

# Certificate of Calibration

**Manufacturer**                    **Radian Research, Inc.**  
**Instrument Model:**            **RX-33-PQ/AS Xytronic Portable Standard**  
**Serial Number**  
**Firmware Revision:**        11.03.01  
**Error Specification**            .01% worst case



ISO 9001:2015 Certified Quality Management System  
 ISO/IEC:17025 Accredited Laboratory

**Customer Name:**  
**Address:**

**Calibration Lab Name:**            Radian Research, Inc.  
**Calibration Lab Address:**        3852 Fortune Drive, Lafayette, IN 47905, USA  
**Calibration Date:**                11-Dec-18

**Environmental Conditions**

Temperature: 23°C +/- 2°C  
 Humidity: between 30% and 60%

**Physical Condition:**    Undamaged

**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 specifications and was calibrated in compliance with ANSI/NCSL Z540-1-1994. Identified results are accredited to ISO/IEC 17025:2005 "General Requirements for the Competence of Testing and Calibration laboratories", using applicable Radian Research procedures which meet the requirements of ISO 9001:2008 and ISO/IEC Guide 98-3 "Uncertainty of measurement - Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)".

This instrument was calibrated by a Radian Research RS-933 Syntron Automated Calibration System which is traceable to the National Institute of Standards and Technology (NIST) and/or other National Metrology Institute (NMI). The Automated Calibration system is cross checked and calibrated on a schedule which is adjusted to maintain required accuracies and traceability. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k=2.

**Procedure used for Calibration:**        9912270  
**Software used for Calibration:**        Radian Research RS-933 Control Application Version 2.3.6234.24469  
**RS-933 Tool Number:**                    9911278

**Standards Used in This Calibration:**

<u>Description</u>	<u>Serial Number(s):</u>	<u>Cal. Source</u>	<u>Cal. Number:</u>	<u>Cal. Due Date:</u>
RS-940B Data Collection Module	000000	Radian Research	704053-20180220	2/20/2019
RS-711 Syntron with RS-932 Boost Module (Phase A)	000000	Radian Research	703143-20180826	8/26/2019
RS-711 Syntron with RS-932 Boost Module (Phase B)	000000	Radian Research	703144-20181024	10/24/2019
RS-711 Syntron with RS-932 Boost Module (Phase C)	000000	Radian Research	703146-20180827	8/27/2019

**Laboratory Technician Signature**

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# Calibration Report

## RX-33-PQ/AS Xytronic Portable Standard

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

Date..... 11-Dec-18      Uncertainty at Unity..... 12

Serial Number..... 000000      Uncertainty at 60° Phase Angle.... 23

The following data was collected by a Radian Research RS-933 Automated Calibration System. The RS-933 watt-hour calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards, traceable to the SI through the National Institute of Standards and Technology (NIST) and/or other National Metrology Institute (NMI). Test time is 5 seconds and stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as  $\mu\text{Wh/Wh}$ . The RS-933 Automated Calibration System has at least a 2 times greater accuracy than the instrument under test. The results presented on this page are compliant with ANSI/NCSL Z540-1-1994. Results are accredited to ISO/IEC 17025:2005.

### Voltage & Phase Angle

Amps	120	120	120	240	240	240	480	480	480	600	600	600
	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead
0.2	16	18	5	17	18	16	16	17	14	31	33	25
0.25	25	34	14	30	25	21	25	26	21	36	40	34
0.5	17	17	15	16	11	21	13	14	23	29	21	29
1	22	15	25	21	12	34	21	14	28	33	24	38
2.5	3	2	0	3	-1	8	1	-1	2	16	10	19
3	3	11	2	6	5	4	5	8	3	21	14	18
5	16	20	12	18	14	17	17	15	18	30	26	25
10	13	10	13	16	8	22	13	7	19	27	17	28
15	19	21	23	24	13	30	23	16	28	37	29	42
20	6	10	9	9	3	10	10	8	13	22	14	21
30	17	22	9	18	19	17	19	18	15	29	29	26
40	16	27	5	17	24	13	18	24	6	31	38	21
50	15	29	8	22	20	13	18	24	12	32	37	25
60	22	23	23	23	18	28	25	20	28	38	29	34
100	12	24	-1	12	16	9	13	20	4	31	33	19
120	16	27	5	18	14	6	17	24	10	28	33	18
180	6	9	-1	6	6	0	9	13	5	23	23	16
200	8	14	-7	10	11	4	10	12	-1	24	30	15

<b>Average</b>	14	18	9	16	13	15	15	16	14	29	27	25
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<b>Minimum</b>	3	2	-7	3	-1	0	1	-1	-1	16	10	15
<b>Maximum</b>	25	34	25	30	25	34	25	26	28	38	40	42

<b>Overall</b>	Unity	Unity	0.5 Lag	0.5 Lead
<b>Average</b>	18	18	16	
<b>Minimum</b>	1	-1	-7	
<b>Maximum</b>	38	40	42	

# Calibration Report

## RX-33-PQ/AS Xytronic Portable Standard

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

Date..... 11-Dec-18 Uncertainty at Unity..... 12

Serial Number..... 000000 Uncertainty at 60° Phase Angle.... 23

The following data was collected by a Radian Research RS-933 Automated Calibration System. The RS-933 watt-hour calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards, traceable to the SI through the National Institute of Standards and Technology (NIST) and/or other National Metrology Institute (NMI). Test time is 5 seconds and stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as  $\mu\text{Wh}/\text{Wh}$ . The RS-933 Automated Calibration System has at least a 2 times greater accuracy than the instrument under test. The results presented on this page are compliant with ANSI/NCSL Z540-1-1994. Results are accredited to ISO/IEC 17025:2005.

### Voltage & Phase Angle

Amps	120	120	120	240	240	240	480	480	480	600	600	600
	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead
0.2	1	1	2	0	5	8	-2	2	-16	16	31	-3
0.25	15	15	24	14	8	10	14	29	2	31	38	21
0.5	5	12	7	4	12	-7	3	23	-7	20	29	-6
1	2	-4	-1	4	4	10	-2	-1	-17	16	28	-4
2.5	-1	-10	10	-2	-17	9	-7	-8	-10	9	7	16
3	-1	-1	17	-2	-17	-1	-5	5	-1	14	6	8
5	-1	-3	-9	-3	4	-11	-5	6	-20	10	23	-11
10	-7	-1	-13	-7	-1	-5	-8	-1	-28	9	23	-7
15	6	18	11	6	4	-1	3	26	-8	20	33	13
20	-10	-9	-2	-8	-10	-17	-11	0	-16	4	5	-14
30	4	7	-8	2	16	4	1	11	-19	18	34	-5
40	-1	10	-8	1	5	-8	-2	17	-27	13	37	1
50	3	11	7	1	-3	-9	0	21	-5	18	26	2
60	10	-4	15	11	5	17	8	9	7	24	19	11
100	5	0	-1	5	-5	9	6	7	-10	23	35	15
120	9	9	21	10	-8	3	11	21	11	28	28	20
180	2	-15	3	2	-8	-2	3	3	3	23	15	4
200	2	-9	0	2	0	7	4	1	-11	24	33	12

Average	2	1	4	2	0	1	1	10	-10	18	25	4
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Minimum	-10	-15	-13	-8	-17	-17	-11	-8	-28	4	5	-14
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Maximum	15	18	24	14	16	17	14	29	11	31	38	21
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<b>Overall</b>	Unity PF	0.5 Lag	0.5 Lead
Average	6	9	0
Minimum	-11	-17	-28
Maximum	31	38	24

## Calibration Report

### RX-33-PQ/AS Xytronic Portable Standard

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

Date..... **11-Dec-18**                              **Uncertainty at Unity..... 12**  
 Serial Number..... **000000**                              **Uncertainty at 60° Phase Angle.... 23**

The following data was collected by a Radian Research RS-933 Automated Calibration System. The RS-933 watt-hour calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards, traceable to the SI through the National Institute of Standards and Technology (NIST) and/or other National Metrology Institute (NMI). Test time is 5 seconds and stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as μWh/Wh. The RS-933 Automated Calibration System has at least a 2 times greater accuracy than the instrument under test. The results presented on this page are compliant with ANSI/NCSL Z540-1-1994. Results are accredited to ISO/IEC 17025:2005.

