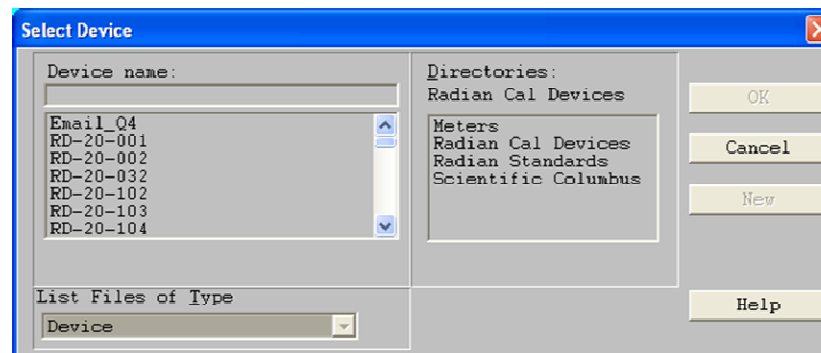
3. Ensure that the device is configured correctly:

Setup tab:
Device Type: Standard
Phases: Single phase
Min Pulse Count: 100
Testing Method: Pulse
Pulse Output Pullup: 150 Ohms (33ma)
Standard Options:
Ramp Rates (seconds): Up = 0.7, Down = 0.7

Ranges tab:
Current Ranging: Auto
Maximum Current: as specified by DUT's specifications
Current Burden: 0.0
Voltage Ranging: Auto
Maximum Voltage: as specified by DUT's specifications

Functions tab:
Function: select functions applicable to DUT's supported measurement parameters
Pulse Factor: 0.00001
Tolerance: as specified by DUT's specifications
Measurement Modes: check Wye only

4. Select Close. If prompted, save any unsaved changes.
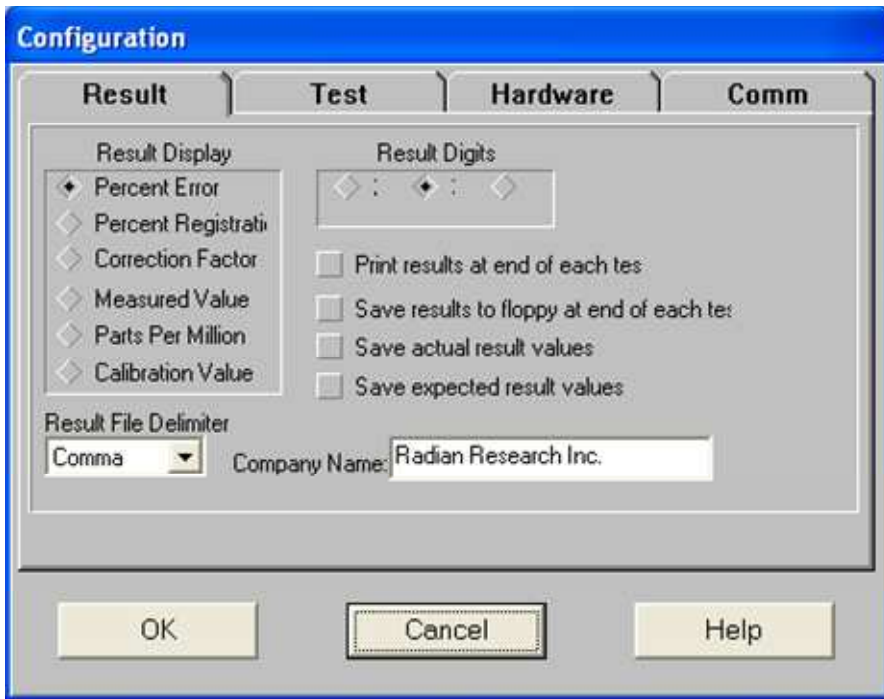
This screen allows the user to select how the resulting data will be displayed, the file type, the number of significant digits in the results data, and the company name.
