

# Certificate of Calibration

Manufacturer **Radian Research, Inc.**  
Instrument Model: **RD-31-221 Dytronic Portable Standard**  
Serial Number 123456  
Firmware Revision: 07.10.20  
Error Specification .02% worst case



**Quality Management System  
ISO 9001 Certified**

Customer Name: RADIAN RESEARCH, INC.  
Address: 3852 FORTUNE DRIVE  
LAFAYETTE, INDIANA 47905

P.O. Number: SO12345  
CE Number:

**Environmental Conditions**  
Temperature: 23°C +/- 1°C  
Humidity: between 35% and 60%

RMA / Certificate Number: 13579  
Calibration Date: 23-Jun-11

Based on the recommended calibration interval, the next calibration is due on: 22-Jun-12

## Radian Research's As-Found Test Results showed this Instrument to be:

New  In Tolerance  Out of Tolerance  Inoperative  Limited Calibration  
For Out of Tolerance conditions, As-Found Data Reports are furnished.

Radian Research Inc. certifies the instrument listed above meets or exceeds all published specifications and was calibrated in compliance with ANSI/NCSL Z540-1 using applicable Radian Research procedures which meet the requirements of ISO 9001:2000. This instrument was calibrated by a Radian Research RS-703A Syntron Automated Calibration System which is traceable to the National Institute of Standards and Technology (NIST). The RS-703A Calibration System is traceable within the limitations of NIST's services, by accuracies derived from accepted values of natural physical constants, or by accuracies derived from accepted ratio type calibration techniques. The RS-703A Calibration System is cross checked and calibrated on a schedule which is adjusted to maintain required accuracies and traceability.

Software used for Calibration: RS-703A Control Program Rel.04.20.02 May 30, 2006  
RS-703A serial number: 703143, 703144, 703146

**Applicable Traceability & Report Numbers for References used by Radian's Metrology Lab:**

### Watt-hour, VA-hour, VAR-hour, Q-hour, Amp-hour, Volt-hour, Volt-Squared hour, AC Volt

Radian Dytronic Transfer Standards consisting of (3) RD-22-RTS,  
Serial Numbers: 200717, 200718, 200719  
NIST Test Report Number: 697/280054-10; Calibration Due Date 6-Jan-2012.

### Time Base (Frequency)

Arbiter Systems Model 1083B Satellite-Controlled Frequency Standard s/n B1057. GPS controlled system with an uncertainty of 0.000002ppm. No calibration required.

### DC Volts

Fluke Model 732B DC Volt Standard s/n 7703004 with an uncertainty of  $\pm .1$ ppm.  
Fluke Certificate Number 9D5460; Calibration Due Date: 14-July-2012.

### Resistance

Guildline Standard Resistor Model 9330/10K s/n 62623, 62624. Guildline Test Certificate Numbers C13274 and C13275; with an Expanded Uncertainty of  $\pm .390$ ppm. Calibration Due Date: 25-May-2012.

### Other

Hewlett Packard 8 Digit Multi-Meter Model 3458A s/n 2823A02816. Agilent Technologies  
Test Certificate Number 53298; Calibration Due Date 2-Mar-2012.

### **Metrology Laboratory Technician Signature**

*Scott Blackwell* LAB  
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in full, without prior written approval of the  
Calibration Facility*

# Calibration Report

## RD-31-221 Dytronic Portable Standard

Function..... Watt-hour 60 Hz      Phase A

Date..... 23-Jun-11

Serial Number..... 300660

The following data was collected by a Radian Research RS-703A Automated Calibration System. The RS-703A watt-hour calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards certified by the National Institute of Standards and Technology (NIST) to an uncertainty of 0.002% @ unity and 0.003% @ 60 degrees lagging Power Factor. Calibration temperature is 23 degrees Centigrade. The test time is 5 seconds and the stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as Percent Error. The RS-703A has at least a 4 times greater accuracy than the Instrument under test.

### Voltage & Phase Angle

Amps	120		240		480		600	
	Unity	60°Lag	Unity	60°Lag	Unity	60°Lag	Unity	60°Lag
0.2	-0.001	0.001	-0.002	0.002	-0.002	0.003	-0.002	0.003
0.25	-0.001	0.001	-0.002	0.001	-0.002	0.002	-0.002	0.003
0.3	-0.001	0.001	-0.002	0.002	-0.002	0.003	-0.002	0.003
0.5	-0.001	0.001	-0.001	0.001	-0.002	0.002	-0.001	0.003
1.0	-0.001	0.001	-0.001	0.002	-0.002	0.003	-0.001	0.003
2.0	0.000	0.002	0.000	0.002	-0.001	0.003	0.000	0.004
2.5	0.000	0.002	-0.001	0.002	-0.001	0.003	-0.001	0.003
3.0	0.000	0.001	-0.001	0.002	-0.001	0.003	-0.001	0.003
4.0	0.000	0.002	-0.001	0.002	-0.001	0.003	0.000	0.004
5.0	0.000	0.002	-0.001	0.002	-0.001	0.003	0.000	0.004
7.0	-0.001	0.001	-0.001	0.002	-0.002	0.003	-0.001	0.003
10.0	-0.001	0.001	-0.001	0.002	-0.002	0.002	-0.001	0.003
15.0	0.000	0.002	-0.001	0.003	-0.001	0.003	-0.001	0.004
20.0	0.000	0.002	-0.001	0.002	-0.001	0.003	-0.001	0.004
25.0	-0.001	0.001	-0.001	0.002	-0.002	0.002	-0.002	0.003
30.0	0.000	0.002	-0.001	0.002	-0.001	0.003	-0.001	0.004
35.0	-0.001	0.001	-0.001	0.002	-0.002	0.003	-0.001	0.004
40.0	-0.001	0.001	-0.001	0.002	-0.001	0.003	-0.001	0.003
45.0	-0.001	0.001	-0.001	0.002	-0.001	0.003	-0.001	0.003
50.0	-0.001	0.002	-0.001	0.002	-0.002	0.003	-0.002	0.003
60.0	-0.001	0.001	-0.002	0.002	-0.002	0.003	-0.001	0.004
80.0	-0.001	0.001	-0.002	0.002	-0.002	0.003	-0.002	0.003
100.0	-0.001	0.001	-0.002	0.002	-0.002	0.003	-0.002	0.004
120.0	-0.001	0.002	-0.002	0.002	-0.002	0.004	-0.001	0.004
<b>Average</b>	<b>-0.001</b>	<b>0.001</b>	<b>-0.001</b>	<b>0.002</b>	<b>-0.002</b>	<b>0.003</b>	<b>-0.001</b>	<b>0.003</b>
<b>Minimum</b>	-0.001	0.001	-0.002	0.001	-0.002	0.002	-0.002	0.003
<b>Maximum</b>	0.000	0.002	0.000	0.003	-0.001	0.004	0.000	0.004

<b>Overall</b>	<b>Unity</b>	<b>60°Lag</b>
<b>Average</b>	-0.001	0.002
<b>Minimum</b>	-0.002	0.001
<b>Maximum</b>	0.000	0.004

# Calibration Report

## RD-31-221 Dytronic Portable Standard

Function..... Watt-hour 60 Hz      Phase B

Date..... 23-Jun-11

Serial Number..... 300660

The following data was collected by a Radian Research RS-703A Automated Calibration System. The RS-703A watt-hour calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards certified by the National Institute of Standards and Technology (NIST) to an uncertainty of 0.002% @ unity and 0.003% @ 60 degrees lagging Power Factor. Calibration temperature is 23 degrees Centigrade. The test time is 2 seconds and the stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as Percent Error. The RS-703A has at least a 4 times greater accuracy than the Instrument under test.

### Voltage & Phase Angle

Amps	120		240		480		600	
	Unity	60°Lag	Unity	60°Lag	Unity	60°Lag	Unity	60°Lag
0.2	-0.001	-0.001	-0.001	0.000	-0.002	0.000	-0.001	0.000
0.25	-0.001	-0.001	-0.001	0.000	-0.001	0.000	-0.001	0.001
0.3	-0.001	-0.001	-0.001	0.000	-0.001	0.000	-0.001	0.001
0.5	-0.001	-0.001	0.000	0.000	-0.001	0.000	0.000	0.001
1.0	0.000	0.000	0.000	0.000	-0.001	0.000	0.000	0.001
2.0	0.000	0.000	0.001	0.001	0.000	0.001	0.001	0.002
2.5	0.000	0.000	0.001	0.001	0.000	0.000	0.001	0.002
3.0	-0.001	-0.001	0.000	0.000	0.000	-0.001	0.000	0.001
4.0	0.000	0.000	0.001	0.001	0.000	0.000	0.001	0.002
5.0	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.002
7.0	-0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.001
10.0	-0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.001
15.0	0.000	0.001	0.000	0.001	0.000	0.001	0.001	0.002
20.0	0.000	0.000	0.000	0.001	0.000	0.001	0.001	0.002
25.0	0.000	0.000	0.001	0.000	0.000	0.001	0.001	0.002
30.0	0.000	0.001	0.001	0.001	0.001	0.002	0.001	0.003
35.0	0.000	0.000	0.001	0.001	0.000	0.001	0.001	0.003
40.0	0.000	0.000	0.001	0.001	0.001	0.001	0.001	0.002
45.0	0.000	0.000	0.001	0.001	0.001	0.001	0.001	0.002
50.0	0.000	0.000	0.001	0.000	0.000	0.001	0.001	0.002
60.0	-0.001	0.000	0.000	0.000	0.000	0.001	0.001	0.002
80.0	-0.001	-0.001	0.000	0.000	0.000	0.001	0.001	0.002
100.0	-0.001	0.000	0.000	0.001	0.000	0.003	0.001	0.004
120.0	-0.002	0.000	0.000	0.002	0.000	0.004	0.001	0.005
<b>Average</b>	<b>-0.001</b>	<b>0.000</b>	<b>0.000</b>	<b>0.001</b>	<b>0.000</b>	<b>0.001</b>	<b>0.001</b>	<b>0.002</b>
<b>Minimum</b>	-0.002	-0.001	-0.001	0.000	-0.002	-0.001	-0.001	0.000
<b>Maximum</b>	0.000	0.001	0.001	0.002	0.001	0.004	0.001	0.005

<b>Overall</b>	<b>Unity</b>	<b>60°Lag</b>
<b>Average</b>	0.000	0.001
<b>Minimum</b>	-0.002	-0.001
<b>Maximum</b>	0.001	0.005

# Calibration Report

## RD-31-221 Dytronic Portable Standard

Function..... Watt-hour 60 Hz      Phase C

Date..... 23-Jun-11

Serial Number..... 300660

The following data was collected by a Radian Research RS-703A Automated Calibration System. The RS-703A watt-hour calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards certified by the National Institute of Standards and Technology (NIST) to an uncertainty of 0.002% @ unity and 0.003% @ 60 degrees lagging Power Factor. Calibration temperature is 23 degrees Centigrade. The test time is 2 seconds and the stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as Percent Error. The RS-703A has at least a 4 times greater accuracy than the Instrument under test.

### Voltage & Phase Angle

Amps	120		240		480		600	
	Unity	60°Lag	Unity	60°Lag	Unity	60°Lag	Unity	60°Lag
0.2	-0.001	0.002	-0.001	0.002	-0.002	0.003	-0.002	0.003
0.25	-0.001	0.002	-0.001	0.002	-0.002	0.003	-0.002	0.004
0.3	-0.001	0.002	-0.001	0.002	-0.002	0.003	-0.001	0.004
0.5	-0.001	0.002	-0.001	0.002	-0.002	0.003	-0.002	0.004
1.0	-0.001	0.002	-0.001	0.003	-0.002	0.004	-0.001	0.004
2.0	0.000	0.002	0.000	0.002	-0.001	0.003	-0.001	0.004
2.5	-0.001	0.002	-0.001	0.002	-0.001	0.003	-0.001	0.004
3.0	-0.001	0.001	-0.001	0.001	-0.002	0.002	-0.002	0.003
4.0	-0.001	0.002	-0.001	0.002	-0.002	0.003	-0.001	0.004
5.0	-0.001	0.002	-0.001	0.002	-0.002	0.003	-0.001	0.004
7.0	-0.001	0.002	-0.001	0.002	-0.002	0.003	-0.002	0.003
10.0	-0.001	0.002	-0.001	0.002	-0.002	0.003	-0.002	0.003
15.0	-0.001	0.002	-0.001	0.003	-0.001	0.004	-0.001	0.004
20.0	-0.001	0.002	-0.001	0.002	-0.001	0.003	-0.001	0.004
25.0	-0.002	0.001	-0.002	0.001	-0.003	0.002	-0.003	0.002
30.0	-0.002	0.001	-0.002	0.001	-0.002	0.003	-0.002	0.003
35.0	-0.002	0.001	-0.002	0.001	-0.002	0.002	-0.002	0.003
40.0	-0.002	0.001	-0.002	0.001	-0.002	0.002	-0.002	0.003
45.0	-0.002	0.001	-0.002	0.001	-0.002	0.002	-0.002	0.003
50.0	-0.002	0.001	-0.002	0.001	-0.003	0.002	-0.003	0.003
60.0	-0.002	0.001	-0.002	0.001	-0.003	0.002	-0.002	0.003
80.0	-0.002	0.000	-0.002	0.000	-0.003	0.002	-0.002	0.003
100.0	-0.002	0.002	-0.002	0.002	-0.002	0.004	-0.003	0.004
120.0	-0.002	0.002	-0.002	0.002	-0.002	0.004	-0.002	0.005
<b>Average</b>	<b>-0.001</b>	<b>0.002</b>	<b>-0.001</b>	<b>0.002</b>	<b>-0.002</b>	<b>0.003</b>	<b>-0.002</b>	<b>0.004</b>
<b>Minimum</b>	-0.002	0.000	-0.002	0.000	-0.003	0.002	-0.003	0.002
<b>Maximum</b>	0.000	0.002	0.000	0.003	-0.001	0.004	-0.001	0.005

<b>Overall</b>	<b>Unity</b>	<b>60°Lag</b>
<b>Average</b>	-0.002	0.002
<b>Minimum</b>	-0.003	0.000
<b>Maximum</b>	0.000	0.005

# Calibration Report

## RD-31-221 Dytronic Portable Standard

Function..... Watt-hour 60 Hz      Total

Date..... 23-Jun-11

Serial Number..... 300660

The following data was collected by a Radian Research RS-703A Automated Calibration System. The RS-703A watt-hour calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards certified by the National Institute of Standards and Technology (NIST) to an uncertainty of 0.002% @ unity and 0.003% @ 60 degrees lagging Power Factor. Calibration temperature is 23 degrees Centigrade. The test time is 2 seconds and the stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as Percent Error. The RS-703A has at least a 4 times greater accuracy than the Instrument under test.