### Voltage & Phase Angle

Amps	120 Unity PF	120 0.5 Lag	120 0.5 Lead	240 Unity PF	240 0.5 Lag	240 0.5 Lead	480 Unity PF	480 0.5 Lag	480 0.5 Lead	600 Unity PF	600 0.5 Lag	600 0.5 Lead
0.2	-1	14	-11	6	4	-5	5	5	15	21	9	21
0.25	9	19	-13	16	20	20	16	1	16	29	13	36
0.5	-1	18	-15	0	-4	1	3	1	10	20	9	27
1	-2	0	2	5	-11	6	4	-6	26	19	-6	32
2.5	-9	-3	-26	-1	1	1	-3	-18	5	15	8	16
3	-6	14	-24	4	2	5	2	-5	-1	19	13	26
5	-10	-2	-1	-2	-24	4	-3	-15	20	14	-18	35
10	-10	-17	-4	2	-20	15	-1	-27	28	14	-15	32
15	6	-2	5	15	0	37	12	-18	32	28	2	51
20	-9	-4	-7	-2	-24	10	-1	-17	18	15	-6	39
30	5	8	11	15	-3	17	15	0	39	29	2	44
40	-4	-2	-14	2	2	15	5	-18	17	18	0	27
50	-1	5	-11	6	-2	19	9	-7	17	23	11	42
60	8	13	16	14	-9	23	15	2	44	33	7	54
100	22	17	24	27	20	46	32	8	55	47	20	61
120	23	20	19	30	11	51	33	1	51	47	27	69
180	2	8	13	9	-12	21	14	-4	37	31	1	58
200	6	4	11	14	-2	26	17	-6	45	36	4	46

<b>Average</b>	2	6	-1	9	-3	17	10	-7	26	25	5	40
<b>Minimum</b>	-10	-17	-26	-2	-24	-5	-3	-27	-1	14	-18	16
<b>Maximum</b>	23	20	24	30	20	51	33	8	55	47	27	69

<i><b>Overall</b></i>	<b>Unity PF</b>	<b>0.5 Lag</b>	<b>0.5 Lead</b>
<b>Average</b>	11	0	21
<b>Minimum</b>	-10	-27	-26
<b>Maximum</b>	47	27	69

# Calibration Report

## RX-33-PQ/AS Xytronic Portable Standard

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

Date..... 11-Dec-18                      Uncertainty at Unity..... 20

Serial Number..... 000000                      Uncertainty at 60° Phase Angle.... 38

The following data was collected by a Radian Research RS-933 Automated Calibration System. The RS-933 watt-hour calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards, traceable to the SI through the National Institute of Standards and Technology (NIST) and/or other National Metrology Institute (NMI). Test time is 5 seconds and stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as  $\mu\text{Wh}/\text{Wh}$ . The RS-933 Automated Calibration System has at least a 2 times greater accuracy than the instrument under test. The results presented on this page are compliant with ANSI/NCSL Z540-1-1994. Results are accredited to ISO/IEC 17025:2005.

### Voltage & Phase Angle

Amps	120	120	120	240	240	240	480	480	480	600	600	600
	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead
0.2	6	11	-1	7	9	6	6	8	4	22	24	14
0.25	16	23	8	20	18	17	18	19	13	32	30	30
0.5	7	16	2	7	6	5	7	12	8	23	20	17
1	7	4	8	10	2	16	8	2	13	23	16	22
2.5	-2	-4	-5	0	-6	6	-3	-9	-1	13	8	17
3	-1	8	-2	3	-3	3	1	3	0	18	11	17
5	2	5	0	5	-2	3	3	2	6	18	10	16
10	-1	-3	-1	3	-4	11	1	-7	6	17	8	18
15	10	12	13	15	5	22	13	8	17	28	21	35
20	-4	-1	0	0	-10	1	-1	-3	5	14	4	16
30	8	12	4	12	11	13	11	10	12	25	22	22
40	4	12	-6	7	10	6	7	8	-1	21	25	16
50	6	15	1	9	5	8	9	13	8	24	24	23
60	13	11	18	16	5	23	16	10	27	32	18	33
100	13	14	7	15	10	21	17	12	17	34	30	32
120	16	19	15	19	6	20	20	15	24	35	30	36
180	3	1	5	6	-5	6	9	4	15	26	13	26
200	5	3	2	9	3	12	10	3	11	28	22	24

Average	6	9	4	9	3	11	8	6	10	24	19	23
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Minimum	-4	-4	-6	0	-10	1	-3	-9	-1	13	4	14
Maximum	16	23	18	20	18	23	20	19	27	35	30	36

<i><b>Overall</b></i>	Unity PF	0.5 Lag	0.5 Lead
<i><b>Average</b></i>	12	9	12
<i><b>Minimum</b></i>	-4	-10	-6
<i><b>Maximum</b></i>	35	30	36

# Calibration Report

## RX-33-PQ/AS Xytronic Portable Standard

Function..... Watt-hour    60 Hz

Date..... 11-Dec-18

Serial Number..... 000000

The following data was collected by a Radian Research RS-933 Automated Calibration System. The RS-933 watt-hour calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards, traceable to the SI through the National Institute of Standards and Technology (NIST) and/or other National Metrology Institute (NMI). Test time is 5 seconds and stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as  $\mu\text{Wh}/\text{Wh}$ . The RS-933 Automated Calibration System has at least a 2 times greater accuracy than the instrument under test. The results presented on this page are compliant with ANSI/NC SL Z540-1-1994. They are not within Radian 's 17025 Scope of Accreditation.

### Voltage & Phase Angle

Phase A:												
	120	120	120	240	240	240	480	480	480	600	600	600
	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead
Amps												
0.005	7	15	3	6	28	14	15	36	-34	12	80	12
0.02	-6	25	-13	-12	12	-5	-17	5	-28	2	33	-5
0.05	7	32	12	7	30	10	0	24	-3	20	39	14
Phase B:												
	120	120	120	240	240	240	480	480	480	600	600	600
	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead
Amps												
0.005	17	27	-9	17	34	12	12	49	-11	31	78	-7
0.02	-1	24	-12	7	17	-11	2	34	-24	22	59	-11
0.05	15	30	13	17	36	1	13	52	-2	34	68	0
Phase C:												
	120	120	120	240	240	240	480	480	480	600	600	600
	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead
Amps												
0.005	0	24	-31	5	13	-33	-1	22	-21	-10	92	-47
0.02	-4	41	-39	-11	35	-25	-16	12	-43	0	55	-23
0.05	4	43	-7	4	33	-7	1	21	-17	14	39	8
Total:												
	120	120	120	240	240	240	480	480	480	600	600	600
	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead
Amps												
0.005	8	22	-12	9	25	-2	9	36	-22	11	84	-14
0.02	-4	30	-21	-5	21	-14	-10	17	-32	8	49	-13
0.05	9	35	6	10	33	1	5	33	-7	23	49	7
Average	4	29	-9	5	26	-5	1	29	-20	14	60	-7
Minimum	-6	15	-39	-12	12	-33	-17	5	-43	-10	33	-47
Maximum	17	43	13	17	36	14	15	52	-2	34	92	14