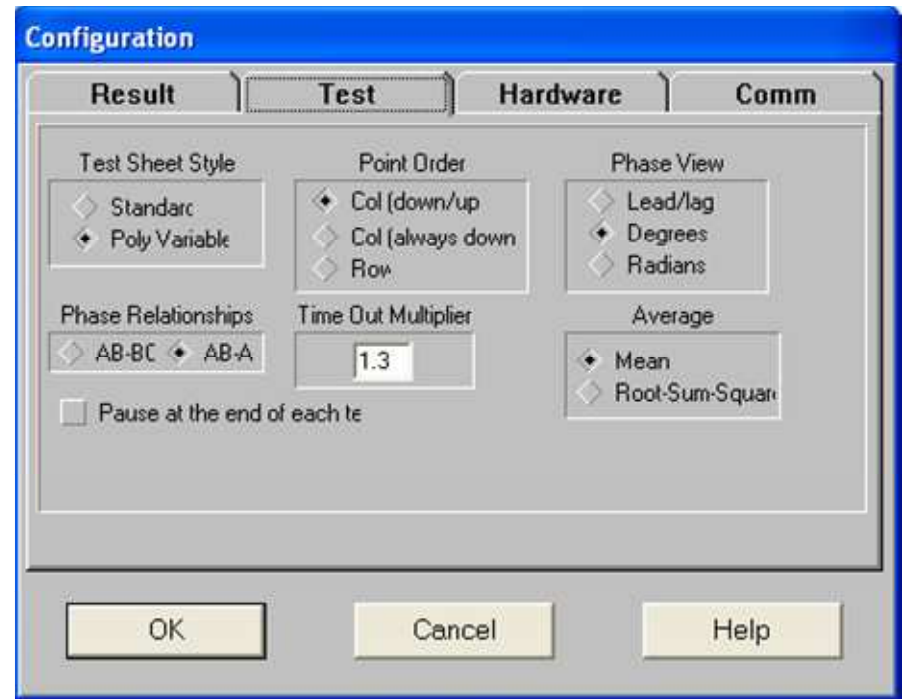
This screen allows the user to select the type of test (standard and poly-variable), the phase relationships, the test point order, the time-out delay, the power factor display, and the averaging method.
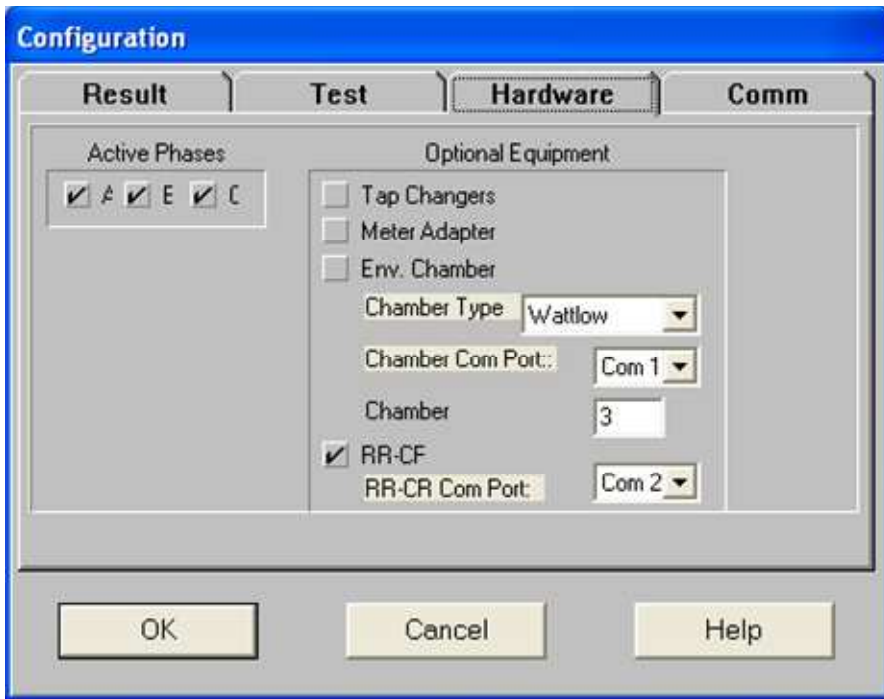
This screen allows the user to select the active phases and configure a temperature chamber control.