### Voltage & Phase Angle

Amps	120		240		480		600	
	Unity	60°Lag	Unity	60°Lag	Unity	60°Lag	Unity	60°Lag
0.2	-0.001	0.001	-0.001	0.001	-0.002	0.002	-0.002	0.002
0.25	-0.001	0.000	-0.001	0.001	-0.002	0.002	-0.001	0.003
0.3	-0.001	0.001	-0.001	0.001	-0.002	0.002	-0.001	0.003
0.5	-0.001	0.001	-0.001	0.001	-0.001	0.002	-0.001	0.002
1.0	-0.001	0.001	-0.001	0.002	-0.001	0.002	-0.001	0.003
2.0	0.000	0.001	0.000	0.002	-0.001	0.002	0.000	0.003
2.5	0.000	0.001	0.000	0.002	-0.001	0.002	0.000	0.003
3.0	-0.001	0.000	-0.001	0.001	-0.001	0.001	-0.001	0.002
4.0	0.000	0.001	0.000	0.002	-0.001	0.002	0.000	0.003
5.0	0.000	0.001	0.000	0.002	-0.001	0.002	0.000	0.003
7.0	-0.001	0.001	-0.001	0.001	-0.001	0.002	-0.001	0.003
10.0	-0.001	0.001	-0.001	0.001	-0.001	0.002	-0.001	0.003
15.0	0.000	0.002	0.000	0.002	-0.001	0.003	0.000	0.003
20.0	0.000	0.002	0.000	0.002	-0.001	0.003	0.000	0.004
25.0	-0.001	0.001	-0.001	0.001	-0.002	0.002	-0.001	0.002
30.0	-0.001	0.001	0.000	0.001	-0.001	0.003	-0.001	0.003
35.0	-0.001	0.001	-0.001	0.001	-0.001	0.002	-0.001	0.003
40.0	-0.001	0.001	-0.001	0.001	-0.001	0.002	-0.001	0.003
45.0	-0.001	0.001	-0.001	0.001	-0.001	0.002	-0.001	0.003
50.0	-0.001	0.001	-0.001	0.001	-0.001	0.002	-0.001	0.003
60.0	-0.001	0.001	-0.001	0.001	-0.001	0.002	-0.001	0.003
80.0	-0.002	0.000	-0.001	0.001	-0.002	0.002	-0.001	0.003
100.0	-0.001	0.001	-0.001	0.002	-0.001	0.003	-0.001	0.004
120.0	-0.002	0.001	-0.001	0.002	-0.001	0.004	-0.001	0.005
<b>Average</b>	<b>-0.001</b>	<b>0.001</b>	<b>-0.001</b>	<b>0.001</b>	<b>-0.001</b>	<b>0.002</b>	<b>-0.001</b>	<b>0.003</b>
<b>Minimum</b>	-0.002	0.000	-0.001	0.001	-0.002	0.001	-0.002	0.002
<b>Maximum</b>	0.000	0.002	0.000	0.002	-0.001	0.004	0.000	0.005

<b>Overall</b>	<b>Unity</b>	<b>60°Lag</b>
<b>Average</b>	-0.001	0.002
<b>Minimum</b>	-0.002	0.000
<b>Maximum</b>	0.000	0.005

# Calibration Report

## RD-31-221 Dytronic Portable Standard

Function..... Watts      60 Hz      Phase A

Date..... 23-Jun-11

Serial Number..... 300660

The following data was collected by a Radian Research RS-703A Automated Calibration System. The RS-703A Watt calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards certified by the National Institute of Standards and Technology (NIST) to an uncertainty of 0.002% @ unity and 0.003% @ 60 degrees lagging Power Factor. Calibration temperature is 23 degrees Centigrade. The test time is 2 seconds and the stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as Percent Error. The RS-703A has at least a 4 times greater accuracy than the Instrument under test.

### Voltage & Phase Angle

Amps	120		240		480		600	
	Unity	60°Lag	Unity	60°Lag	Unity	60°Lag	Unity	60°Lag
0.2	-0.001	0.001	-0.002	0.002	-0.002	0.003	-0.002	0.003
0.25	-0.001	0.001	-0.002	0.001	-0.002	0.002	-0.002	0.003
0.3	-0.001	0.001	-0.002	0.002	-0.002	0.003	-0.002	0.003
0.5	-0.001	0.001	-0.001	0.001	-0.001	0.002	-0.001	0.003
1.0	-0.001	0.002	-0.001	0.002	-0.002	0.003	-0.001	0.003
2.0	0.000	0.002	0.000	0.002	-0.001	0.003	0.000	0.004
2.5	0.000	0.002	-0.001	0.002	-0.001	0.003	0.000	0.004
3.0	0.000	0.001	-0.001	0.002	-0.001	0.003	-0.001	0.003
4.0	0.000	0.002	0.000	0.003	-0.001	0.003	0.000	0.004
5.0	0.000	0.002	0.000	0.002	-0.001	0.003	0.000	0.004
7.0	-0.001	0.001	-0.001	0.002	-0.001	0.003	-0.001	0.003
10.0	-0.001	0.001	-0.001	0.002	-0.002	0.003	-0.001	0.003
15.0	0.000	0.002	-0.001	0.003	-0.001	0.004	-0.001	0.004
20.0	0.000	0.002	-0.001	0.002	-0.001	0.003	-0.001	0.004
25.0	-0.001	0.001	-0.001	0.002	-0.002	0.002	-0.002	0.003
30.0	0.000	0.002	-0.001	0.002	-0.001	0.003	-0.001	0.004
35.0	-0.001	0.001	-0.001	0.002	-0.002	0.003	-0.001	0.004
40.0	-0.001	0.001	-0.001	0.002	-0.001	0.003	-0.001	0.004
45.0	0.000	0.002	-0.001	0.002	-0.001	0.003	-0.001	0.004
50.0	-0.001	0.002	-0.001	0.002	-0.002	0.003	-0.001	0.004
60.0	-0.001	0.001	-0.002	0.002	-0.002	0.003	-0.001	0.004
80.0	-0.001	0.001	-0.002	0.002	-0.002	0.003	-0.001	0.004
100.0	-0.001	0.001	-0.001	0.002	-0.002	0.003	-0.002	0.004
120.0	-0.001	0.002	-0.001	0.002	-0.002	0.004	-0.001	0.004
<b>Average</b>	<b>-0.001</b>	<b>0.001</b>	<b>-0.001</b>	<b>0.002</b>	<b>-0.002</b>	<b>0.003</b>	<b>-0.001</b>	<b>0.004</b>
<b>Minimum</b>	-0.001	0.001	-0.002	0.001	-0.002	0.002	-0.002	0.003
<b>Maximum</b>	0.000	0.002	0.000	0.003	-0.001	0.004	0.000	0.004

<u>Overall</u>	Unity	60°Lag
<b>Average</b>	-0.001	0.003
<b>Minimum</b>	-0.002	0.001
<b>Maximum</b>	0.000	0.004

# Calibration Report

## RD-31-221 Dytronic Portable Standard

Function..... Watts      60 Hz      Phase B

Date..... 23-Jun-11

Serial Number..... 300660

The following data was collected by a Radian Research RS-703A Automated Calibration System. The RS-703A Watt calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards certified by the National Institute of Standards and Technology (NIST) to an uncertainty of 0.002% @ unity and 0.003% @ 60 degrees lagging Power Factor. Calibration temperature is 23 degrees Centigrade. The test time is 2 seconds and the stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as Percent Error. The RS-703A has at least a 4 times greater accuracy than the Instrument under test.

### Voltage & Phase Angle

Amps	120		240		480		600	
	Unity	60°Lag	Unity	60°Lag	Unity	60°Lag	Unity	60°Lag
0.2	-0.001	-0.001	-0.001	0.000	-0.001	0.000	-0.001	0.000
0.25	-0.001	-0.001	-0.001	0.000	-0.001	0.000	-0.001	0.001
0.3	-0.001	-0.001	0.000	0.000	-0.001	0.000	-0.001	0.001
0.5	0.000	-0.001	0.000	0.000	-0.001	0.000	0.000	0.001
1.0	0.000	0.000	0.000	0.000	-0.001	0.000	0.000	0.001
2.0	0.000	0.000	0.001	0.001	0.000	0.001	0.001	0.002
2.5	0.000	0.000	0.001	0.001	0.000	0.000	0.001	0.002
3.0	-0.001	-0.001	0.000	0.000	0.000	-0.001	0.000	0.001
4.0	0.000	0.000	0.001	0.001	0.000	0.000	0.001	0.002
5.0	0.000	0.000	0.001	0.001	0.000	0.001	0.001	0.002
7.0	0.000	0.000	0.000	0.001	0.000	0.001	0.000	0.001
10.0	-0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.002
15.0	0.000	0.001	0.000	0.001	0.000	0.001	0.001	0.002
20.0	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.002
25.0	0.000	0.000	0.001	0.000	0.000	0.001	0.001	0.002
30.0	0.000	0.001	0.001	0.001	0.001	0.002	0.001	0.003
35.0	0.000	0.000	0.001	0.001	0.000	0.001	0.001	0.003
40.0	0.000	0.000	0.001	0.001	0.001	0.001	0.001	0.002
45.0	0.000	0.000	0.001	0.001	0.001	0.001	0.001	0.002
50.0	0.000	0.000	0.001	0.000	0.000	0.001	0.001	0.002
60.0	-0.001	0.000	0.000	0.000	0.000	0.002	0.001	0.003
80.0	-0.001	-0.001	0.000	0.000	0.000	0.001	0.001	0.003
100.0	-0.001	0.000	0.000	0.001	0.000	0.003	0.001	0.004
120.0	-0.001	0.000	0.000	0.002	0.000	0.004	0.001	0.005
<b>Average</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.001</b>	<b>0.000</b>	<b>0.001</b>	<b>0.001</b>	<b>0.002</b>
<b>Minimum</b>	-0.001	-0.001	-0.001	0.000	-0.001	-0.001	-0.001	0.000
<b>Maximum</b>	0.000	0.001	0.001	0.002	0.001	0.004	0.001	0.005

<b>Overall</b>	<b>Unity</b>	<b>60°Lag</b>
<b>Average</b>	0.000	0.001
<b>Minimum</b>	-0.001	-0.001
<b>Maximum</b>	0.001	0.005

# Calibration Report

## RD-31-221 Dytronic Portable Standard

Function..... Watts      60 Hz      Phase C

Date..... 23-Jun-11

Serial Number..... 300660

The following data was collected by a Radian Research RS-703A Automated Calibration System. The RS-703A Watt calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards certified by the National Institute of Standards and Technology (NIST) to an uncertainty of 0.002% @ unity and 0.003% @ 60 degrees lagging Power Factor. Calibration temperature is 23 degrees Centigrade. The test time is 2 seconds and the stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as Percent Error. The RS-703A has at least a 4 times greater accuracy than the Instrument under test.

### Voltage & Phase Angle

Amps	120		240		480		600	
	Unity	60°Lag	Unity	60°Lag	Unity	60°Lag	Unity	60°Lag
0.2	-0.001	0.002	-0.001	0.002	-0.002	0.003	-0.002	0.003
0.25	-0.001	0.002	-0.001	0.002	-0.002	0.003	-0.001	0.004
0.3	-0.001	0.002	-0.001	0.003	-0.001	0.004	-0.001	0.004
0.5	-0.001	0.002	-0.001	0.002	-0.002	0.003	-0.001	0.004
1.0	-0.001	0.003	-0.001	0.003	-0.002	0.004	-0.001	0.004
2.0	0.000	0.002	0.000	0.002	-0.001	0.004	-0.001	0.004
2.5	-0.001	0.002	-0.001	0.002	-0.001	0.003	-0.001	0.004
3.0	-0.001	0.001	-0.001	0.001	-0.002	0.002	-0.002	0.003
4.0	-0.001	0.002	-0.001	0.002	-0.001	0.003	-0.001	0.004
5.0	-0.001	0.002	-0.001	0.002	-0.002	0.003	-0.001	0.004
7.0	-0.001	0.002	-0.001	0.002	-0.002	0.003	-0.002	0.003
10.0	-0.001	0.002	-0.001	0.002	-0.002	0.003	-0.001	0.003
15.0	0.000	0.002	-0.001	0.003	-0.001	0.004	-0.001	0.004
20.0	-0.001	0.002	-0.001	0.002	-0.001	0.003	-0.001	0.004
25.0	-0.002	0.001	-0.002	0.001	-0.002	0.002	-0.002	0.003
30.0	-0.001	0.001	-0.002	0.001	-0.002	0.003	-0.002	0.003
35.0	-0.002	0.001	-0.002	0.001	-0.002	0.002	-0.002	0.003
40.0	-0.002	0.001	-0.002	0.001	-0.002	0.002	-0.002	0.003
45.0	-0.001	0.001	-0.002	0.001	-0.002	0.002	-0.002	0.003
50.0	-0.002	0.001	-0.002	0.001	-0.003	0.002	-0.002	0.003
60.0	-0.002	0.001	-0.002	0.001	-0.002	0.002	-0.002	0.003
80.0	-0.002	0.000	-0.002	0.000	-0.003	0.002	-0.002	0.003
100.0	-0.002	0.002	-0.002	0.002	-0.002	0.004	-0.003	0.004
120.0	-0.002	0.003	-0.002	0.002	-0.002	0.004	-0.002	0.005
<b>Average</b>	<b>-0.001</b>	<b>0.002</b>	<b>-0.001</b>	<b>0.002</b>	<b>-0.002</b>	<b>0.003</b>	<b>-0.002</b>	<b>0.004</b>
<b>Minimum</b>	-0.002	0.000	-0.002	0.000	-0.003	0.002	-0.003	0.003
<b>Maximum</b>	0.000	0.003	0.000	0.003	-0.001	0.004	-0.001	0.005

<b>Overall</b>	<b>Unity</b>	<b>60°Lag</b>
<b>Average</b>	-0.002	0.002
<b>Minimum</b>	-0.003	0.000
<b>Maximum</b>	0.000	0.005



# Calibration Report

## RD-31-221 Dytronic Portable Standard

**Function..... Watts      60 Hz      Total**  
**Date..... 23-Jun-11**  
**Serial Number..... 300660**

The following data was collected by a Radian Research RS-703A Automated Calibration System. The RS-703A watt-hour calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards certified by the National Institute of Standards and Technology (NIST) to an uncertainty of 0.002% @ unity and 0.003% @ 60 degrees lagging Power Factor. Calibration temperature is 23 degrees Centigrade. The test time is 2 seconds and the stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as Percent Error. The RS-703A has at least a 4 times greater accuracy than the Instrument under test.