<u>Overall</u>	Unity PF	0.5 Lag	0.5 Lead
Average	6	36	-10
Minimum	-17	5	-47
Maximum	34	92	14

# Calibration Report

## RX-33-PQ/AS Xytronic Portable Standard

Function..... Watts      60 Hz      Phase A

Date..... 11-Dec-18      Uncertainty at Unity..... 12

Serial Number..... 000000      Uncertainty at 60° Phase Angle.... 23

The following data was collected by a Radian Research RS-933 Automated Calibration System. The RS-933 watt calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards, traceable to the SI through the National Institute of Standards and Technology (NIST) and/or other National Metrology Institute (NMI). Test time is 5 seconds and stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as  $\mu\text{W}/\text{W}$ . The RS-933 Automated Calibration System has at least a 2 times greater accuracy than the instrument under test. The results presented on this page are compliant with ANSI/NCSL Z540-1-1994. Results are accredited to ISO/IEC 17025:2005.

### Voltage & Phase Angle

Amps	120	120	120	240	240	240	480	480	480	600	600	600
	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead
0.2	16	18	5	17	18	16	16	17	14	31	33	25
0.25	25	34	14	29	25	21	24	27	21	35	40	34
0.5	16	16	15	16	10	20	13	13	22	29	20	30
1	22	16	25	22	12	34	21	14	28	34	24	39
2.5	3	1	-1	2	-2	8	0	-1	1	15	11	19
3	3	11	1	6	6	4	5	8	3	21	14	18
5	16	20	11	18	14	17	16	15	17	29	26	25
10	13	10	13	15	8	21	13	7	18	27	17	28
15	19	20	23	24	12	30	23	16	27	36	28	42
20	6	9	8	9	2	9	9	8	12	22	13	21
30	16	22	9	18	18	16	18	18	15	29	28	25
40	16	27	4	17	23	12	18	23	5	31	37	21
50	15	29	8	22	20	13	18	23	11	31	37	25
60	22	22	22	23	18	28	25	20	28	38	29	34
100	12	24	-1	12	16	8	13	19	4	30	33	19
120	16	27	5	17	14	5	17	24	10	28	34	18
180	5	10	-3	6	5	-1	8	13	3	23	24	14
200	8	14	-7	10	11	3	9	13	-1	23	29	14

<b>Average</b>	14	18	9	16	13	15	15	15	13	28	27	25
<b>Minimum</b>	3	1	-7	2	-2	-1	0	-1	-1	15	11	14
<b>Maximum</b>	25	34	25	29	25	34	25	27	28	38	40	42

<b>Overall</b>	Unity PF	0.5 Lag	0.5 Lead
<b>Average</b>	18	18	15
<b>Minimum</b>	0	-2	-7
<b>Maximum</b>	38	40	42

# Calibration Report

## RX-33-PQ/AS Xytronic Portable Standard

Function..... Watts      60 Hz      Phase B

Date..... 11-Dec-18      Uncertainty at Unity..... 12

Serial Number..... 000000      Uncertainty at 60° Phase Angle.... 23

The following data was collected by a Radian Research RS-933 Automated Calibration System. The RS-933 watt calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards, traceable to the SI through the National Institute of Standards and Technology (NIST) and/or other National Metrology Institute (NMI). Test time is 5 seconds and stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as  $\mu\text{W}/\text{W}$ . The RS-933 Automated Calibration System has at least a 2 times greater accuracy than the instrument under test. The results presented on this page are compliant with ANSI/NCSL Z540-1-1994. Results are accredited to ISO/IEC 17025:2005.

### Voltage & Phase Angle

Amps	120	120	120	240	240	240	480	480	480	600	600	600
	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead
0.2	1	1	2	0	5	8	-2	2	-15	16	31	-5
0.25	14	15	22	14	8	11	14	30	3	32	37	21
0.5	5	12	8	5	12	-6	3	24	-7	21	29	-4
1	2	-4	-2	3	4	8	-2	-1	-17	16	28	-5
2.5	-1	-11	10	-1	-17	10	-6	-8	-10	9	8	16
3	-1	-1	17	-2	-17	-1	-5	5	-1	14	6	9
5	-1	-3	-9	-3	3	-10	-5	7	-19	10	23	-11
10	-7	-2	-13	-8	1	-5	-9	-1	-28	9	23	-7
15	7	18	11	6	4	1	3	26	-8	19	33	14
20	-9	-9	-1	-7	-10	-17	-11	2	-16	4	5	-12
30	4	6	-8	2	16	3	1	11	-18	18	34	-6
40	-1	10	-9	1	5	-7	-3	18	-27	13	37	1
50	3	11	7	0	-3	-9	-1	20	-5	17	27	2
60	10	-5	15	10	4	17	8	9	8	24	19	11
100	5	0	-1	5	-4	9	5	6	-10	23	35	15
120	10	8	21	9	-8	3	11	21	10	28	28	21
180	2	-15	3	1	-9	-3	2	3	3	22	14	3
200	3	-10	-1	2	0	7	4	1	-11	24	32	12

Average	2	1	4	2	0	1	0	10	-9	18	25	4
Minimum	-9	-15	-13	-8	-17	-17	-11	-8	-28	4	5	-12
Maximum	14	18	22	14	16	17	14	30	10	32	37	21

Overall	Unity PF	0.5 Lag	0.5 Lead
Average	6	9	0
Minimum	-11	-17	-28
Maximum	32	37	22



# Calibration Report

## RX-33-PQ/AS Xytronic Portable Standard

Function..... Watts      60 Hz      Phase C

Date..... 11-Dec-18      Uncertainty at Unity..... 12

Serial Number..... 000000      Uncertainty at 60° Phase Angle.... 23

The following data was collected by a Radian Research RS-933 Automated Calibration System. The RS-933 watt calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards, traceable to the SI through the National Institute of Standards and Technology (NIST) and/or other National Metrology Institute (NMI). Test time is 5 seconds and stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as  $\mu\text{W}/\text{W}$ . The RS-933 Automated Calibration System has at least a 2 times greater accuracy than the instrument under test. The results presented on this page are compliant with ANSI/NCSL Z540-1-1994. Results are accredited to ISO/IEC 17025:2005.