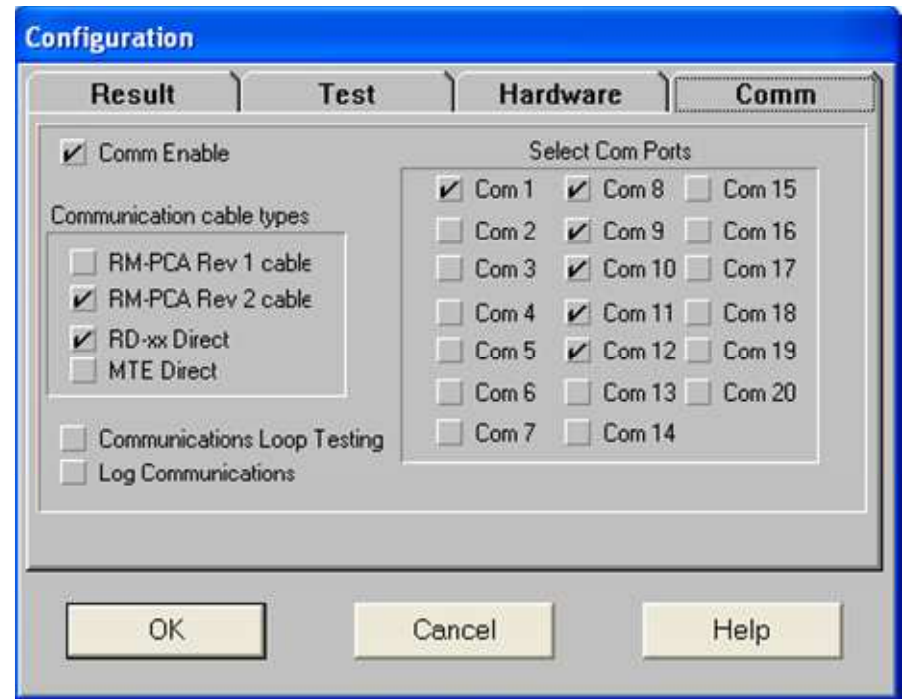
This screen allows the user to configure the serial communications to the devices under test.