### Voltage & Phase Angle

Amps	120		240		480		600	
	Unity	60°Lag	Unity	60°Lag	Unity	60°Lag	Unity	60°Lag
<b>0.2</b>	-0.001	0.001	-0.001	0.001	-0.002	0.002	-0.002	0.002
<b>0.25</b>	-0.001	0.001	-0.001	0.001	-0.002	0.002	-0.001	0.003
<b>0.3</b>	-0.001	0.001	-0.001	0.001	-0.002	0.002	-0.001	0.003
<b>0.5</b>	-0.001	0.001	-0.001	0.001	-0.001	0.002	-0.001	0.003
<b>1.0</b>	-0.001	0.001	-0.001	0.002	-0.001	0.002	-0.001	0.003
<b>2.0</b>	0.000	0.001	0.000	0.002	0.000	0.003	0.000	0.003
<b>2.5</b>	0.000	0.001	0.000	0.002	-0.001	0.002	0.000	0.003
<b>3.0</b>	-0.001	0.001	-0.001	0.001	-0.001	0.001	-0.001	0.002
<b>4.0</b>	0.000	0.001	0.000	0.002	-0.001	0.002	0.000	0.003
<b>5.0</b>	0.000	0.001	0.000	0.002	-0.001	0.002	0.000	0.003
<b>7.0</b>	-0.001	0.001	-0.001	0.001	-0.001	0.002	-0.001	0.003
<b>10.0</b>	-0.001	0.001	-0.001	0.001	-0.001	0.002	-0.001	0.003
<b>15.0</b>	0.000	0.002	0.000	0.002	-0.001	0.003	0.000	0.003
<b>20.0</b>	0.000	0.002	0.000	0.002	-0.001	0.003	0.000	0.004
<b>25.0</b>	-0.001	0.001	-0.001	0.001	-0.001	0.002	-0.001	0.002
<b>30.0</b>	-0.001	0.001	0.000	0.002	-0.001	0.003	0.000	0.003
<b>35.0</b>	-0.001	0.001	-0.001	0.001	-0.001	0.002	-0.001	0.003
<b>40.0</b>	-0.001	0.001	-0.001	0.001	-0.001	0.002	-0.001	0.003
<b>45.0</b>	-0.001	0.001	-0.001	0.001	-0.001	0.002	-0.001	0.003
<b>50.0</b>	-0.001	0.001	-0.001	0.001	-0.001	0.002	-0.001	0.003
<b>60.0</b>	-0.001	0.001	-0.001	0.001	-0.001	0.002	-0.001	0.003
<b>80.0</b>	-0.002	0.000	-0.001	0.001	-0.001	0.002	-0.001	0.003
<b>100.0</b>	-0.001	0.001	-0.001	0.002	-0.001	0.003	-0.001	0.004
<b>120.0</b>	-0.002	0.002	-0.001	0.002	-0.001	0.004	-0.001	0.005
<b>Average</b>	<b>-0.001</b>	<b>0.001</b>	<b>-0.001</b>	<b>0.001</b>	<b>-0.001</b>	<b>0.002</b>	<b>-0.001</b>	<b>0.003</b>
<b>Minimum</b>	-0.002	0.000	-0.001	0.001	-0.002	0.001	-0.002	0.002
<b>Maximum</b>	0.000	0.002	0.000	0.002	0.000	0.004	0.000	0.005

<u>Overall</u>	Unity	60°Lag
<b>Average</b>	-0.001	0.002
<b>Minimum</b>	-0.002	0.000
<b>Maximum</b>	0.000	0.005

# Calibration Report

## RD-31-221 Dytronic Portable Standard

Function..... VAR-hour 60 Hz      Phase A

Date..... 23-Jun-11

Serial Number..... 300660

The following data was collected by a Radian Research RS-703A Automated Calibration System. The RS-703A VAR-hour calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards certified by the National Institute of Standards and Technology (NIST) with the use of an ultra low distortion synthesis and digital delay. Uncertainty is 0.005% for VAR-hour. Calibration temperature is 23 degrees Centigrade. Test time is 2 seconds and the stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as Percent Error. The RS-703A has at least a 4 times greater accuracy than the Instrument under test.

### Voltage & Phase Angle

Amps	120		240		480		600	
	90°Lag	30°Lag	90°Lag	30°Lag	90°Lag	30°Lag	90°Lag	30°Lag
0.2	-0.001	-0.004	-0.002	-0.005	-0.002	-0.007	-0.002	-0.007
0.25	-0.002	-0.004	-0.002	-0.006	-0.002	-0.007	-0.002	-0.007
0.3	-0.001	-0.004	-0.002	-0.005	-0.002	-0.007	-0.002	-0.006
0.5	-0.001	-0.002	-0.001	-0.003	-0.001	-0.005	-0.001	-0.005
1.0	-0.001	-0.003	-0.001	-0.004	-0.002	-0.006	-0.001	-0.005
2.0	0.000	-0.001	0.000	-0.003	0.000	-0.004	0.000	-0.004
2.5	0.000	-0.001	-0.001	-0.003	-0.001	-0.004	0.000	-0.004
3.0	0.000	-0.002	-0.001	-0.003	-0.001	-0.004	-0.001	-0.004
4.0	0.000	-0.002	0.000	-0.003	-0.001	-0.004	0.000	-0.004
5.0	0.000	-0.002	0.000	-0.003	-0.001	-0.004	0.000	-0.004
7.0	-0.001	-0.002	-0.001	-0.004	-0.001	-0.005	-0.001	-0.005
10.0	-0.001	-0.002	-0.001	-0.004	-0.002	-0.005	-0.001	-0.005
15.0	0.000	-0.002	0.000	-0.003	-0.001	-0.004	0.000	-0.004
20.0	0.000	-0.002	-0.001	-0.003	-0.001	-0.004	0.000	-0.005
25.0	-0.001	-0.002	-0.001	-0.003	-0.001	-0.005	-0.001	-0.005
30.0	0.000	-0.002	0.000	-0.003	-0.001	-0.005	-0.001	-0.004
35.0	0.000	-0.002	-0.001	-0.003	-0.001	-0.005	-0.001	-0.005
40.0	0.000	-0.002	-0.001	-0.003	-0.001	-0.005	-0.001	-0.005
45.0	0.000	-0.001	0.000	-0.002	-0.001	-0.004	-0.001	-0.005
50.0	-0.001	-0.002	-0.001	-0.003	-0.001	-0.005	-0.001	-0.005
60.0	0.000	-0.002	-0.001	-0.003	-0.001	-0.005	-0.001	-0.005
80.0	-0.001	-0.002	0.000	-0.003	-0.002	-0.005	-0.001	-0.005
100.0	0.000	-0.002	0.000	-0.002	-0.001	-0.005	-0.001	-0.006
120.0	0.000	-0.002	0.000	-0.002	-0.001	-0.005	-0.001	-0.006
<b>Average</b>	<b>0.000</b>	<b>-0.002</b>	<b>-0.001</b>	<b>-0.003</b>	<b>-0.001</b>	<b>-0.005</b>	<b>-0.001</b>	<b>-0.005</b>
<b>Minimum</b>	-0.002	-0.004	-0.002	-0.006	-0.002	-0.007	-0.002	-0.007
<b>Maximum</b>	0.000	-0.001	0.000	-0.002	0.000	-0.004	0.000	-0.004

<u>Overall</u>	90°Lag	30°Lag
<b>Average</b>	-0.001	-0.004
<b>Minimum</b>	-0.002	-0.007
<b>Maximum</b>	0.000	-0.001

# Calibration Report

## RD-31-221 Dytronic Portable Standard

Function..... VAR-hour 60 Hz      Phase B

Date..... 23-Jun-11

Serial Number..... 300660

The following data was collected by a Radian Research RS-703A Automated Calibration System. The RS-703A VAR-hour calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards certified by the National Institute of Standards and Technology (NIST) with the use of an ultra low distortion synthesis and digital delay. Uncertainty is 0.005% for VAR-hour. Calibration temperature is 23 degrees Centigrade. Test time is 2 seconds and the stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as Percent Error. The RS-703A has at least a 4 times greater accuracy than the Instrument under test.

### Voltage & Phase Angle

Amps	120		240		480		600	
	90°Lag	30°Lag	90°Lag	30°Lag	90°Lag	30°Lag	90°Lag	30°Lag
0.2	-0.001	-0.003	-0.001	-0.001	-0.001	-0.002	-0.001	-0.002
0.25	-0.002	-0.003	-0.001	-0.001	-0.001	-0.002	-0.001	-0.002
0.3	-0.001	-0.002	-0.001	-0.001	-0.001	-0.002	-0.001	-0.002
0.5	0.000	-0.001	0.000	0.000	0.000	0.000	0.000	0.000
1.0	0.000	-0.002	0.000	0.000	-0.001	-0.001	0.000	-0.001
2.0	0.001	0.000	0.001	0.001	0.001	0.001	0.001	0.000
2.5	0.000	0.000	0.001	0.001	0.000	0.000	0.001	0.000
3.0	0.000	-0.001	0.000	0.001	0.000	0.000	0.000	0.000
4.0	0.000	0.000	0.001	0.001	0.000	0.000	0.001	0.000
5.0	0.000	0.000	0.001	0.001	0.000	0.000	0.001	0.000
7.0	0.000	-0.001	0.001	0.000	0.000	-0.001	0.000	-0.001
10.0	0.000	-0.001	0.000	0.000	0.000	-0.001	0.000	-0.001
15.0	0.000	-0.001	0.001	0.000	0.001	0.000	0.001	0.000
20.0	0.001	-0.001	0.001	0.001	0.001	0.000	0.001	0.000
25.0	0.001	0.000	0.001	0.001	0.001	0.001	0.001	0.000
30.0	0.001	0.001	0.002	0.002	0.001	0.001	0.002	0.001
35.0	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
40.0	0.001	0.001	0.002	0.002	0.001	0.001	0.001	0.001
45.0	0.001	0.001	0.002	0.002	0.001	0.001	0.002	0.001
50.0	0.001	0.000	0.002	0.002	0.001	0.001	0.001	0.001
60.0	0.001	0.000	0.002	0.001	0.001	0.001	0.001	0.000
80.0	0.001	0.000	0.001	0.001	0.001	0.001	0.001	0.000
100.0	0.001	-0.001	0.002	0.000	0.001	0.000	0.002	-0.001
120.0	0.002	-0.001	0.002	-0.001	0.002	-0.001	0.002	-0.001
<b>Average</b>	<b>0.000</b>	<b>-0.001</b>	<b>0.001</b>	<b>0.001</b>	<b>0.000</b>	<b>0.000</b>	<b>0.001</b>	<b>0.000</b>
<b>Minimum</b>	-0.002	-0.003	-0.001	-0.001	-0.001	-0.002	-0.001	-0.002
<b>Maximum</b>	0.002	0.001	0.002	0.002	0.002	0.001	0.002	0.001

<u>Overall</u>	90°Lag	30°Lag
<b>Average</b>	0.001	0.000
<b>Minimum</b>	-0.002	-0.003
<b>Maximum</b>	0.002	0.002

# Calibration Report

## RD-31-221 Dytronic Portable Standard

Function..... VAR-hour 60 Hz      Phase C

Date..... 23-Jun-11

Serial Number..... 300660

The following data was collected by a Radian Research RS-703A Automated Calibration System. The RS-703A VAR-hour calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards certified by the National Institute of Standards and Technology (NIST) with the use of an ultra low distortion synthesis and digital delay. Uncertainty is 0.005% for VAR-hour. Calibration temperature is 23 degrees Centigrade. Test time is 2 seconds and the stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as Percent Error. The RS-703A has at least a 4 times greater accuracy than the Instrument under test.