### Voltage & Phase Angle

Amps	120	120	120	240	240	240	480	480	480	600	600	600
	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead
0.2	-1	15	-11	6	3	-5	5	5	15	21	9	23
0.25	9	17	-13	16	19	20	16	2	16	30	14	36
0.5	-1	18	-16	0	-3	1	3	0	10	19	9	27
1	-3	1	2	5	-13	6	4	-6	26	19	-6	32
2.5	-9	-4	-25	-1	1	0	-4	-18	5	15	7	16
3	-6	14	-25	4	2	5	2	-6	-1	19	15	26
5	-10	-2	-2	-2	-24	4	-2	-15	19	14	-18	36
10	-10	-16	-4	2	-21	14	-1	-27	30	14	-15	32
15	6	-3	5	15	-1	37	12	-17	32	28	2	50
20	-9	-4	-8	-2	-24	10	-2	-18	18	15	-6	39
30	4	8	11	15	-4	17	15	1	39	29	1	45
40	-4	-2	-13	3	2	14	6	-18	18	18	-1	27
50	-1	5	-12	5	-2	19	9	-8	17	23	11	42
60	8	13	17	14	-9	23	14	2	43	33	7	54
100	22	18	24	27	19	46	32	10	56	47	21	61
120	24	20	19	30	12	52	33	0	51	48	27	69
180	2	8	13	9	-12	21	13	-4	36	31	2	58
200	6	5	12	14	-2	26	17	-5	45	35	4	46

Average	1	6	-1	9	-3	17	10	-7	26	25	5	40
Minimum	-10	-16	-25	-2	-24	-5	-4	-27	-1	14	-18	16
Maximum	24	20	24	30	19	52	33	10	56	48	27	69

Overall	Unity PF	0.5 Lag	0.5 Lead
Average	11	0	20
Minimum	-10	-27	-25
Maximum	48	27	69

# Calibration Report

## RX-33-PQ/AS Xytronic Portable Standard

Function.....	Watts	60 Hz	Total
Date.....	11-Dec-18	Uncertainty at Unity.....	20
Serial Number.....	000000	Uncertainty at 60° Phase Angle....	38

The following data was collected by a Radian Research RS-933 Automated Calibration System. The RS-933 watt calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards, traceable to the SI through the National Institute of Standards and Technology (NIST) and/or other National Metrology Institute (NMI). Test time is 5 seconds and stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as  $\mu\text{W}/\text{W}$ . The RS-933 Automated Calibration System has at least a 2 times greater accuracy than the instrument under test. The results presented on this page are compliant with ANSI/NCSL Z540-1-1994. Results are accredited to ISO/IEC 17025:2005.

### Voltage & Phase Angle

Amps	120	120	120	240	240	240	480	480	480	600	600	600
	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead
0.2	5	11	-1	8	9	6	6	8	4	22	24	14
0.25	16	22	8	20	17	17	18	19	13	32	30	30
0.5	7	16	3	7	6	5	6	12	8	23	20	17
1	7	4	8	10	1	16	8	2	13	23	16	22
2.5	-3	-4	-5	0	-6	6	-3	-9	-1	13	8	17
3	-1	8	-2	2	-3	3	1	2	0	18	11	18
5	2	5	0	4	-2	3	3	2	6	18	10	16
10	-1	-3	-1	3	-4	10	1	-7	7	17	8	18
15	11	12	13	15	5	22	13	8	17	28	21	35
20	-4	-1	0	0	-11	1	-1	-3	5	14	4	16
30	8	12	4	12	10	12	11	10	12	25	21	21
40	4	12	-6	7	10	6	7	8	-1	21	24	16
50	6	15	1	9	5	8	9	12	8	24	25	23
60	13	10	18	16	4	22	16	10	27	32	18	33
100	13	14	7	15	10	21	17	12	17	33	30	32
120	16	19	15	19	6	20	20	15	24	35	30	36
180	3	1	4	6	-5	6	8	4	14	25	13	25
200	5	3	1	9	3	12	10	3	11	27	21	24

Average	6	9	4	9	3	11	8	6	10	24	19	23
Minimum	-4	-4	-6	0	-11	1	-3	-9	-1	13	4	14
Maximum	16	22	18	20	17	22	20	19	27	35	30	36

<u>Overall</u>	Unity PF	0.5 Lag	0.5 Lead
Average	12	9	12
Minimum	-4	-11	-6
Maximum	35	30	36

# Calibration Report

RX-33-PQ/AS Xytronic Portable Standard

Function..... Watts      60 Hz

Date..... 11-Dec-18

Serial Number..... 000000

The following data was collected by a Radian Research RS-933 Automated Calibration System. The RS-933 watt calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards, traceable to the SI through the National Institute of Standards and Technology (NIST) and/or other National Metrology Institute (NMI). Test time is 5 seconds and stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as  $\mu\text{W/W}$ . The RS-933 Automated Calibration System has at least a 2 times greater accuracy than the instrument under test. The results presented on this page are compliant with ANSI/NCSL Z540-1-1994. They are not within Radian 's 17025 Scope of Accreditation.

## Voltage & Phase Angle

		120	120	120	240	240	240	480	480	480	600	600	600
		Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead
Amps													
0.005		7	13	1	6	30	14	15	35	-35	13	82	12
0.02		-6	24	-13	-12	12	-5	-17	5	-29	2	33	-5
0.05		8	32	12	7	30	10	0	24	-4	20	39	14
Phase B:													
		120	120	120	240	240	240	480	480	480	600	600	600
		Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead
Amps													
0.005		17	28	-9	17	33	11	13	49	-11	32	78	-7
0.02		-1	23	-12	6	18	-11	2	33	-24	23	59	-11
0.05		15	30	13	17	36	1	13	53	-2	34	68	1
Phase C:													
		120	120	120	240	240	240	480	480	480	600	600	600
		Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead
Amps													
0.005		0	22	-34	6	12	-31	1	24	-22	-10	91	-47
0.02		-4	41	-38	-11	34	-25	-16	12	-42	0	55	-23
0.05		4	43	-8	4	33	-8	1	21	-18	14	38	7
Total:													
		120	120	120	240	240	240	480	480	480	600	600	600
		Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead
Amps													
0.005		8	21	-13	9	25	-2	9	36	-23	12	84	-14
0.02		-4	29	-21	-5	21	-14	-10	17	-32	8	49	-13
0.05		9	35	6	9	33	1	5	33	-8	23	48	7
Average		4	28	-10	4	26	-5	1	28	-21	14	60	-7
Minimum		-6	13	-38	-12	12	-31	-17	5	-42	-10	33	-47
Maximum		17	43	13	17	36	14	15	53	-2	34	91	14

<u>Overall</u>	Unity PF	0.5 Lag	0.5 Lead
Average	6	36	-10
Minimum	-17	5	-47
Maximum	34	91	14

# Calibration Report

RX-33-PQ/AS Xytronic Portable Standard

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

Date..... 11-Dec-18      Uncertainty ..... 23

Serial Number..... 000000

The following data was collected by a Radian Research RS-933 Automated Calibration System. The RS-933 VARh calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards, traceable to the SI through the National Institute of Standards and Technology (NIST) and/or other National Metrology Institute (NMI). Test time is 2 seconds and stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as  $\mu$ VARh/VARh. The RS-933 Automated Calibration System has at least a 2 times greater accuracy than the instrument under test. The results presented on this page are compliant with ANSI/NCSL Z540-1-1994. Results are accredited to ISO/IEC 17025:2005.