1. Click on the *Open a Wave* icon. A *Open* window will appear.
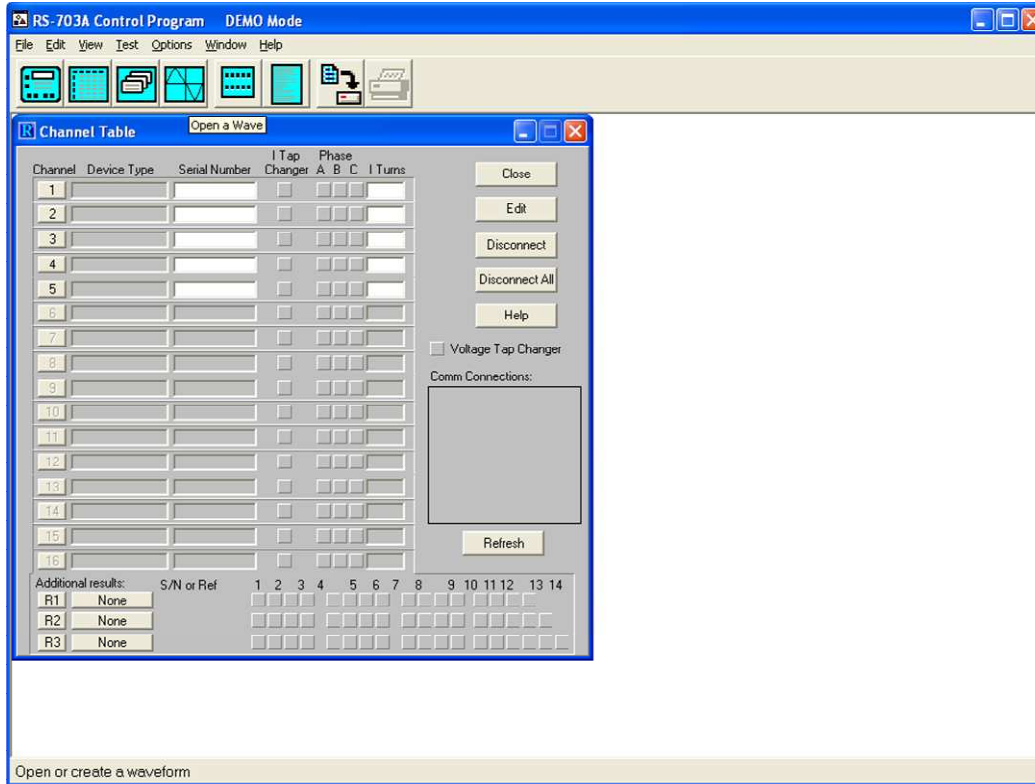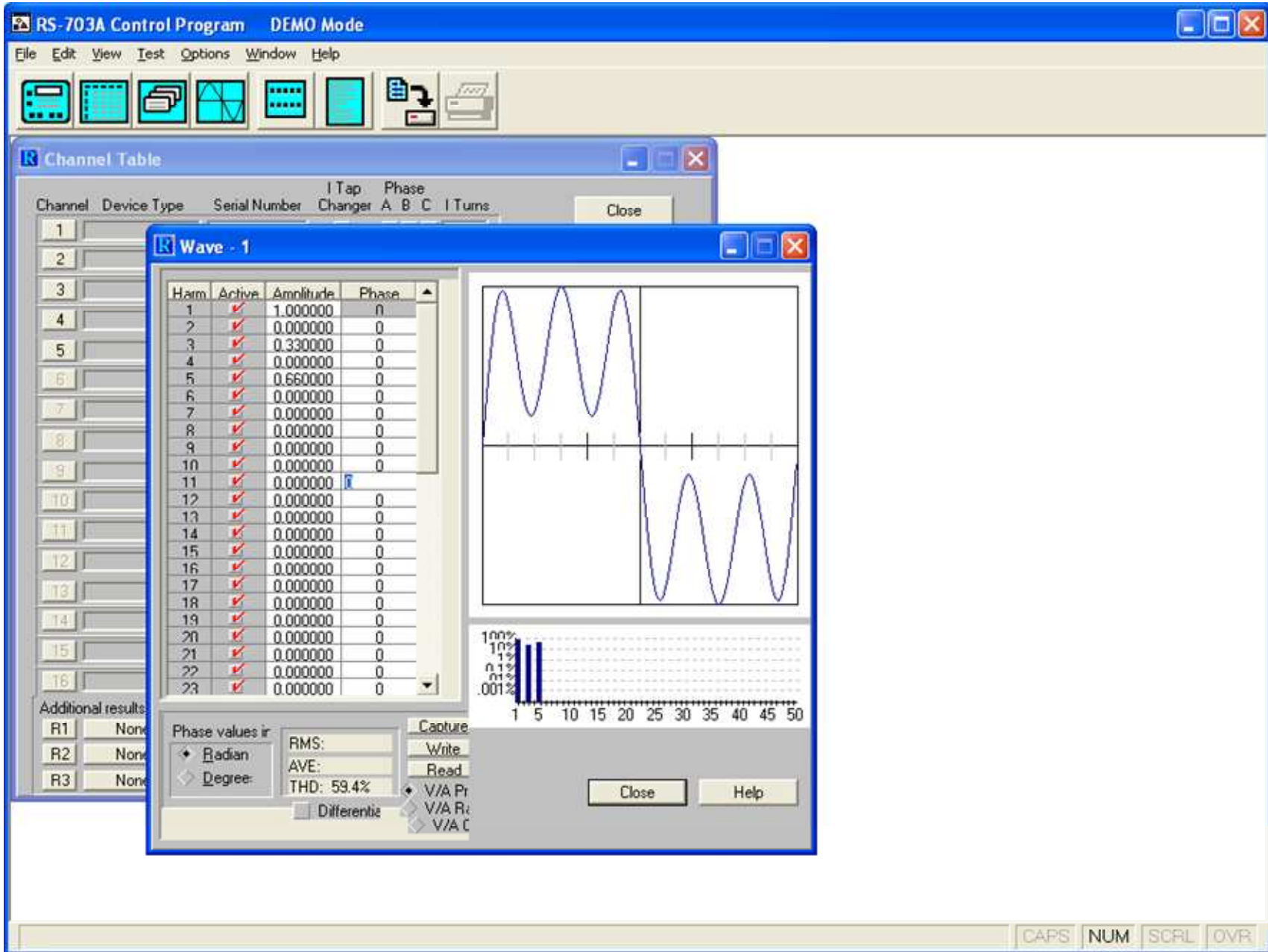
2. Select the *New* button. A new *Wave* configuration window will appear.