### Voltage & Phase Angle

Amps	120		240		480		600	
	90°Lag	30°Lag	90°Lag	30°Lag	90°Lag	30°Lag	90°Lag	30°Lag
0.2	-0.002	-0.005	-0.002	-0.005	-0.003	-0.008	-0.003	-0.008
0.25	-0.002	-0.005	-0.002	-0.005	-0.003	-0.008	-0.003	-0.008
0.3	-0.002	-0.004	-0.002	-0.005	-0.003	-0.007	-0.002	-0.007
0.5	-0.002	-0.004	-0.002	-0.004	-0.002	-0.007	-0.002	-0.007
1.0	-0.001	-0.005	-0.001	-0.005	-0.002	-0.007	-0.002	-0.007
2.0	-0.001	-0.003	-0.001	-0.003	-0.001	-0.005	-0.001	-0.005
2.5	-0.001	-0.003	-0.001	-0.003	-0.002	-0.006	-0.001	-0.005
3.0	-0.002	-0.003	-0.002	-0.004	-0.002	-0.006	-0.002	-0.006
4.0	-0.001	-0.003	-0.001	-0.003	-0.002	-0.006	-0.002	-0.005
5.0	-0.001	-0.003	-0.001	-0.003	-0.002	-0.006	-0.002	-0.005
7.0	-0.001	-0.004	-0.001	-0.004	-0.002	-0.006	-0.002	-0.006
10.0	-0.002	-0.004	-0.002	-0.004	-0.002	-0.006	-0.002	-0.006
15.0	-0.001	-0.003	-0.001	-0.003	-0.002	-0.005	-0.001	-0.005
20.0	-0.001	-0.003	-0.001	-0.003	-0.002	-0.005	-0.001	-0.005
25.0	-0.002	-0.004	-0.002	-0.004	-0.003	-0.007	-0.003	-0.007
30.0	-0.002	-0.004	-0.002	-0.004	-0.002	-0.006	-0.002	-0.006
35.0	-0.002	-0.004	-0.002	-0.004	-0.003	-0.007	-0.002	-0.006
40.0	-0.002	-0.004	-0.002	-0.004	-0.003	-0.006	-0.002	-0.006
45.0	-0.002	-0.003	-0.002	-0.004	-0.003	-0.006	-0.002	-0.006
50.0	-0.002	-0.004	-0.002	-0.004	-0.003	-0.007	-0.003	-0.007
60.0	-0.002	-0.004	-0.002	-0.004	-0.003	-0.007	-0.002	-0.007
80.0	-0.002	-0.003	-0.002	-0.004	-0.003	-0.006	-0.002	-0.007
100.0	-0.001	-0.004	-0.002	-0.005	-0.002	-0.007	-0.002	-0.008
120.0	-0.001	-0.004	-0.002	-0.006	-0.002	-0.008	-0.002	-0.008
<b>Average</b>	<b>-0.002</b>	<b>-0.004</b>	<b>-0.002</b>	<b>-0.004</b>	<b>-0.002</b>	<b>-0.006</b>	<b>-0.002</b>	<b>-0.006</b>
<b>Minimum</b>	-0.002	-0.005	-0.002	-0.006	-0.003	-0.008	-0.003	-0.008
<b>Maximum</b>	-0.001	-0.003	-0.001	-0.003	-0.001	-0.005	-0.001	-0.005

<u>Overall</u>	90°Lag	30°Lag
<b>Average</b>	-0.002	-0.005
<b>Minimum</b>	-0.003	-0.008
<b>Maximum</b>	-0.001	-0.003

# Calibration Report

## RD-31-221 Dytronic Portable Standard

Function..... VAR-hour 60 Hz            Total

Date..... 23-Jun-11

Serial Number..... 300660

The following data was collected by a Radian Research RS-703A Automated Calibration System. The RS-703A VAR-hour calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards certified by the National Institute of Standards and Technology (NIST) with the use of an ultra low distortion synthesis and digital delay. Uncertainty is 0.005% for VAR-hour. Calibration temperature is 23 degrees Centigrade. Test time is 2 seconds and the stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as Percent Error. The RS-703A has at least a 4 times greater accuracy than the Instrument under test.

### Voltage & Phase Angle

Amps	120		240		480		600	
	90°Lag	30°Lag	90°Lag	30°Lag	90°Lag	30°Lag	90°Lag	30°Lag
0.2	-0.001	-0.004	-0.002	-0.004	-0.002	-0.006	-0.002	-0.006
0.25	-0.002	-0.004	-0.002	-0.004	-0.002	-0.006	-0.002	-0.006
0.3	-0.001	-0.003	-0.001	-0.004	-0.002	-0.005	-0.002	-0.005
0.5	-0.001	-0.002	-0.001	-0.002	-0.001	-0.004	-0.001	-0.004
1.0	-0.001	-0.003	-0.001	-0.003	-0.001	-0.004	-0.001	-0.004
2.0	0.000	-0.001	0.000	-0.001	0.000	-0.003	0.000	-0.003
2.5	0.000	-0.002	0.000	-0.002	-0.001	-0.003	0.000	-0.003
3.0	-0.001	-0.002	-0.001	-0.002	-0.001	-0.003	-0.001	-0.003
4.0	0.000	-0.002	0.000	-0.002	-0.001	-0.003	0.000	-0.003
5.0	0.000	-0.002	0.000	-0.002	-0.001	-0.003	0.000	-0.003
7.0	-0.001	-0.002	-0.001	-0.002	-0.001	-0.004	-0.001	-0.004
10.0	-0.001	-0.002	-0.001	-0.002	-0.001	-0.004	-0.001	-0.004
15.0	0.000	-0.002	0.000	-0.002	-0.001	-0.003	0.000	-0.003
20.0	0.000	-0.002	0.000	-0.002	-0.001	-0.003	0.000	-0.003
25.0	-0.001	-0.002	-0.001	-0.002	-0.001	-0.004	-0.001	-0.004
30.0	0.000	-0.002	0.000	-0.002	-0.001	-0.003	0.000	-0.003
35.0	0.000	-0.002	0.000	-0.002	-0.001	-0.004	-0.001	-0.003
40.0	-0.001	-0.002	0.000	-0.002	-0.001	-0.003	-0.001	-0.003
45.0	0.000	-0.001	0.000	-0.001	-0.001	-0.003	0.000	-0.003
50.0	-0.001	-0.002	0.000	-0.002	-0.001	-0.004	-0.001	-0.004
60.0	0.000	-0.002	0.000	-0.002	-0.001	-0.004	-0.001	-0.004
80.0	-0.001	-0.002	0.000	-0.002	-0.001	-0.004	-0.001	-0.004
100.0	0.000	-0.002	0.000	-0.003	-0.001	-0.004	-0.001	-0.005
120.0	0.000	-0.003	0.000	-0.003	-0.001	-0.005	0.000	-0.005
<b>Average</b>	<b>-0.001</b>	<b>-0.002</b>	<b>0.000</b>	<b>-0.002</b>	<b>-0.001</b>	<b>-0.004</b>	<b>-0.001</b>	<b>-0.004</b>
<b>Minimum</b>	-0.002	-0.004	-0.002	-0.004	-0.002	-0.006	-0.002	-0.006
<b>Maximum</b>	0.000	-0.001	0.000	-0.001	0.000	-0.003	0.000	-0.003

<u>Overall</u>	90°Lag	30°Lag
<b>Average</b>	-0.001	-0.003
<b>Minimum</b>	-0.002	-0.006
<b>Maximum</b>	0.000	-0.001

# Calibration Report

## RD-31-221 Dytronic Portable Standard

Function..... VAR      60 Hz      Phase A

Date..... 23-Jun-11

Serial Number..... 300660

The following data was collected by a Radian Research RS-703A Automated Calibration System. The RS-703A VAR calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards certified by the National Institute of Standards and Technology (NIST) with the use of an ultra low distortion synthesis and digital delay. Uncertainty is 0.005% for VAR-hour. Calibration temperature is 23 degrees Centigrade. Test time is 2 seconds and the stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as Percent Error. The RS-703A has at least a 4 times greater accuracy than the Instrument under test.

### Voltage & Phase Angle

Amps	120		240		480		600	
	90°Lag	30°Lag	90°Lag	30°Lag	90°Lag	30°Lag	90°Lag	30°Lag
<b>0.2</b>	-0.001	-0.004	-0.002	-0.005	-0.002	-0.007	-0.002	-0.007
<b>0.25</b>	-0.002	-0.004	-0.002	-0.005	-0.002	-0.007	-0.002	-0.007
<b>0.3</b>	-0.001	-0.004	-0.002	-0.005	-0.002	-0.007	-0.002	-0.006
<b>0.5</b>	0.000	-0.002	-0.001	-0.003	-0.001	-0.005	-0.001	-0.004
<b>1.0</b>	-0.001	-0.003	-0.001	-0.004	-0.002	-0.005	-0.001	-0.005
<b>2.0</b>	0.000	-0.001	0.000	-0.002	0.000	-0.004	0.000	-0.004
<b>2.5</b>	0.000	-0.001	-0.001	-0.003	-0.001	-0.004	0.000	-0.004
<b>3.0</b>	0.000	-0.002	-0.001	-0.003	-0.001	-0.004	0.000	-0.004
<b>4.0</b>	0.000	-0.002	0.000	-0.003	0.000	-0.004	0.000	-0.004
<b>5.0</b>	0.000	-0.001	0.000	-0.003	-0.001	-0.004	0.000	-0.004
<b>7.0</b>	0.000	-0.003	-0.001	-0.004	-0.001	-0.005	-0.001	-0.005
<b>10.0</b>	-0.001	-0.002	-0.001	-0.004	-0.002	-0.005	-0.001	-0.005
<b>15.0</b>	0.000	-0.002	0.000	-0.003	-0.001	-0.004	0.000	-0.004
<b>20.0</b>	0.000	-0.002	0.000	-0.003	-0.001	-0.004	0.000	-0.004
<b>25.0</b>	0.000	-0.002	-0.001	-0.003	-0.001	-0.004	-0.001	-0.005
<b>30.0</b>	0.000	-0.002	0.000	-0.003	-0.001	-0.004	0.000	-0.004
<b>35.0</b>	0.000	-0.002	-0.001	-0.003	-0.001	-0.005	-0.001	-0.005
<b>40.0</b>	0.000	-0.002	-0.001	-0.003	-0.001	-0.005	-0.001	-0.005
<b>45.0</b>	0.000	-0.001	0.000	-0.002	-0.001	-0.004	-0.001	-0.004
<b>50.0</b>	0.000	-0.002	-0.001	-0.003	-0.001	-0.005	-0.001	-0.005
<b>60.0</b>	0.000	-0.002	0.000	-0.003	-0.001	-0.005	-0.001	-0.005
<b>80.0</b>	-0.001	-0.002	0.000	-0.002	-0.001	-0.005	-0.001	-0.005
<b>100.0</b>	0.000	-0.002	0.000	-0.002	-0.001	-0.005	-0.001	-0.006
<b>120.0</b>	0.000	-0.002	0.000	-0.002	-0.001	-0.005	-0.001	-0.006
<b>Average</b>	<b>0.000</b>	<b>-0.002</b>	<b>-0.001</b>	<b>-0.003</b>	<b>-0.001</b>	<b>-0.005</b>	<b>-0.001</b>	<b>-0.005</b>
<b>Minimum</b>	-0.002	-0.004	-0.002	-0.005	-0.002	-0.007	-0.002	-0.007
<b>Maximum</b>	0.000	-0.001	0.000	-0.002	0.000	-0.004	0.000	-0.004

<u>Overall</u>	90°Lag	30°Lag
<b>Average</b>	-0.001	-0.004
<b>Minimum</b>	-0.002	-0.007
<b>Maximum</b>	0.000	-0.001

# Calibration Report

## RD-31-221 Dytronic Portable Standard

Function..... VAR      60 Hz      Phase B

Date..... 23-Jun-11

Serial Number..... 300660

The following data was collected by a Radian Research RS-703A Automated Calibration System. The RS-703A VAR calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards certified by the National Institute of Standards and Technology (NIST) with the use of an ultra low distortion synthesis and digital delay. Uncertainty is 0.005% for VAR-hour. Calibration temperature is 23 degrees Centigrade. Test time is 2 seconds and the stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as Percent Error. The RS-703A has at least a 4 times greater accuracy than the Instrument under test.

### Voltage & Phase Angle

Amps	120		240		480		600	
	90°Lag	30°Lag	90°Lag	30°Lag	90°Lag	30°Lag	90°Lag	30°Lag
0.2	-0.001	-0.002	-0.001	-0.001	-0.001	-0.002	-0.001	-0.001
0.25	-0.001	-0.003	-0.001	-0.001	-0.001	-0.002	-0.001	-0.002
0.3	-0.001	-0.002	0.000	-0.001	-0.001	-0.002	0.000	-0.002
0.5	0.000	-0.001	0.000	0.000	0.000	0.000	0.000	0.000
1.0	0.000	-0.001	0.000	0.000	0.000	-0.001	0.000	-0.001
2.0	0.001	0.000	0.001	0.002	0.001	0.001	0.001	0.001
2.5	0.000	0.000	0.001	0.002	0.000	0.000	0.001	0.000
3.0	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000
4.0	0.000	0.000	0.001	0.001	0.000	0.000	0.001	0.000
5.0	0.000	0.000	0.001	0.001	0.000	0.000	0.001	0.000
7.0	0.000	-0.001	0.001	0.000	0.000	0.000	0.000	0.000
10.0	0.000	-0.001	0.000	0.000	0.000	-0.001	0.000	-0.001
15.0	0.001	-0.001	0.001	0.001	0.001	0.000	0.001	0.000
20.0	0.001	0.000	0.001	0.001	0.000	0.000	0.001	0.000
25.0	0.001	0.000	0.001	0.002	0.001	0.001	0.001	0.001
30.0	0.001	0.001	0.002	0.002	0.001	0.001	0.002	0.001
35.0	0.001	0.000	0.001	0.001	0.001	0.001	0.001	0.001
40.0	0.001	0.000	0.002	0.002	0.001	0.001	0.001	0.001
45.0	0.001	0.001	0.002	0.002	0.001	0.001	0.002	0.001
50.0	0.001	0.001	0.002	0.002	0.001	0.001	0.002	0.000
60.0	0.001	0.000	0.002	0.002	0.001	0.001	0.001	0.001
80.0	0.001	0.000	0.002	0.001	0.001	0.001	0.002	0.001
100.0	0.001	-0.001	0.002	0.000	0.001	0.000	0.002	-0.001
120.0	0.002	-0.001	0.002	-0.001	0.002	-0.001	0.002	-0.001
Average	0.000	0.000	0.001	0.001	0.000	0.000	0.001	0.000
Minimum	-0.001	-0.003	-0.001	-0.001	-0.001	-0.002	-0.001	-0.002
Maximum	0.002	0.001	0.002	0.002	0.002	0.001	0.002	0.001

Overall	90°Lag	30°Lag
Average	0.001	0.000
Minimum	-0.001	-0.003
Maximum	0.002	0.002

# Calibration Report

## RD-31-221 Dytronic Portable Standard

Function..... VAR      60 Hz      Phase C

Date..... 23-Jun-11

Serial Number..... 300660

The following data was collected by a Radian Research RS-703A Automated Calibration System. The RS-703A VAR calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards certified by the National Institute of Standards and Technology (NIST) with the use of an ultra low distortion synthesis and digital delay. Uncertainty is 0.005% for VAR-hour. Calibration temperature is 23 degrees Centigrade. Test time is 2 seconds and the stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as Percent Error. The RS-703A has at least a 4 times greater accuracy than the Instrument under test.