## Voltage & Phase Angle

Amps	120	120	240	240	480	480	600	600
	90°Lag	30°Lag	90°Lag	30°Lag	90°Lag	30°Lag	90°Lag	30°Lag
0.2	40	33	33	30	31	25	45	42
0.25	50	41	41	32	42	36	52	42
0.5	40	42	35	35	33	37	44	43
1	39	47	36	43	34	40	47	53
2.5	20	21	15	17	17	16	26	21
3	28	28	25	21	22	21	30	28
5	40	38	36	33	35	33	46	42
10	37	38	32	38	31	34	42	45
15	48	48	38	48	41	48	51	53
20	32	36	27	24	26	28	36	35
30	45	39	40	38	39	37	48	48
40	45	31	38	31	39	31	48	36
50	45	41	41	32	39	39	45	40
60	38	41	33	36	34	40	45	48
100	31	24	22	18	23	20	37	26
120	31	26	21	12	27	23	35	23
180	26	22	15	9	17	12	28	26
200	28	19	20	14	20	9	31	25

<b>Average</b>	<b>37</b>	<b>34</b>	<b>30</b>	<b>28</b>	<b>30</b>	<b>29</b>	<b>41</b>	<b>38</b>
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<b>Minimum</b>	20	19	15	9	17	9	26	21
<b>Maximum</b>	50	48	41	48	42	48	52	53

<b>Overall</b>	<b>90°Lag</b>	<b>30°Lag</b>
<b>Average</b>	35	32
<b>Minimum</b>	15	9
<b>Maximum</b>	52	53

# Calibration Report

RX-33-PQ/AS Xytronic Portable Standard

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

Date..... 11-Dec-18      Uncertainty ..... 23

Serial Number..... 000000

The following data was collected by a Radian Research RS-933 Automated Calibration System. The RS-933 VARh calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards, traceable to the SI through the National Institute of Standards and Technology (NIST) and/or other National Metrology Institute (NMI). Test time is 2 seconds and stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as  $\mu$ VARh/VARh. The RS-933 Automated Calibration System has at least a 2 times greater accuracy than the instrument under test. The results presented on this page are compliant with ANSI/NCSL Z540-1-1994. Results are accredited to ISO/IEC 17025:2005.

## 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	12	-1	5	7	6	-15	23	15
0.25	26	17	19	4	21	7	38	13
0.5	16	11	11	-5	10	-15	28	8
1	14	4	6	7	5	-19	23	10
2.5	6	6	-1	5	-3	-11	14	5
3	12	23	6	4	7	-1	21	10
5	11	-2	6	-6	5	-26	20	4
10	4	-9	-1	-2	-1	-26	15	-3
15	18	13	17	-3	13	1	29	7
20	3	1	-1	-14	-2	-24	15	2
30	20	1	15	14	13	-17	29	15
40	16	-7	12	-11	9	-16	24	-5
50	20	15	14	-4	13	0	28	9
60	19	17	9	11	8	-5	27	23
100	13	0	6	0	7	-8	24	4
120	20	21	9	-6	9	6	25	9
180	10	8	1	-5	6	-9	21	19
200	12	-1	5	1	7	-10	25	13

<b>Average</b>	14	7	8	0	7	-10	24	9
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<b>Minimum</b>	3	-9	-1	-14	-3	-26	14	-5
<b>Maximum</b>	26	23	19	14	21	7	38	23

<u>Overall</u>	90°Lag	30°Lag
<b>Average</b>	13	1
<b>Minimum</b>	-3	-26
<b>Maximum</b>	38	23

# Calibration Report

RX-33-PQ/AS Xytronic Portable Standard

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

Date..... 11-Dec-18      Uncertainty ..... 23

Serial Number..... 000000

The following data was collected by a Radian Research RS-933 Automated Calibration System. The RS-933 VARh calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards, traceable to the SI through the National Institute of Standards and Technology (NIST) and/or other National Metrology Institute (NMI). Test time is 2 seconds and stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as  $\mu$ VARh/VARh. The RS-933 Automated Calibration System has at least a 2 times greater accuracy than the instrument under test. The results presented on this page are compliant with ANSI/NCSL Z540-1-1994. Results are accredited to ISO/IEC 17025:2005.

### Voltage & Phase Angle

Amps	120	120	240	240	480	480	600	600
	90°Lag	30°Lag	90°Lag	30°Lag	90°Lag	30°Lag	90°Lag	30°Lag
0.2	16	7	15	2	12	7	25	28
0.25	26	5	26	29	22	17	39	42
0.5	14	0	15	6	9	14	30	20
1	10	14	11	11	11	23	26	38
2.5	5	-12	3	7	-1	-5	14	27
3	13	-10	15	9	11	6	22	21
5	7	8	9	11	7	24	21	32
10	9	11	8	24	6	20	19	48
15	21	14	23	42	20	32	37	57
20	8	-3	9	14	7	21	21	29
30	26	21	26	28	24	32	40	56
40	15	2	16	25	15	13	30	45
50	21	1	22	23	18	23	32	36
60	17	16	17	17	16	35	31	42
100	35	31	32	42	31	42	50	72
120	31	23	30	42	33	46	46	61
180	13	16	11	16	13	35	28	43
200	20	21	18	21	17	2	33	53

Average	17	9	17	21	15	21	30	42
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Minimum	5	-12	3	2	-1	-5	14	20
Maximum	35	31	32	42	33	46	50	72

<u>Overall</u>	90°Lag	30°Lag
Average	20	23
Minimum	-1	-12
Maximum	50	72

# Calibration Report

RX-33-PQ/AS Xytronic Portable Standard

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

Date..... 11-Dec-18                      Uncertainty .....                      39

Serial Number..... 000000

The following data was collected by a Radian Research RS-933 Automated Calibration System. The RS-933 VARh calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards, traceable to the SI through the National Institute of Standards and Technology (NIST) and/or other National Metrology Institute (NMI). Test time is 2 seconds and stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as  $\mu$ VARh/VARh. The RS-933 Automated Calibration System has at least a 2 times greater accuracy than the instrument under test. The results presented on this page are compliant with ANSI/NCSL Z540-1-1994. Results are accredited to ISO/IEC 17025:2005.

## Voltage & Phase Angle

Amps	120	120	240	240	480	480	600	600
	90°Lag	30°Lag	90°Lag	30°Lag	90°Lag	30°Lag	90°Lag	30°Lag
0.2	23	13	17	13	16	6	31	29
0.25	34	21	29	22	28	20	43	32
0.5	24	18	20	12	18	12	34	24
1	21	21	18	21	17	15	32	34
2.5	10	5	6	10	5	0	18	18
3	18	14	15	11	13	9	24	20
5	19	15	17	13	16	11	29	26
10	16	13	13	20	12	10	25	30
15	29	25	26	29	25	27	39	39
20	14	11	12	8	11	8	24	22
30	31	20	27	27	25	17	39	40
40	25	9	22	15	21	9	34	26
50	29	19	25	17	23	21	35	28
60	25	25	20	21	19	23	35	38
100	26	18	20	20	20	18	37	34
120	27	23	20	16	23	25	36	31
180	16	15	9	7	12	13	26	30
200	20	13	14	12	15	0	30	30

Average	23	17	18	16	18	14	32	29
Minimum	10	5	6	7	5	0	18	18
Maximum	34	25	29	29	28	27	43	40

<u>Overall</u>	90°Lag	30°Lag
Average	23	19
Minimum	5	0
Maximum	43	40

# Calibration Report

## RX-33-PQ/AS Xytronic Portable Standard

Function..... VAR-hour    60 Hz

Date..... 11-Dec-18

Serial Number..... 000000

The following data was collected by a Radian Research RS-933 Automated Calibration System. The RS-933 VAR-hour calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards, traceable to the SI through the National Institute of Standards and Technology (NIST) and/or other National Metrology Institute (NMI). Test time is 5 seconds and stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as  $\mu\text{VARh}/\text{VARh}$ . The RS-933 Automated Calibration System has at least a 2 times greater accuracy than the instrument under test. The results presented on this page are compliant with ANSI/NCSL Z540-1-1994. They are not within Radian's 17025 Scope of Accreditation.