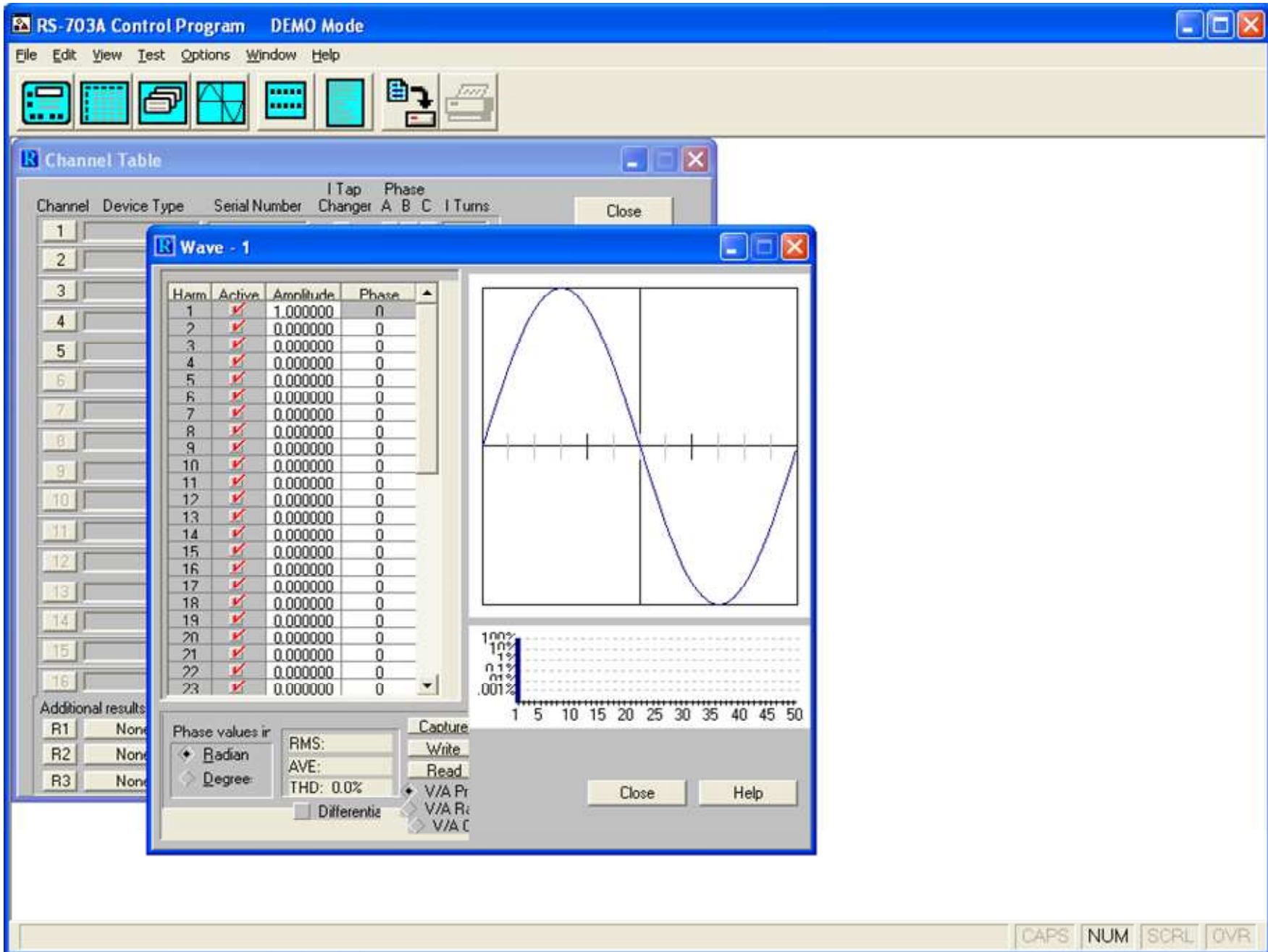
3. Enter the harmonic amplitude and phase parameters. The displayed waveform will change accordingly. Select the *Close* button and save changes when prompted.