### Voltage & Phase Angle

Amps	120		240		480		600	
	90°Lag	30°Lag	90°Lag	30°Lag	90°Lag	30°Lag	90°Lag	30°Lag
0.2	-0.002	-0.005	-0.002	-0.005	-0.003	-0.009	-0.003	-0.008
0.25	-0.002	-0.005	-0.002	-0.005	-0.003	-0.008	-0.003	-0.008
0.3	-0.002	-0.004	-0.002	-0.005	-0.002	-0.007	-0.002	-0.007
0.5	-0.002	-0.004	-0.002	-0.004	-0.002	-0.007	-0.002	-0.007
1.0	-0.001	-0.004	-0.001	-0.004	-0.002	-0.007	-0.002	-0.007
2.0	-0.001	-0.003	-0.001	-0.003	-0.001	-0.005	-0.001	-0.005
2.5	-0.001	-0.003	-0.001	-0.003	-0.002	-0.005	-0.001	-0.005
3.0	-0.002	-0.003	-0.002	-0.004	-0.002	-0.006	-0.002	-0.006
4.0	-0.001	-0.003	-0.001	-0.003	-0.002	-0.006	-0.002	-0.005
5.0	-0.001	-0.003	-0.001	-0.003	-0.002	-0.006	-0.002	-0.005
7.0	-0.001	-0.003	-0.001	-0.004	-0.002	-0.006	-0.002	-0.006
10.0	-0.002	-0.004	-0.002	-0.004	-0.002	-0.006	-0.002	-0.006
15.0	-0.001	-0.003	-0.001	-0.003	-0.001	-0.005	-0.001	-0.005
20.0	-0.001	-0.003	-0.001	-0.003	-0.002	-0.005	-0.001	-0.005
25.0	-0.002	-0.004	-0.002	-0.004	-0.003	-0.007	-0.002	-0.007
30.0	-0.002	-0.003	-0.002	-0.004	-0.002	-0.006	-0.002	-0.006
35.0	-0.002	-0.004	-0.002	-0.004	-0.003	-0.007	-0.002	-0.007
40.0	-0.002	-0.003	-0.002	-0.004	-0.003	-0.006	-0.002	-0.006
45.0	-0.002	-0.003	-0.002	-0.004	-0.002	-0.006	-0.002	-0.006
50.0	-0.002	-0.004	-0.002	-0.004	-0.003	-0.006	-0.003	-0.007
60.0	-0.002	-0.004	-0.002	-0.004	-0.003	-0.006	-0.002	-0.007
80.0	-0.002	-0.003	-0.002	-0.004	-0.003	-0.006	-0.002	-0.006
100.0	-0.001	-0.004	-0.002	-0.005	-0.002	-0.007	-0.002	-0.007
120.0	-0.001	-0.004	-0.002	-0.006	-0.002	-0.008	-0.002	-0.008
<b>Average</b>	<b>-0.002</b>	<b>-0.004</b>	<b>-0.002</b>	<b>-0.004</b>	<b>-0.002</b>	<b>-0.006</b>	<b>-0.002</b>	<b>-0.006</b>
<b>Minimum</b>	-0.002	-0.005	-0.002	-0.006	-0.003	-0.009	-0.003	-0.008
<b>Maximum</b>	-0.001	-0.003	-0.001	-0.003	-0.001	-0.005	-0.001	-0.005

<u>Overall</u>	90°Lag	30°Lag
<b>Average</b>	-0.002	-0.005
<b>Minimum</b>	-0.003	-0.009
<b>Maximum</b>	-0.001	-0.003



# Calibration Report

## RD-31-221 Dytronic Portable Standard

Function..... VAR      60 Hz      Total  
 Date..... 23-Jun-11  
 Serial Number..... 300660

The following data was collected by a Radian Research RS-703A Automated Calibration System. The RS-703A VAR calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards certified by the National Institute of Standards and Technology (NIST) with the use of an ultra low distortion synthesis and digital delay. Uncertainty is 0.005% for VAR-hour. Calibration temperature is 23 degrees Centigrade. Test time is 2 seconds and the stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as Percent Error. The RS-703A has at least a 4 times greater accuracy than the Instrument under test.

### Voltage & Phase Angle

Amps	120		240		480		600	
	90°Lag	30°Lag	90°Lag	30°Lag	90°Lag	30°Lag	90°Lag	30°Lag
0.2	-0.001	-0.004	-0.002	-0.004	-0.002	-0.006	-0.002	-0.005
0.25	-0.002	-0.004	-0.002	-0.004	-0.002	-0.006	-0.002	-0.006
0.3	-0.001	-0.003	-0.001	-0.003	-0.002	-0.005	-0.002	-0.005
0.5	-0.001	-0.002	-0.001	-0.002	-0.001	-0.004	-0.001	-0.004
1.0	-0.001	-0.003	-0.001	-0.003	-0.001	-0.005	-0.001	-0.004
2.0	0.000	-0.001	0.000	-0.001	0.000	-0.003	0.000	-0.003
2.5	0.000	-0.001	0.000	-0.001	-0.001	-0.003	0.000	-0.003
3.0	-0.001	-0.002	-0.001	-0.002	-0.001	-0.003	-0.001	-0.003
4.0	0.000	-0.002	0.000	-0.002	-0.001	-0.003	0.000	-0.003
5.0	0.000	-0.002	0.000	-0.002	-0.001	-0.003	0.000	-0.003
7.0	-0.001	-0.002	-0.001	-0.002	-0.001	-0.004	-0.001	-0.004
10.0	-0.001	-0.002	-0.001	-0.002	-0.001	-0.004	-0.001	-0.004
15.0	0.000	-0.002	0.000	-0.002	0.000	-0.003	0.000	-0.003
20.0	0.000	-0.002	0.000	-0.002	-0.001	-0.003	0.000	-0.003
25.0	0.000	-0.002	-0.001	-0.002	-0.001	-0.003	-0.001	-0.003
30.0	0.000	-0.002	0.000	-0.002	-0.001	-0.003	0.000	-0.003
35.0	-0.001	-0.002	0.000	-0.002	-0.001	-0.004	-0.001	-0.004
40.0	0.000	-0.002	0.000	-0.002	-0.001	-0.003	-0.001	-0.003
45.0	0.000	-0.001	0.000	-0.001	-0.001	-0.003	0.000	-0.003
50.0	0.000	-0.002	0.000	-0.002	-0.001	-0.003	-0.001	-0.004
60.0	0.000	-0.002	0.000	-0.002	-0.001	-0.004	-0.001	-0.004
80.0	0.000	-0.002	0.000	-0.002	-0.001	-0.004	-0.001	-0.004
100.0	0.000	-0.002	0.000	-0.003	-0.001	-0.004	-0.001	-0.005
120.0	0.000	-0.002	0.000	-0.003	0.000	-0.005	0.000	-0.005
<b>Average</b>	<b>0.000</b>	<b>-0.002</b>	<b>0.000</b>	<b>-0.002</b>	<b>-0.001</b>	<b>-0.004</b>	<b>-0.001</b>	<b>-0.004</b>
<b>Minimum</b>	-0.002	-0.004	-0.002	-0.004	-0.002	-0.006	-0.002	-0.006
<b>Maximum</b>	0.000	-0.001	0.000	-0.001	0.000	-0.003	0.000	-0.003

<u>Overall</u>	90°Lag	30°Lag
<b>Average</b>	-0.001	-0.003
<b>Minimum</b>	-0.002	-0.006
<b>Maximum</b>	0.000	-0.001

# Calibration Report

## RD-31-221 Dytronic Portable Standard

Function.....VA-hour RMS 60 Hz Phase A

Date..... 23-Jun-11

Serial Number..... 300660

The following data was collected by a Radian Research RS-703A Automated Calibration System. The RS-703A VA-hour calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards certified by the National Institute of Standards and Technology (NIST) to an uncertainty of 0.002% @ unity and 0.003% @ 60 degrees lagging Power Factor. Calibration temperature is 23 degrees Centigrade. The test time is 2 seconds and the stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as Percent Error. The RS-703A has at least a 4 times greater accuracy than the Instrument under test.

### Voltage & Phase Angle

Amps	120		240		480		600	
	Unity	60°Lag	Unity	60°Lag	Unity	60°Lag	Unity	60°Lag
0.2	-0.001	-0.001	-0.002	-0.002	-0.002	-0.003	-0.002	-0.002
0.25	-0.001	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
0.3	-0.001	-0.001	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
0.5	-0.001	-0.001	-0.001	-0.001	-0.002	-0.001	-0.001	-0.001
1.0	-0.001	-0.001	-0.001	-0.002	-0.002	-0.002	-0.001	-0.001
2.0	0.000	0.000	-0.001	0.000	-0.001	-0.001	0.000	0.000
2.5	0.000	0.000	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
3.0	-0.001	0.000	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
4.0	0.000	0.000	-0.001	-0.001	-0.001	-0.001	0.000	0.000
5.0	0.000	0.000	-0.001	-0.001	-0.001	-0.001	-0.001	0.000
7.0	-0.001	-0.001	-0.001	-0.001	-0.002	-0.001	-0.001	-0.001
10.0	-0.001	-0.001	-0.002	-0.001	-0.002	-0.002	-0.001	-0.001
15.0	0.000	0.000	-0.001	-0.001	-0.001	-0.001	-0.001	0.000
20.0	0.000	0.000	-0.001	-0.001	-0.001	-0.001	-0.001	0.000
25.0	-0.001	-0.001	-0.002	-0.001	-0.002	-0.002	-0.002	-0.001
30.0	-0.001	0.000	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
35.0	-0.001	-0.001	-0.001	-0.001	-0.002	-0.001	-0.001	-0.001
40.0	-0.001	0.000	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
45.0	-0.001	0.000	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
50.0	-0.001	-0.001	-0.002	-0.001	-0.002	-0.002	-0.002	-0.001
60.0	-0.001	-0.001	-0.002	-0.001	-0.002	-0.001	-0.001	-0.001
80.0	-0.001	-0.001	-0.002	-0.001	-0.002	-0.002	-0.002	-0.001
100.0	-0.001	-0.001	-0.002	0.000	-0.002	-0.001	-0.002	-0.001
120.0	-0.001	0.000	-0.002	0.000	-0.002	-0.001	-0.001	-0.001
<b>Average</b>	<b>-0.001</b>	<b>-0.001</b>	<b>-0.001</b>	<b>-0.001</b>	<b>-0.002</b>	<b>-0.001</b>	<b>-0.001</b>	<b>-0.001</b>
<b>Minimum</b>	-0.001	-0.002	-0.002	-0.002	-0.002	-0.003	-0.002	-0.002
<b>Maximum</b>	0.000	0.000	-0.001	0.000	-0.001	-0.001	0.000	0.000

<u>Overall</u>	Unity	60°Lag
<b>Average</b>	-0.001	-0.001
<b>Minimum</b>	-0.002	-0.003
<b>Maximum</b>	0.000	0.000

# Calibration Report

## RD-31-221 Dytronic Portable Standard

Function.....VA-hour RMS 60 Hz Phase B

Date..... 23-Jun-11

Serial Number..... 300660

The following data was collected by a Radian Research RS-703A Automated Calibration System. The RS-703A VA-hour calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards certified by the National Institute of Standards and Technology (NIST) to an uncertainty of 0.002% @ unity and 0.003% @ 60 degrees lagging Power Factor. Calibration temperature is 23 degrees Centigrade. The test time is 2 seconds and the stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as Percent Error. The RS-703A has at least a 4 times greater accuracy than the Instrument under test.

### Voltage & Phase Angle

Amps	120		240		480		600	
	Unity	60°Lag	Unity	60°Lag	Unity	60°Lag	Unity	60°Lag
0.2	-0.001	-0.001	-0.001	-0.001	-0.002	-0.001	-0.001	-0.001
0.25	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
0.3	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
0.5	-0.001	-0.001	0.000	0.000	-0.001	0.000	0.000	0.000
1.0	-0.001	-0.001	0.000	0.000	-0.001	-0.001	0.000	0.000
2.0	0.000	0.000	0.001	0.001	0.000	0.000	0.001	0.001
2.5	0.000	0.000	0.001	0.001	0.000	0.000	0.001	0.001
3.0	-0.001	-0.001	0.000	0.000	-0.001	-0.001	0.000	0.000
4.0	0.000	0.000	0.001	0.001	0.000	0.000	0.001	0.001
5.0	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.001
7.0	-0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10.0	-0.001	0.000	0.000	0.000	-0.001	0.000	0.000	0.000
15.0	0.000	0.000	0.000	0.001	0.000	0.000	0.001	0.001
20.0	0.000	0.000	0.000	0.001	0.000	0.000	0.001	0.001
25.0	0.000	0.000	0.001	0.001	0.000	0.000	0.001	0.001
30.0	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.002
35.0	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.002
40.0	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
45.0	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.002
50.0	-0.001	0.000	0.000	0.001	0.000	0.001	0.001	0.001
60.0	-0.001	0.000	0.000	0.001	0.000	0.001	0.001	0.001
80.0	-0.001	0.000	0.000	0.001	0.000	0.001	0.001	0.001
100.0	-0.001	0.000	0.000	0.001	0.000	0.001	0.001	0.002
120.0	-0.002	0.000	0.000	0.001	0.000	0.001	0.001	0.002
<b>Average</b>	<b>-0.001</b>	<b>0.000</b>	<b>0.000</b>	<b>0.001</b>	<b>0.000</b>	<b>0.000</b>	<b>0.001</b>	<b>0.001</b>
<b>Minimum</b>	-0.002	-0.001	-0.001	-0.001	-0.002	-0.001	-0.001	-0.001
<b>Maximum</b>	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.002

<u>Overall</u>	Unity	60°Lag
<b>Average</b>	0.000	0.000
<b>Minimum</b>	-0.002	-0.001
<b>Maximum</b>	0.001	0.002

# Calibration Report

## RD-31-221 Dytronic Portable Standard

Function.....VA-hour RMS 60 Hz Phase C

Date..... 23-Jun-11

Serial Number..... 300660

The following data was collected by a Radian Research RS-703A Automated Calibration System. The RS-703A VA-hour calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards certified by the National Institute of Standards and Technology (NIST) to an uncertainty of 0.002% @ unity and 0.003% @ 60 degrees lagging Power Factor. Calibration temperature is 23 degrees Centigrade. The test time is 2 seconds and the stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as Percent Error. The RS-703A has at least a 4 times greater accuracy than the Instrument under test.