### Voltage & Phase Angle

**Phase A:**

	120 90°Lag	120 30°Lag	240 90°Lag	240 30°Lag	480 90°Lag	480 30°Lag	600 90°Lag	600 30°Lag
<b>Amps</b>								
<b>0.005</b>	-17	-28	-13	-57	-16	-42	-9	-59
<b>0.02</b>	-15	-23	-25	-37	-23	-43	-8	-36
<b>0.05</b>	1	6	-5	-14	-8	-18	8	-6

**Phase B:**

	120 90°Lag	120 30°Lag	240 90°Lag	240 30°Lag	480 90°Lag	480 30°Lag	600 90°Lag	600 30°Lag
<b>Amps</b>								
<b>0.005</b>	-6	-19	0	-20	0	-40	24	-7
<b>0.02</b>	-18	-28	-15	-31	-9	-38	38	-2
<b>0.05</b>	-3	-3	2	-15	5	-19	30	4

**Phase C:**

	120 90°Lag	120 30°Lag	240 90°Lag	240 30°Lag	480 90°Lag	480 30°Lag	600 90°Lag	600 30°Lag
<b>Amps</b>								
<b>0.005</b>	-3	-20	-7	-61	-2	-43	5	-25
<b>0.02</b>	-11	-50	-12	-38	-22	-51	23	-4
<b>0.05</b>	-3	-15	-5	-30	-16	-27	10	-16

**Total:**

	120 90°Lag	120 30°Lag	240 90°Lag	240 30°Lag	480 90°Lag	480 30°Lag	600 90°Lag	600 30°Lag
<b>Amps</b>								
<b>0.005</b>	-8	-22	-7	-46	-6	-42	15	-19
<b>0.02</b>	-15	-34	-17	-35	-18	-44	27	-6
<b>0.05</b>	-2	-4	-3	-19	-6	-21	19	-2

<b>Average</b>	-8	-20	-9	-34	-10	-36	15	-15
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<b>Minimum</b>	-18	-50	-25	-61	-23	-51	-9	-59
<b>Maximum</b>	1	6	2	-14	5	-18	38	4

<b>Overall</b>	90°Lag	30°Lag
<b>Average</b>	-3	-26
<b>Minimum</b>	-25	-61
<b>Maximum</b>	38	6



# Calibration Report

RX-33-PQ/AS Xytronic Portable Standard

Function..... VAR      60 Hz      Phase A

Date..... 11-Dec-18      Uncertainty ..... 23

Serial Number..... 000000

The following data was collected by a Radian Research RS-933 Automated Calibration System. The RS-933 VAR calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards, traceable to the SI through the National Institute of Standards and Technology (NIST) and/or other National Metrology Institute (NMI). Test time is 2 seconds and stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as  $\mu$ VAR/VAR. The RS-933 Automated Calibration System has at least a 2 times greater accuracy than the instrument under test. The results presented on this page are compliant with ANSI/NCSL Z540-1-1994. Results are accredited to ISO/IEC 17025:2005.

## Voltage & Phase Angle

Amps	120	120	240	240	480	480	600	600
	90°Lag	30°Lag	90°Lag	30°Lag	90°Lag	30°Lag	90°Lag	30°Lag
0.2	40	33	33	30	31	25	45	42
0.25	49	41	41	32	42	36	52	42
0.5	40	42	35	35	33	37	44	42
1	38	46	35	43	34	39	46	53
2.5	20	21	15	17	17	15	26	21
3	28	27	25	21	22	20	30	28
5	40	37	36	33	35	34	46	42
10	37	38	32	38	31	34	42	45
15	48	48	38	48	41	48	51	53
20	33	35	27	23	26	28	36	35
30	45	39	40	38	39	37	48	48
40	45	30	38	31	39	32	49	36
50	45	40	41	31	39	39	45	40
60	38	42	33	36	33	41	45	48
100	30	24	22	19	23	20	36	26
120	31	26	21	12	27	23	35	24
180	25	21	13	8	16	12	28	25
200	27	19	21	14	20	9	31	25

Average	37	34	30	28	30	29	41	37
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Minimum	20	19	13	8	16	9	26	21
Maximum	49	48	41	48	42	48	52	53

Overall	90°Lag	30°Lag
Average	35	32
Minimum	13	8
Maximum	52	53

# Calibration Report

RX-33-PQ/AS Xytronic Portable Standard

Function..... VAR      60 Hz      Phase B

Date..... 11-Dec-18      Uncertainty ..... 23

Serial Number..... 000000

The following data was collected by a Radian Research RS-933 Automated Calibration System. The RS-933 VAR calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards, traceable to the SI through the National Institute of Standards and Technology (NIST) and/or other National Metrology Institute (NMI). Test time is 2 seconds and stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as  $\mu$ VAR/VAR. The RS-933 Automated Calibration System has at least a 2 times greater accuracy than the instrument under test. The results presented on this page are compliant with ANSI/NCSL Z540-1-1994. Results are accredited to ISO/IEC 17025:2005.

## Voltage & Phase Angle

Amps	120	120	240	240	480	480	600	600
	90°Lag	30°Lag	90°Lag	30°Lag	90°Lag	30°Lag	90°Lag	30°Lag
0.2	12	0	4	7	6	-15	24	15
0.25	25	16	20	5	20	6	38	13
0.5	16	11	11	-5	11	-14	29	7
1	14	4	6	7	5	-19	23	10
2.5	6	6	-1	4	-2	-10	14	6
3	12	23	6	4	6	-1	21	10
5	11	-2	5	-6	5	-25	19	5
10	4	-9	-2	-2	-1	-27	15	-3
15	18	12	18	-2	13	2	29	7
20	3	1	-1	-14	-2	-24	15	2
30	20	2	15	14	13	-17	29	15
40	16	-8	12	-10	9	-16	24	-4
50	20	15	14	-5	13	0	28	8
60	19	18	10	11	8	-5	27	23
100	13	-1	6	0	6	-9	24	5
120	20	21	9	-6	8	6	25	8
180	9	9	1	-6	6	-9	21	19
200	12	-2	5	1	7	-11	25	13

<b>Average</b>	<b>14</b>	<b>6</b>	<b>8</b>	<b>0</b>	<b>7</b>	<b>-10</b>	<b>24</b>	<b>9</b>
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<b>Minimum</b>	3	-9	-2	-14	-2	-27	14	-4
<b>Maximum</b>	25	23	20	14	20	6	38	23

<u>Overall</u>	90°Lag	30°Lag
<b>Average</b>	13	1
<b>Minimum</b>	-2	-27
<b>Maximum</b>	38	23

# Calibration Report

RX-33-PQ/AS Xytronic Portable Standard

Function..... VAR      60 Hz      Phase C

Date..... 11-Dec-18      Uncertainty ..... 23

Serial Number..... 000000

The following data was collected by a Radian Research RS-933 Automated Calibration System. The RS-933 VAR calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards, traceable to the SI through the National Institute of Standards and Technology (NIST) and/or other National Metrology Institute (NMI). Test time is 2 seconds and stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as  $\mu$ VAR/VAR. The RS-933 Automated Calibration System has at least a 2 times greater accuracy than the instrument under test. The results presented on this page are compliant with ANSI/NCSL Z540-1-1994. Results are accredited to ISO/IEC 17025:2005.