### Voltage & Phase Angle

Amps	120		240		480		600	
	Unity	60°Lag	Unity	60°Lag	Unity	60°Lag	Unity	60°Lag
0.2	-0.001	-0.001	-0.001	-0.002	-0.002	-0.003	-0.002	-0.003
0.25	-0.001	-0.001	-0.001	-0.002	-0.002	-0.003	-0.002	-0.003
0.3	-0.001	-0.001	-0.001	-0.001	-0.002	-0.002	-0.001	-0.002
0.5	-0.001	-0.001	-0.001	-0.001	-0.002	-0.002	-0.002	-0.002
1.0	-0.001	-0.001	-0.001	-0.001	-0.002	-0.002	-0.002	-0.002
2.0	0.000	0.000	0.000	-0.001	-0.001	-0.001	-0.001	-0.001
2.5	-0.001	-0.001	-0.001	-0.001	-0.001	-0.002	-0.001	-0.001
3.0	-0.001	-0.001	-0.001	-0.001	-0.002	-0.002	-0.002	-0.002
4.0	-0.001	-0.001	-0.001	-0.001	-0.002	-0.002	-0.001	-0.001
5.0	-0.001	-0.001	-0.001	-0.001	-0.002	-0.002	-0.001	-0.002
7.0	-0.001	-0.001	-0.001	-0.001	-0.002	-0.002	-0.002	-0.002
10.0	-0.001	-0.001	-0.001	-0.001	-0.002	-0.002	-0.002	-0.002
15.0	-0.001	0.000	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
20.0	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
25.0	-0.002	-0.002	-0.002	-0.002	-0.003	-0.003	-0.003	-0.003
30.0	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
35.0	-0.002	-0.002	-0.002	-0.002	-0.003	-0.002	-0.002	-0.002
40.0	-0.002	-0.002	-0.002	-0.002	-0.003	-0.002	-0.002	-0.002
45.0	-0.002	-0.001	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
50.0	-0.002	-0.002	-0.002	-0.002	-0.003	-0.003	-0.002	-0.002
60.0	-0.002	-0.002	-0.002	-0.002	-0.003	-0.003	-0.002	-0.002
80.0	-0.002	-0.002	-0.002	-0.002	-0.003	-0.003	-0.003	-0.002
100.0	-0.002	-0.001	-0.002	-0.002	-0.003	-0.002	-0.003	-0.002
120.0	-0.002	-0.001	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
<b>Average</b>	<b>-0.001</b>	<b>-0.001</b>	<b>-0.001</b>	<b>-0.002</b>	<b>-0.002</b>	<b>-0.002</b>	<b>-0.002</b>	<b>-0.002</b>
<b>Minimum</b>	-0.002	-0.002	-0.002	-0.002	-0.003	-0.003	-0.003	-0.003
<b>Maximum</b>	0.000	0.000	0.000	-0.001	-0.001	-0.001	-0.001	-0.001

<u>Overall</u>	Unity	60°Lag
<b>Average</b>	-0.002	-0.002
<b>Minimum</b>	-0.003	-0.003
<b>Maximum</b>	0.000	0.000

# Calibration Report

## RD-31-221 Dytronic Portable Standard

Function.....VA-hour RMS 60 Hz Total

Date..... 23-Jun-11

Serial Number..... 300660

The following data was collected by a Radian Research RS-703A Automated Calibration System. The RS-703A VA-hour calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards certified by the National Institute of Standards and Technology (NIST) to an uncertainty of 0.002% @ unity and 0.003% @ 60 degrees lagging Power Factor. Calibration temperature is 23 degrees Centigrade. The test time is 2 seconds and the stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as Percent Error. The RS-703A has at least a 4 times greater accuracy than the Instrument under test.

### Voltage & Phase Angle

Amps	120		240		480		600	
	Unity	60°Lag	Unity	60°Lag	Unity	60°Lag	Unity	60°Lag
0.2	-0.001	-0.001	-0.001	-0.002	-0.002	-0.002	-0.001	-0.002
0.25	-0.001	-0.001	-0.001	-0.002	-0.002	-0.002	-0.001	-0.002
0.3	-0.001	-0.001	-0.001	-0.001	-0.002	-0.002	-0.001	-0.002
0.5	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
1.0	-0.001	-0.001	-0.001	-0.001	-0.002	-0.002	-0.001	-0.001
2.0	0.000	0.000	0.000	0.000	-0.001	-0.001	0.000	0.000
2.5	0.000	0.000	0.000	0.000	-0.001	-0.001	0.000	0.000
3.0	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
4.0	0.000	0.000	0.000	0.000	-0.001	-0.001	0.000	0.000
5.0	0.000	0.000	0.000	0.000	-0.001	-0.001	-0.001	-0.001
7.0	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
10.0	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
15.0	0.000	0.000	0.000	0.000	-0.001	-0.001	0.000	0.000
20.0	0.000	0.000	0.000	0.000	-0.001	-0.001	0.000	0.000
25.0	-0.001	-0.001	-0.001	-0.001	-0.002	-0.001	-0.001	-0.001
30.0	-0.001	0.000	0.000	0.000	-0.001	-0.001	-0.001	0.000
35.0	-0.001	-0.001	-0.001	0.000	-0.001	-0.001	-0.001	-0.001
40.0	-0.001	0.000	-0.001	0.000	-0.001	-0.001	-0.001	-0.001
45.0	-0.001	0.000	-0.001	0.000	-0.001	-0.001	-0.001	0.000
50.0	-0.001	-0.001	-0.001	-0.001	-0.002	-0.001	-0.001	-0.001
60.0	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
80.0	-0.002	-0.001	-0.002	-0.001	-0.002	-0.001	-0.001	-0.001
100.0	-0.002	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
120.0	-0.002	0.000	-0.001	0.000	-0.001	-0.001	-0.001	0.000
<b>Average</b>	<b>-0.001</b>	<b>-0.001</b>	<b>-0.001</b>	<b>-0.001</b>	<b>-0.001</b>	<b>-0.001</b>	<b>-0.001</b>	<b>-0.001</b>
<b>Minimum</b>	-0.002	-0.001	-0.002	-0.002	-0.002	-0.002	-0.001	-0.002
<b>Maximum</b>	0.000	0.000	0.000	0.000	-0.001	-0.001	0.000	0.000

<u>Overall</u>	Unity	60°Lag
<b>Average</b>	-0.001	-0.001
<b>Minimum</b>	-0.002	-0.002
<b>Maximum</b>	0.000	0.000

# Calibration Report

## RD-31-221 Dytronic Portable Standard

Function..... VA RMS 60 Hz Phase A

Date..... 23-Jun-11

Serial Number..... 300660

The following data was collected by a Radian Research RS-703A Automated Calibration System. The RS-703A VA calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards certified by the National Institute of Standards and Technology (NIST) to an uncertainty of 0.002% @ unity and 0.003% @ 60 degrees lagging Power Factor. Calibration temperature is 23 degrees Centigrade. The test time is 2 seconds and the stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as Percent Error. The RS-703A has at least a 4 times greater accuracy than the Instrument under test.

### Voltage & Phase Angle

Amps	120		240		480		600	
	Unity	60°Lag	Unity	60°Lag	Unity	60°Lag	Unity	60°Lag
0.2	-0.001	-0.001	-0.002	-0.002	-0.002	-0.003	-0.002	-0.002
0.25	-0.001	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
0.3	-0.001	-0.001	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
0.5	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
1.0	-0.001	-0.001	-0.001	-0.001	-0.002	-0.002	-0.001	-0.001
2.0	0.000	0.000	0.000	0.000	-0.001	-0.001	0.000	0.000
2.5	0.000	0.000	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
3.0	-0.001	0.000	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
4.0	0.000	0.000	0.000	0.000	-0.001	-0.001	0.000	0.000
5.0	0.000	0.000	-0.001	-0.001	-0.001	-0.001	0.000	0.000
7.0	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
10.0	-0.001	-0.001	-0.001	-0.001	-0.002	-0.002	-0.001	-0.001
15.0	0.000	0.000	-0.001	0.000	-0.001	-0.001	-0.001	0.000
20.0	0.000	0.000	-0.001	-0.001	-0.001	-0.001	-0.001	0.000
25.0	-0.001	-0.001	-0.001	-0.001	-0.002	-0.002	-0.001	-0.001
30.0	0.000	0.000	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
35.0	-0.001	-0.001	-0.001	-0.001	-0.002	-0.001	-0.001	-0.001
40.0	-0.001	0.000	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
45.0	-0.001	0.000	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
50.0	-0.001	-0.001	-0.002	-0.001	-0.002	-0.001	-0.001	-0.001
60.0	-0.001	-0.001	-0.002	-0.001	-0.002	-0.001	-0.001	-0.001
80.0	-0.001	-0.001	-0.002	-0.001	-0.002	-0.002	-0.002	-0.001
100.0	-0.001	-0.001	-0.002	0.000	-0.002	-0.001	-0.002	-0.001
120.0	-0.001	0.000	-0.001	0.000	-0.002	-0.001	-0.001	-0.001
<b>Average</b>	<b>-0.001</b>	<b>-0.001</b>	<b>-0.001</b>	<b>-0.001</b>	<b>-0.002</b>	<b>-0.001</b>	<b>-0.001</b>	<b>-0.001</b>
<b>Minimum</b>	-0.001	-0.002	-0.002	-0.002	-0.002	-0.003	-0.002	-0.002
<b>Maximum</b>	0.000	0.000	0.000	0.000	-0.001	-0.001	0.000	0.000

<u>Overall</u>	Unity	60°Lag
<b>Average</b>	-0.001	-0.001
<b>Minimum</b>	-0.002	-0.003
<b>Maximum</b>	0.000	0.000

# Calibration Report

## RD-31-221 Dytronic Portable Standard

Function..... VA RMS 60 Hz Phase B

Date..... 23-Jun-11

Serial Number..... 300660

The following data was collected by a Radian Research RS-703A Automated Calibration System. The RS-703A VA calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards certified by the National Institute of Standards and Technology (NIST) to an uncertainty of 0.002% @ unity and 0.003% @ 60 degrees lagging Power Factor. Calibration temperature is 23 degrees Centigrade. The test time is 2 seconds and the stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as Percent Error. The RS-703A has at least a 4 times greater accuracy than the Instrument under test.

### Voltage & Phase Angle

Amps	120		240		480		600	
	Unity	60°Lag	Unity	60°Lag	Unity	60°Lag	Unity	60°Lag
0.2	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
0.25	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
0.3	-0.001	-0.001	0.000	-0.001	-0.001	-0.001	-0.001	-0.001
0.5	0.000	0.000	0.000	0.000	-0.001	0.000	0.000	0.000
1.0	0.000	-0.001	0.000	0.000	-0.001	-0.001	0.000	0.000
2.0	0.000	0.000	0.001	0.001	0.000	0.000	0.001	0.001
2.5	0.000	0.000	0.001	0.001	0.000	0.000	0.001	0.001
3.0	-0.001	0.000	0.000	0.000	-0.001	0.000	0.000	0.000
4.0	0.000	0.000	0.001	0.001	0.000	0.000	0.001	0.001
5.0	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.001
7.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10.0	-0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
15.0	0.000	0.000	0.000	0.001	0.000	0.000	0.001	0.001
20.0	0.000	0.000	0.000	0.001	0.000	0.000	0.001	0.001
25.0	0.000	0.000	0.001	0.001	0.000	0.000	0.001	0.001
30.0	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.002
35.0	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.002
40.0	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.002
45.0	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.002
50.0	0.000	0.000	0.001	0.001	0.000	0.001	0.001	0.002
60.0	-0.001	0.000	0.000	0.001	0.000	0.001	0.001	0.001
80.0	-0.001	0.000	0.000	0.001	0.000	0.001	0.001	0.001
100.0	-0.001	0.000	0.000	0.001	0.000	0.001	0.001	0.002
120.0	-0.001	0.000	0.000	0.001	0.000	0.001	0.001	0.002
<b>Average</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.001</b>	<b>0.000</b>	<b>0.000</b>	<b>0.001</b>	<b>0.001</b>
<b>Minimum</b>	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
<b>Maximum</b>	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.002

<u>Overall</u>	Unity	60°Lag
<b>Average</b>	0.000	0.000
<b>Minimum</b>	-0.001	-0.001
<b>Maximum</b>	0.001	0.002

# Calibration Report

## RD-31-221 Dytronic Portable Standard

Function..... VA RMS 60 Hz Phase C

Date..... 23-Jun-11

Serial Number..... 300660

The following data was collected by a Radian Research RS-703A Automated Calibration System. The RS-703A VA calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards certified by the National Institute of Standards and Technology (NIST) to an uncertainty of 0.002% @ unity and 0.003% @ 60 degrees lagging Power Factor. Calibration temperature is 23 degrees Centigrade. The test time is 2 seconds and the stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as Percent Error. The RS-703A has at least a 4 times greater accuracy than the Instrument under test.

### Voltage & Phase Angle

Amps	120		240		480		600	
	Unity	60°Lag	Unity	60°Lag	Unity	60°Lag	Unity	60°Lag
0.2	-0.001	-0.001	-0.001	-0.002	-0.002	-0.003	-0.001	-0.003
0.25	-0.001	-0.001	-0.001	-0.002	-0.002	-0.002	-0.001	-0.002
0.3	-0.001	-0.001	-0.001	-0.001	-0.001	-0.002	-0.001	-0.002
0.5	-0.001	-0.001	-0.001	-0.001	-0.002	-0.002	-0.001	-0.002
1.0	-0.001	-0.001	-0.001	-0.001	-0.002	-0.002	-0.001	-0.002
2.0	0.000	0.000	0.000	-0.001	-0.001	-0.001	-0.001	-0.001
2.5	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
3.0	-0.001	-0.001	-0.001	-0.001	-0.002	-0.002	-0.002	-0.002
4.0	-0.001	-0.001	-0.001	-0.001	-0.001	-0.002	-0.001	-0.001
5.0	-0.001	-0.001	-0.001	-0.001	-0.002	-0.002	-0.001	-0.001
7.0	-0.001	-0.001	-0.001	-0.001	-0.002	-0.002	-0.002	-0.002
10.0	-0.001	-0.001	-0.001	-0.001	-0.002	-0.002	-0.002	-0.002
15.0	0.000	0.000	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
20.0	-0.001	0.000	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
25.0	-0.002	-0.002	-0.002	-0.002	-0.003	-0.003	-0.002	-0.002
30.0	-0.002	-0.001	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
35.0	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
40.0	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
45.0	-0.002	-0.001	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
50.0	-0.002	-0.002	-0.002	-0.002	-0.003	-0.003	-0.002	-0.002
60.0	-0.002	-0.002	-0.002	-0.002	-0.003	-0.003	-0.002	-0.002
80.0	-0.002	-0.002	-0.002	-0.002	-0.003	-0.003	-0.002	-0.002
100.0	-0.002	-0.001	-0.002	-0.002	-0.003	-0.002	-0.002	-0.002
120.0	-0.002	-0.001	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
<b>Average</b>	<b>-0.001</b>	<b>-0.001</b>	<b>-0.001</b>	<b>-0.002</b>	<b>-0.002</b>	<b>-0.002</b>	<b>-0.002</b>	<b>-0.002</b>
<b>Minimum</b>	-0.002	-0.002	-0.002	-0.002	-0.003	-0.003	-0.002	-0.003
<b>Maximum</b>	0.000	0.000	0.000	-0.001	-0.001	-0.001	-0.001	-0.001

<u>Overall</u>	Unity	60°Lag
<b>Average</b>	-0.002	-0.002
<b>Minimum</b>	-0.003	-0.003
<b>Maximum</b>	0.000	0.000



# Calibration Report

## RD-31-221 Dytronic Portable Standard

**Function..... VA RMS 60 Hz Total**  
**Date..... 23-Jun-11**  
**Serial Number..... 300660**

The following data was collected by a Radian Research RS-703A Automated Calibration System. The RS-703A VA calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards certified by the National Institute of Standards and Technology (NIST) to an uncertainty of 0.002% @ unity and 0.003% @ 60 degrees lagging Power Factor. Calibration temperature is 23 degrees Centigrade. The test time is 2 seconds and the stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as Percent Error. The RS-703A has at least a 4 times greater accuracy than the Instrument under test.

### Voltage & Phase Angle

Amps	120		240		480		600	
	Unity	60°Lag	Unity	60°Lag	Unity	60°Lag	Unity	60°Lag
<b>0.2</b>	-0.001	-0.001	-0.001	-0.002	-0.002	-0.002	-0.001	-0.002
<b>0.25</b>	-0.001	-0.001	-0.001	-0.002	-0.002	-0.002	-0.001	-0.002
<b>0.3</b>	-0.001	-0.001	-0.001	-0.001	-0.001	-0.002	-0.001	-0.002
<b>0.5</b>	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
<b>1.0</b>	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
<b>2.0</b>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
<b>2.5</b>	0.000	0.000	0.000	0.000	-0.001	-0.001	0.000	0.000
<b>3.0</b>	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
<b>4.0</b>	0.000	0.000	0.000	0.000	-0.001	-0.001	0.000	0.000
<b>5.0</b>	0.000	0.000	0.000	0.000	-0.001	-0.001	0.000	0.000
<b>7.0</b>	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
<b>10.0</b>	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
<b>15.0</b>	0.000	0.000	0.000	0.000	-0.001	-0.001	0.000	0.000
<b>20.0</b>	0.000	0.000	0.000	0.000	-0.001	-0.001	0.000	0.000
<b>25.0</b>	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
<b>30.0</b>	-0.001	0.000	0.000	0.000	-0.001	-0.001	-0.001	0.000
<b>35.0</b>	-0.001	-0.001	-0.001	0.000	-0.001	-0.001	-0.001	-0.001
<b>40.0</b>	-0.001	0.000	-0.001	0.000	-0.001	-0.001	-0.001	-0.001
<b>45.0</b>	-0.001	0.000	-0.001	0.000	-0.001	-0.001	-0.001	0.000
<b>50.0</b>	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
<b>60.0</b>	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
<b>80.0</b>	-0.002	-0.001	-0.001	-0.001	-0.002	-0.001	-0.001	-0.001
<b>100.0</b>	-0.002	0.000	-0.001	0.000	-0.001	-0.001	-0.001	0.000
<b>120.0</b>	-0.002	0.000	-0.001	0.000	-0.001	-0.001	-0.001	0.000
<b>Average</b>	<b>-0.001</b>	<b>-0.001</b>	<b>-0.001</b>	<b>-0.001</b>	<b>-0.001</b>	<b>-0.001</b>	<b>-0.001</b>	<b>-0.001</b>
<b>Minimum</b>	-0.002	-0.001	-0.001	-0.002	-0.002	-0.002	-0.001	-0.002
<b>Maximum</b>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

<u>Overall</u>	Unity	60°Lag
<b>Average</b>	-0.001	-0.001
<b>Minimum</b>	-0.002	-0.002
<b>Maximum</b>	0.000	0.000

# Calibration Report

## RD-31-221 Dytronic Portable Standard

Function..... Q-hour    60 Hz    Phase A

Date..... 23-Jun-11

Serial Number..... 300660

The following data was collected by a Radian Research RS-703A Automated Calibration System. The RS-703A Q-hour calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards certified by the National Institute of Standards and Technology (NIST) with the use of an ultra low distortion synthesis and digital delay. Uncertainty is 0.005% for Q-hour. Calibration temperature is 23 degrees Centigrade. Test time is 2 seconds and the stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as Percent Error. The RS-703A has at least a 4 times greater accuracy than the Instrument under test.

### Voltage & Phase Angle

Amps	120 60°Lag	120 Unity	240 60°Lag	240 Unity	480 60°Lag	480 Unity	600 60°Lag	600 Unity
<b>0.2</b>	-0.004	-0.001	-0.006	-0.002	-0.007	-0.003	-0.007	-0.002
<b>0.25</b>	-0.004	-0.002	-0.006	-0.002	-0.007	-0.002	-0.007	-0.002
<b>0.3</b>	-0.004	-0.001	-0.006	-0.002	-0.007	-0.002	-0.007	-0.002
<b>0.5</b>	-0.003	-0.001	-0.004	-0.001	-0.005	-0.001	-0.005	-0.001
<b>1.0</b>	-0.003	-0.001	-0.005	-0.002	-0.006	-0.002	-0.006	-0.001
<b>2.0</b>	-0.002	0.000	-0.003	0.000	-0.004	-0.001	-0.004	0.000
<b>2.5</b>	-0.002	0.000	-0.003	-0.001	-0.004	-0.001	-0.004	-0.001
<b>3.0</b>	-0.002	0.000	-0.003	-0.001	-0.004	-0.001	-0.004	-0.001
<b>4.0</b>	-0.002	0.000	-0.003	0.000	-0.005	-0.001	-0.004	0.000
<b>5.0</b>	-0.002	0.000	-0.004	-0.001	-0.005	-0.001	-0.005	0.000
<b>7.0</b>	-0.003	-0.001	-0.004	-0.001	-0.005	-0.001	-0.005	-0.001
<b>10.0</b>	-0.003	-0.001	-0.004	-0.001	-0.006	-0.002	-0.005	-0.001
<b>15.0</b>	-0.002	0.000	-0.004	0.000	-0.005	-0.001	-0.005	0.000
<b>20.0</b>	-0.002	0.000	-0.004	0.000	-0.005	-0.001	-0.005	0.000
<b>25.0</b>	-0.003	-0.001	-0.004	-0.001	-0.006	-0.002	-0.006	-0.001
<b>30.0</b>	-0.002	0.000	-0.003	-0.001	-0.005	-0.001	-0.005	-0.001
<b>35.0</b>	-0.003	-0.001	-0.004	-0.001	-0.005	-0.001	-0.005	-0.001
<b>40.0</b>	-0.002	0.000	-0.003	-0.001	-0.005	-0.001	-0.005	-0.001
<b>45.0</b>	-0.002	0.000	-0.003	0.000	-0.005	-0.001	-0.005	-0.001
<b>50.0</b>	-0.003	-0.001	-0.004	-0.001	-0.006	-0.001	-0.006	-0.001
<b>60.0</b>	-0.003	-0.001	-0.004	-0.001	-0.006	-0.001	-0.006	-0.001
<b>80.0</b>	-0.003	-0.001	-0.003	-0.001	-0.006	-0.002	-0.006	-0.001
<b>100.0</b>	-0.003	-0.001	-0.003	0.000	-0.006	-0.001	-0.006	-0.001
<b>120.0</b>	-0.003	0.000	-0.003	0.000	-0.006	-0.001	-0.006	-0.001
<b>Average</b>	<b>-0.003</b>	<b>-0.001</b>	<b>-0.004</b>	<b>-0.001</b>	<b>-0.005</b>	<b>-0.001</b>	<b>-0.005</b>	<b>-0.001</b>
<b>Minimum</b>	-0.004	-0.002	-0.006	-0.002	-0.007	-0.003	-0.007	-0.002
<b>Maximum</b>	-0.002	0.000	-0.003	0.000	-0.004	-0.001	-0.004	0.000

	60°Lag	Unity
<b>Average</b>	-0.004	-0.001
<b>Minimum</b>	-0.007	-0.003
<b>Maximum</b>	-0.002	0.000

# Calibration Report

## RD-31-221 Dytronic Portable Standard

Function..... Q-hour    60 Hz    Phase B

Date..... 23-Jun-11

Serial Number..... 300660

The following data was collected by a Radian Research RS-703A Automated Calibration System. The RS-703A Q-hour calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards certified by the National Institute of Standards and Technology (NIST) with the use of an ultra low distortion synthesis and digital delay. Uncertainty is 0.005% for Q-hour. Calibration temperature is 23 degrees Centigrade. Test time is 2 seconds and the stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as Percent Error. The RS-703A has at least a 4 times greater accuracy than the Instrument under test.

### Voltage & Phase Angle

Amps	120		240		480		600	
	60°Lag	Unity	60°Lag	Unity	60°Lag	Unity	60°Lag	Unity
0.2	-0.002	-0.001	-0.001	-0.001	-0.002	-0.001	-0.002	-0.001
0.25	-0.002	-0.001	-0.002	-0.001	-0.002	-0.001	-0.002	-0.001
0.3	-0.002	-0.001	-0.001	-0.001	-0.002	-0.001	-0.002	-0.001
0.5	-0.001	0.000	0.000	0.000	-0.001	0.000	-0.001	0.000
1.0	-0.001	-0.001	0.000	0.000	-0.001	-0.001	-0.001	0.000
2.0	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.001
2.5	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.001
3.0	-0.001	-0.001	0.001	0.000	0.000	0.000	0.000	0.000
4.0	-0.001	0.000	0.001	0.001	0.000	0.000	0.000	0.001
5.0	-0.001	0.000	0.001	0.001	0.000	0.000	0.000	0.001
7.0	-0.001	0.000	0.000	0.000	-0.001	0.000	-0.001	0.000
10.0	-0.001	0.000	0.000	0.000	-0.001	0.000	-0.001	0.000
15.0	-0.001	0.000	0.000	0.001	-0.001	0.000	-0.001	0.001
20.0	-0.001	0.000	0.000	0.001	0.000	0.000	-0.001	0.001
25.0	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.001
30.0	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.002
35.0	0.000	0.001	0.001	0.001	0.000	0.001	0.000	0.002
40.0	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001
45.0	0.000	0.001	0.001	0.002	0.001	0.001	0.000	0.002
50.0	-0.001	0.000	0.001	0.001	0.000	0.001	0.000	0.001
60.0	-0.001	0.000	0.000	0.001	0.000	0.001	0.000	0.001
80.0	-0.001	0.000	0.000	0.001	0.000	0.001	0.000	0.001
100.0	-0.003	0.000	-0.002	0.001	-0.001	0.001	-0.002	0.002
120.0	-0.004	0.000	-0.003	0.001	-0.002	0.001	-0.002	0.002
<b>Average</b>	<b>-0.001</b>	<b>0.000</b>	<b>0.000</b>	<b>0.001</b>	<b>-0.001</b>	<b>0.000</b>	<b>-0.001</b>	<b>0.001</b>
<b>Minimum</b>	-0.004	-0.001	-0.003	-0.001	-0.002	-0.001	-0.002	-0.001
<b>Maximum</b>	0.000	0.001	0.001	0.002	0.001	0.001	0.001	0.002

	60°Lag	Unity
<b>Average</b>	-0.001	0.000
<b>Minimum</b>	-0.004	-0.001
<b>Maximum</b>	0.001	0.002

# Calibration Report

## RD-31-221 Dytronic Portable Standard

Function..... Q-hour    60 Hz    Phase C

Date..... 23-Jun-11

Serial Number..... 300660

The following data was collected by a Radian Research RS-703A Automated Calibration System. The RS-703A Q-hour calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards certified by the National Institute of Standards and Technology (NIST) with the use of an ultra low distortion synthesis and digital delay. Uncertainty is 0.005% for Q-hour. Calibration temperature is 23 degrees Centigrade. Test time is 2 seconds and the stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as Percent Error. The RS-703A has at least a 4 times greater accuracy than the Instrument under test.