## 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	16	8	15	1	12	8	26	28
0.25	26	6	26	29	22	16	38	42
0.5	14	0	15	6	9	14	29	20
1	10	14	10	11	11	24	26	38
2.5	5	-12	2	7	-1	-5	14	27
3	13	-10	15	10	11	5	22	22
5	7	8	9	11	7	24	21	32
10	8	11	8	24	7	21	18	48
15	21	13	23	42	20	32	37	57
20	7	-3	9	15	7	20	21	28
30	26	21	27	28	24	33	40	55
40	15	2	16	24	15	12	30	45
50	21	1	22	24	18	23	32	37
60	17	16	17	17	16	35	31	42
100	36	31	32	42	31	43	50	72
120	31	23	30	42	34	44	46	61
180	13	14	11	15	12	35	28	43
200	20	22	17	21	17	7	33	52

<b>Average</b>	17	9	17	21	15	22	30	42
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<b>Minimum</b>	5	-12	2	1	-1	-5	14	20
<b>Maximum</b>	36	31	32	42	34	44	50	72

<u>Overall</u>	90°Lag	30°Lag
<b>Average</b>	20	23
<b>Minimum</b>	-1	-12
<b>Maximum</b>	50	72

# Calibration Report

## RX-33-PQ/AS Xytronic Portable Standard

Function..... VAR      60 Hz      Total

Date..... 11-Dec-18      Uncertainty ..... 39

Serial Number..... 000000

The following data was collected by a Radian Research RS-933 Automated Calibration System. The RS-933 VAR calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards, traceable to the SI through the National Institute of Standards and Technology (NIST) and/or other National Metrology Institute (NMI). Test time is 2 seconds and stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as  $\mu$ VAR/VAR. The RS-933 Automated Calibration System has at least a 2 times greater accuracy than the instrument under test. The results presented on this page are compliant with ANSI/NCSL Z540-1-1994. Results are accredited to ISO/IEC 17025:2005.

### Voltage & Phase Angle

Amps	120	120	240	240	480	480	600	600
	90°Lag	30°Lag	90°Lag	30°Lag	90°Lag	30°Lag	90°Lag	30°Lag
0.2	23	13	17	13	16	6	31	28
0.25	34	22	29	22	28	20	43	32
0.5	24	18	20	12	18	12	34	23
1	20	21	17	21	17	15	32	34
2.5	10	5	5	10	5	0	18	18
3	18	13	15	11	13	8	24	20
5	19	15	17	13	16	11	26	26
10	16	13	13	20	12	9	25	30
15	29	24	26	30	25	27	39	39
20	14	11	12	8	10	8	24	22
30	30	21	27	27	25	18	39	39
40	25	8	22	15	21	9	34	26
50	29	19	25	17	23	21	35	28
60	25	25	20	21	19	23	34	38
100	26	18	20	20	20	18	36	34
120	27	23	20	16	23	24	36	31
180	16	15	8	6	11	12	25	29
200	20	13	14	12	15	2	30	30

Average	23	17	18	16	18	14	31	29
Minimum	10	5	5	6	5	0	18	18
Maximum	34	25	29	30	28	27	43	39

<u>Overall</u>	90°Lag	30°Lag
Average	22	19
Minimum	5	0
Maximum	43	39

# Calibration Report

## RX-33-PQ/AS Xytronic Portable Standard

Function..... VAR                      60 Hz

Date..... 11-Dec-18

Serial Number..... 000000

The following data was collected by a Radian Research RS-933 Automated Calibration System. The RS-933 VAR calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards, traceable to the SI through the National Institute of Standards and Technology (NIST) and/or other National Metrology Institute (NMI). Test time is 5 seconds and stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as  $\mu$ VAR/VAR. The RS-933 Automated Calibration System has at least a 2 times greater accuracy than the instrument under test. The results presented on this page are compliant with ANSI/NCSL Z540-1-1994. They are not within Radian's 17025 Scope of Accreditation.

### Voltage & Phase Angle

**Phase A:**

	120 90°Lag	120 30°Lag	240 90°Lag	240 30°Lag	480 90°Lag	480 30°Lag	600 90°Lag	600 30°Lag
<b>Amps</b>								
<b>0.005</b>	-17	-26	-13	-57	-17	-44	-9	-60
<b>0.02</b>	-15	-24	-24	-37	-23	-43	-9	-36
<b>0.05</b>	1	6	-5	-14	-8	-18	8	-7

**Phase B:**

	120 90°Lag	120 30°Lag	240 90°Lag	240 30°Lag	480 90°Lag	480 30°Lag	600 90°Lag	600 30°Lag
<b>Amps</b>								
<b>0.005</b>	-5	-19	0	-20	0	-41	9	-35
<b>0.02</b>	-19	-28	-15	-32	-9	-40	8	-29
<b>0.05</b>	-3	-4	2	-16	5	-18	25	-4

**Phase C:**

	120 90°Lag	120 30°Lag	240 90°Lag	240 30°Lag	480 90°Lag	480 30°Lag	600 90°Lag	600 30°Lag
<b>Amps</b>								
<b>0.005</b>	-3	-19	-6	-63	-2	-42	-24	-75
<b>0.02</b>	-11	-50	-12	-39	-22	-52	-7	-41
<b>0.05</b>	-4	-16	-5	-29	-16	-28	1	-28

**Total:**

	120 90°Lag	120 30°Lag	240 90°Lag	240 30°Lag	480 90°Lag	480 30°Lag	600 90°Lag	600 30°Lag
<b>Amps</b>								
<b>0.005</b>	-9	-22	-6	-47	-6	-42	-8	-56
<b>0.02</b>	-15	-34	-17	-36	-18	-45	-3	-35
<b>0.05</b>	-2	-4	-3	-20	-7	-21	11	-13
<b>Average</b>	-8	-20	-9	-34	-10	-36	0	-35
<b>Minimum</b>	-19	-50	-24	-63	-23	-52	-24	-75
<b>Maximum</b>	1	6	2	-14	5	-18	25	-4

<b>Overall</b>	90°Lag	30°Lag
<b>Average</b>	-7	-31
<b>Minimum</b>	-24	-75
<b>Maximum</b>	25	6

# Calibration Report

## RX-33-PQ/AS Xytronic Portable Standard

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

Date..... 11-Dec-18      Uncertainty at Unity..... 12

Serial Number..... 000000      Uncertainty at 60° Phase Angle.... 23

The following data was collected by a Radian Research RS-933 Automated Calibration System. The RS-933 VAh calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards, traceable to the SI through the National Institute of Standards and Technology (NIST) and/or other National Metrology Institute (NMI). Test time is 2 seconds and stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as  $\mu$ VAh/VAh. The RS-933 Automated Calibration System has at least a 2 times greater accuracy than the instrument under test. The results presented on this page are compliant with ANSI/NCSL Z540-1-1994. Results are accredited to ISO/IEC 17025:2005.