### Voltage & Phase Angle

Amps	120		240		480		600	
	60°Lag	Unity	60°Lag	Unity	60°Lag	Unity	60°Lag	Unity
0.2	-0.004	-0.001	-0.005	-0.002	-0.008	-0.003	-0.009	-0.003
0.25	-0.004	-0.001	-0.005	-0.002	-0.008	-0.002	-0.008	-0.003
0.3	-0.004	-0.001	-0.005	-0.001	-0.007	-0.002	-0.008	-0.002
0.5	-0.004	-0.001	-0.005	-0.001	-0.007	-0.002	-0.007	-0.002
1.0	-0.004	-0.001	-0.005	-0.001	-0.007	-0.002	-0.007	-0.002
2.0	-0.003	0.000	-0.003	-0.001	-0.005	-0.001	-0.005	-0.001
2.5	-0.003	-0.001	-0.003	-0.001	-0.006	-0.001	-0.006	-0.001
3.0	-0.003	-0.001	-0.004	-0.001	-0.006	-0.002	-0.006	-0.002
4.0	-0.003	-0.001	-0.004	-0.001	-0.006	-0.002	-0.006	-0.001
5.0	-0.003	-0.001	-0.004	-0.001	-0.006	-0.002	-0.006	-0.002
7.0	-0.004	-0.001	-0.004	-0.001	-0.006	-0.002	-0.006	-0.002
10.0	-0.003	-0.001	-0.004	-0.001	-0.006	-0.002	-0.006	-0.002
15.0	-0.003	0.000	-0.003	-0.001	-0.006	-0.001	-0.006	-0.001
20.0	-0.003	0.000	-0.003	-0.001	-0.006	-0.001	-0.006	-0.001
25.0	-0.004	-0.002	-0.005	-0.002	-0.007	-0.003	-0.008	-0.003
30.0	-0.004	-0.001	-0.004	-0.002	-0.007	-0.002	-0.007	-0.002
35.0	-0.004	-0.002	-0.005	-0.002	-0.007	-0.002	-0.007	-0.002
40.0	-0.004	-0.001	-0.004	-0.002	-0.007	-0.002	-0.007	-0.002
45.0	-0.003	-0.001	-0.004	-0.002	-0.006	-0.002	-0.007	-0.002
50.0	-0.004	-0.002	-0.005	-0.002	-0.007	-0.003	-0.007	-0.002
60.0	-0.004	-0.002	-0.005	-0.002	-0.007	-0.002	-0.007	-0.002
80.0	-0.004	-0.001	-0.005	-0.002	-0.007	-0.002	-0.007	-0.002
100.0	-0.005	-0.001	-0.006	-0.002	-0.008	-0.002	-0.008	-0.002
120.0	-0.005	-0.001	-0.007	-0.002	-0.008	-0.002	-0.009	-0.002
<b>Average</b>	<b>-0.004</b>	<b>-0.001</b>	<b>-0.004</b>	<b>-0.002</b>	<b>-0.007</b>	<b>-0.002</b>	<b>-0.007</b>	<b>-0.002</b>
<b>Minimum</b>	-0.005	-0.002	-0.007	-0.002	-0.008	-0.003	-0.009	-0.003
<b>Maximum</b>	-0.003	0.000	-0.003	-0.001	-0.005	-0.001	-0.005	-0.001

	60°Lag	Unity
<b>Average</b>	-0.005	-0.002
<b>Minimum</b>	-0.009	-0.003
<b>Maximum</b>	-0.003	0.000

# Calibration Report

## RD-31-221 Dytronic Portable Standard

Function..... Volts RMS 60 Hz      Phase A

Date..... 23-Jun-11

Serial Number..... 300660

The following data was collected by a Radian Research RS-703A Automated Calibration System. The RS-703A Voltage Axis is calibrated to a bank of three RD-22-RTS Dytronic Transfer Standards certified by the National Institute of Standards and Technology (NIST) to an uncertainty of 0.0008%. Calibration temperature is 23 degrees Centigrade. Test time is 2 seconds per point with a 2 second stabilization time in between points. All readings are in Percent Error. The RS-703A has at least a 4 times greater accuracy than the Instrument under test.

Voltage	V RMS
60	-0.001
80	0.000
100	0.000
120	-0.001
140	-0.001
160	-0.001
180	-0.001
200	-0.001
220	-0.001
240	-0.001
260	-0.002
280	-0.002
300	-0.001
320	-0.002
340	-0.002
360	-0.002
380	-0.002
400	-0.001
420	-0.001
440	-0.001
460	-0.002
480	-0.002
500	-0.001
520	-0.002
540	-0.001
560	-0.001
580	-0.001
600	-0.001
Average	-0.001
Minimum	-0.002
Maximum	0.000

# Calibration Report

## RD-31-221 Dytronic Portable Standard

Function..... Volts RMS 60 Hz      Phase B

Date..... 23-Jun-11

Serial Number..... 300660

The following data was collected by a Radian Research RS-703A Automated Calibration System. The RS-703A Voltage Axis is calibrated to a bank of three RD-22-RTS Dytronic Transfer Standards certified by the National Institute of Standards and Technology (NIST) to an uncertainty of 0.0008%. Calibration temperature is 23 degrees Centigrade. Test time is 2 seconds per point with a 2 second stabilization time in between points. All readings are in Percent Error. The RS-703A has at least a 4 times greater accuracy than the Instrument under test.

Voltage	V RMS
60	-0.001
80	0.000
100	0.000
120	0.000
140	0.000
160	0.000
180	0.000
200	0.001
220	0.000
240	0.000
260	0.001
280	0.000
300	-0.001
320	-0.001
340	-0.001
360	-0.001
380	-0.001
400	0.000
420	0.000
440	0.000
460	0.000
480	0.000
500	0.000
520	0.000
540	0.000
560	0.000
580	0.000
600	0.000
Average	0.000
Minimum	-0.001
Maximum	0.001

# Calibration Report

## RD-31-221 Dytronic Portable Standard

Function..... Volts RMS 60 Hz      Phase C

Date..... 23-Jun-11

Serial Number..... 300660

The following data was collected by a Radian Research RS-703A Automated Calibration System. The RS-703A Voltage Axis is calibrated to a bank of three RD-22-RTS Dytronic Transfer Standards certified by the National Institute of Standards and Technology (NIST) to an uncertainty of 0.0008%. Calibration temperature is 23 degrees Centigrade. Test time is 2 seconds per point with a 2 second stabilization time in between points. All readings are in Percent Error. The RS-703A has at least a 4 times greater accuracy than the Instrument under test.

Voltage	V RMS
60	-0.001
80	-0.001
100	-0.001
120	-0.001
140	-0.001
160	-0.001
180	-0.001
200	-0.001
220	-0.001
240	-0.001
260	-0.001
280	-0.001
300	-0.001
320	-0.001
340	-0.001
360	-0.001
380	-0.001
400	-0.001
420	-0.001
440	-0.001
460	-0.001
480	-0.001
500	-0.001
520	-0.001
540	-0.001
560	-0.001
580	-0.001
600	-0.001
Average	-0.001
Minimum	-0.001
Maximum	-0.001

# Calibration Report

## RD-31-221 Dytronic Portable Standard

Function..... Amps RMS 60 Hz      Phase A

Date..... 23-Jun-11

Serial Number..... 300660

The following data was collected by a Radian Research RS-703A Automated Calibration System. The RS-703A Current Axis calibration is derived directly from the ratio of the (3) Radian RD-22-RTS Dytronic Transfer Standards which are certified by the National Institute of Standards and Technology (NIST) for an uncertainty of .0028%. Calibration Temperature is 23° Centigrade. Test time is 2 seconds per point with a 5 second stabilization time inbetween points. All readings are in Percent Error.

The RS703A has at least a 4 times greater accuracy than the Instrument under test.

Amps	A RMS
0.2	-0.001
0.25	-0.001
0.3	-0.001
0.5	0.000
1.0	0.000
2.0	0.001
2.5	0.000
3.0	0.000
4.0	0.001
5.0	0.000
7.0	0.000
10.0	0.000
15.0	0.000
20.0	0.000
25.0	0.000
30.0	0.000
35.0	0.000
40.0	0.000
45.0	0.000
50.0	0.000
60.0	0.000
80.0	-0.001
100.0	0.000
120.0	0.000
Average	0.000
Minimum	-0.001
Maximum	0.001



# Calibration Report

## RD-31-221 Dytronic Portable Standard

Function..... Amps RMS 60 Hz      Phase B

Date..... 23-Jun-11

Serial Number..... 300660

The following data was collected by a Radian Research RS-703A Automated Calibration System. The RS-703A Current Axis calibration is derived directly from the ratio of the (3) Radian RD-22-RTS Dytronic Transfer Standards which are certified by the National Institute of Standards and Technology (NIST) for an uncertainty of .0028%. Calibration Temperature is 23° Centigrade. Test time is 2 seconds per point with a 5 second stabilization time inbetween points. All readings are in Percent Error.

The RS703A has at least a 4 times greater accuracy than the Instrument under test.

Amps	A RMS
0.2	-0.001
0.25	-0.001
0.3	-0.001
0.5	0.000
1.0	0.000
2.0	0.000
2.5	0.000
3.0	-0.001
4.0	0.000
5.0	0.000
7.0	0.000
10.0	0.000
15.0	0.000
20.0	0.000
25.0	0.000
30.0	0.001
35.0	0.001
40.0	0.001
45.0	0.001
50.0	0.000
60.0	0.000
80.0	0.000
100.0	0.000
120.0	0.000
Average	0.000
Minimum	-0.001
Maximum	0.001

# Calibration Report

## RD-31-221 Dytronic Portable Standard

Function..... Amps RMS 60 Hz      Phase C

Date..... 23-Jun-11

Serial Number..... 300660

The following data was collected by a Radian Research RS-703A Automated Calibration System. The RS-703A Current Axis calibration is derived directly from the ratio of the (3) Radian RD-22-RTS Dytronic Transfer Standards which are certified by the National Institute of Standards and Technology (NIST) for an uncertainty of .0028%. Calibration Temperature is 23° Centigrade. Test time is 2 seconds per point with a 5 second stabilization time inbetween points. All readings are in Percent Error.

The RS703A has at least a 4 times greater accuracy than the Instrument under test.

Amps	A RMS
0.2	0.000
0.25	0.000
0.3	0.000
0.5	0.000
1.0	0.000
2.0	0.000
2.5	0.000
3.0	-0.001
4.0	0.000
5.0	0.000
7.0	0.000
10.0	0.000
15.0	0.000
20.0	0.000
25.0	-0.001
30.0	-0.001
35.0	-0.001
40.0	-0.001
45.0	-0.001
50.0	-0.001
60.0	-0.001
80.0	-0.001
100.0	-0.001
120.0	-0.001
Average	0.000
Minimum	-0.001
Maximum	0.000

# Calibration Report

## RD-31-221 Dytronic Portable Standard

Mode..... Frequency                      Phase A  
Date..... 23-Jun-11  
Serial Number..... 300660

The following data was collected by a Radian Research RS-703A Automated Calibration System. The RS-703A time base calibration (1/frequency) is derived directly from an Arbiter Systems Model 1083B GPS Satellite-Controlled Frequency Standard. Uncertainty of the GPS System is .00005 parts per million, traceable to United States Naval Observatory (USNO). Calibration temperature is 23 degrees Centigrade. Test time is 2 seconds with a stabilization of 2 seconds in between points. All Results are listed as Percent Error. The RS703A has at least a 4 times greater accuracy than the Instrument under test.

### Frequency

45	0.0003
46	0.0003
47	0.0003
48	0.0003
49	0.0003
50	0.0002
51	0.0003
52	0.0003
53	0.0003
54	0.0002
55	0.0003
56	0.0003
57	0.0003
58	0.0003
59	0.0003
60	0.0003
61	0.0003
62	0.0003
63	0.0003
64	0.0003
65	0.0003
Average	0.0003
Minimum	0.0002
Maximum	0.0003

# Calibration Report

## RD-31-221 Dytronic Portable Standard

Mode..... Frequency                      Phase B  
Date..... 23-Jun-11  
Serial Number..... 300660

The following data was collected by a Radian Research RS-703A Automated Calibration System. The RS-703A time base calibration (1/frequency) is derived directly from an Arbiter Systems Model 1083B GPS Satellite-Controlled Frequency Standard. Uncertainty of the GPS System is .00005 parts per million, traceable to United States Naval Observatory (USNO). Calibration temperature is 23 degrees Centigrade. Test time is 2 seconds with a stabilization of 2 seconds in between points. All Results are listed as Percent Error. The RS703A has at least a 4 times greater accuracy than the Instrument under test.

### Frequency

45	0.0003
46	0.0003
47	0.0003
48	0.0003
49	0.0003
50	0.0002
51	0.0002
52	0.0003
53	0.0003
54	0.0003
55	0.0003
56	0.0003
57	0.0003
58	0.0003
59	0.0003
60	0.0003
61	0.0003
62	0.0002
63	0.0003
64	0.0003
65	0.0003
<b>Average</b>	<b>0.0003</b>
<b>Minimum</b>	0.0002
<b>Maximum</b>	0.0003

# Calibration Report

## RD-31-221 Dytronic Portable Standard

Mode..... Frequency                      Phase C  
Date..... 23-Jun-11  
Serial Number..... 300660

The following data was collected by a Radian Research RS-703A Automated Calibration System. The RS-703A time base calibration (1/frequency) is derived directly from an Arbiter Systems Model 1083B GPS Satellite-Controlled Frequency Standard. Uncertainty of the GPS System is .00005 parts per million, traceable to United States Naval Observatory (USNO). Calibration temperature is 23 degrees Centigrade. Test time is 2 seconds with a stabilization of 2 seconds in between points. All Results are listed as Percent Error. The RS703A has at least a 4 times greater accuracy than the Instrument under test.

### Frequency

45	0.0003
46	0.0003
47	0.0003
48	0.0003
49	0.0003
50	0.0003
51	0.0003
52	0.0003
53	0.0003
54	0.0003
55	0.0003
56	0.0003
57	0.0003
58	0.0003
59	0.0003
60	0.0003
61	0.0003
62	0.0003
63	0.0003
64	0.0003
65	0.0003
<b>Average</b>	<b>0.0003</b>
<b>Minimum</b>	0.0003
<b>Maximum</b>	0.0003