### Voltage & Phase Angle

Amps	120	120	120	240	240	240	480	480	480	600	600	600
	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead
0.2	17	2	25	18	5	23	17	13	26	30	16	34
0.25	25	15	34	30	15	31	25	19	37	36	26	42
0.5	17	-2	19	17	0	19	14	7	21	30	7	27
1	22	19	34	21	17	32	21	24	38	33	24	40
2.5	4	-3	10	4	-2	7	2	4	10	17	5	18
3	4	-12	11	7	-8	8	6	-5	11	20	-2	17
5	18	9	28	19	8	27	18	13	31	31	16	34
10	14	4	21	17	5	17	14	11	24	28	8	25
15	19	11	32	24	10	29	23	16	35	37	21	37
20	7	-1	19	10	-2	15	11	6	21	23	7	25
30	17	4	27	19	2	23	19	10	30	30	12	32
40	17	5	27	18	4	24	19	11	28	32	14	32
50	16	-1	21	24	-3	19	19	3	23	31	12	27
60	22	15	22	24	12	20	26	20	22	38	23	26
100	13	7	11	14	3	11	15	12	13	30	11	19
120	17	7	12	18	4	10	17	13	13	29	14	16
180	7	-1	5	8	-4	3	10	6	5	23	9	11
200	9	0	3	11	-6	2	11	5	3	23	7	12

Average	15	4	20	17	3	18	16	10	22	29	13	26
Minimum	4	-12	3	4	-8	2	2	-5	3	17	-2	11
Maximum	25	19	34	30	17	32	26	24	38	38	26	42

Overall	Unity PF	0.5 Lag	0.5 Lead
Average	19	8	21
Minimum	2	-12	2
Maximum	38	26	42

# Calibration Report

## RX-33-PQ/AS Xytronic Portable Standard

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

Date..... 11-Dec-18      Uncertainty at Unity..... 12

Serial Number..... 000000      Uncertainty at 60° Phase Angle.... 23

The following data was collected by a Radian Research RS-933 Automated Calibration System. The RS-933 VAh calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards, traceable to the SI through the National Institute of Standards and Technology (NIST) and/or other National Metrology Institute (NMI). Test time is 2 seconds and stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as  $\mu$ VAh/VAh. The RS-933 Automated Calibration System has at least a 2 times greater accuracy than the instrument under test. The results presented on this page are compliant with ANSI/NCSL Z540-1-1994. Results are accredited to ISO/IEC 17025:2005.

### Voltage & Phase Angle

Amps	120	120	120	240	240	240	480	480	480	600	600	600
	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead
0.2	3	-8	19	1	-11	8	-1	-7	9	15	-1	17
0.25	15	7	31	14	4	21	14	8	23	32	12	31
0.5	6	-14	13	5	-14	3	3	-9	6	20	-3	14
1	2	-1	19	4	-3	14	-1	-1	17	16	7	21
2.5	0	-6	5	-1	-9	-3	-6	-7	2	10	-1	9
3	0	-15	9	0	-19	1	-3	-14	3	13	-7	10
5	0	-11	10	-2	-14	3	-4	-11	8	11	-5	18
10	-6	-15	3	-6	-18	-5	-7	-14	0	10	-10	6
15	6	-6	18	6	-7	10	3	-2	13	20	2	20
20	-9	-18	4	-6	-22	-3	-10	-16	0	5	-10	7
30	4	-10	16	2	-14	10	1	-9	12	18	-1	16
40	0	-15	12	2	-16	5	-1	-9	9	14	-4	17
50	4	-20	10	2	-24	4	1	-15	8	17	-7	13
60	10	-3	11	11	-6	7	8	2	7	25	7	15
100	6	-8	6	6	-11	2	8	-2	3	22	5	11
120	10	1	12	10	-5	6	11	4	7	28	11	15
180	4	-7	7	4	-14	0	4	-2	2	22	4	8
200	4	-7	10	3	-13	1	5	-2	2	23	5	10

Average	3	-9	12	3	-12	5	1	-6	7	18	0	14
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Minimum	-9	-20	3	-6	-24	-5	-10	-16	0	5	-10	6
Maximum	15	7	31	14	4	21	14	8	23	32	12	31

Overall	Unity PF	0.5 Lag	0.5 Lead
Average	6	-7	10
Minimum	-10	-24	-5
Maximum	32	12	31

# Calibration Report

## RX-33-PQ/AS Xytronic Portable Standard

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

Date..... 11-Dec-18      Uncertainty at Unity..... 12

Serial Number..... 000000      Uncertainty at 60° Phase Angle.... 23

The following data was collected by a Radian Research RS-933 Automated Calibration System. The RS-933 VAh calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards, traceable to the SI through the National Institute of Standards and Technology (NIST) and/or other National Metrology Institute (NMI). Test time is 2 seconds and stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as  $\mu$ VAh/VAh. The RS-933 Automated Calibration System has at least a 2 times greater accuracy than the instrument under test. The results presented on this page are compliant with ANSI/NCSL Z540-1-1994. Results are accredited to ISO/IEC 17025:2005.

### Voltage & Phase Angle

Amps	120	120	120	240	240	240	480	480	480	600	600	600
	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead
0.2	1	-15	13	7	-7	12	7	0	15	20	7	24
0.25	9	-2	22	16	3	22	17	12	28	29	16	35
0.5	-1	-22	5	0	-16	4	4	-8	8	20	-4	14
1	-2	-6	13	5	0	12	4	7	23	20	12	24
2.5	-8	-14	0	0	-9	0	-2	-2	5	16	4	15
3	-5	-19	2	5	-16	4	3	-8	8	18	-3	15
5	-9	-18	6	-1	-13	6	-2	-4	9	15	-2	17
10	-9	-19	-1	3	-15	1	0	-6	8	15	-3	14
15	6	-6	17	15	-2	19	12	6	24	28	9	26
20	-8	-20	2	-1	-14	3	0	-4	8	16	-4	17
30	5	-12	18	15	-7	18	15	2	25	29	7	28
40	-3	-16	7	3	-12	10	7	-5	14	19	0	22
50	1	-24	3	7	-19	7	10	-8	14	22	-3	18
60	8	-5	8	14	-2	10	15	11	15	33	14	21
100	23	13	21	29	20	28	34	29	31	46	33	37
120	23	11	18	30	15	25	33	23	28	48	31	33
180	3	-8	1	11	-3	6	15	7	8	30	9	17
200	7	-4	4	15	-4	8	18	8	11	35	13	19

<b>Average</b>	2	-10	9	10	-6	11	10	3	16	25	7	22
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<b>Minimum</b>	-9	-24	-1	-1	-19	0	-2	-8	5	15	-4	14
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<b>Maximum</b>	23	13	22	30	20	28	34	29	31	48	33	37
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<b>Overall</b>	Unity PF	0.5 Lag	0.5 Lead
<b>Average</b>	12	-1	14
<b>Minimum</b>	-9	-24	-1
<b>Maximum</b>	48	33	37



# Calibration Report

## RX-33-PQ/AS Xytronic Portable Standard

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

Date..... 11-Dec-18      Uncertainty at Unity..... 20

Serial Number..... 000000      Uncertainty at 60° Phase Angle.... 38

The following data was collected by a Radian Research RS-933 Automated Calibration System. The RS-933 VAh calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards, traceable to the SI through the National Institute of Standards and Technology (NIST) and/or other National Metrology Institute (NMI). Test time is 2 seconds and stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as  $\mu$ VAh/VAh. The RS-933 Automated Calibration System has at least a 2 times greater accuracy than the instrument under test. The results presented on this page are compliant with ANSI/NCSL Z540-1-1994. Results are accredited to ISO/IEC 17025:2005.

### Voltage & Phase Angle

Amps	120	120	120	240	240	240	480	480	480	600	600	600
	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead
0.2	7	-7	19	9	-4	15	8	2	17	21	7	25
0.25	16	7	29	20	7	25	18	13	29	32	18	36
0.5	7	-13	12	7	-10	9	7	-3	12	23	0	18
1	7	4	22	10	5	19	8	10	26	23	14	28
2.5	-1	-8	5	1	-7	1	-2	-2	6	14	3	14
3	0	-15	8	4	-14	4	2	-9	7	17	-4	14
5	3	-7	15	6	-6	12	4	-1	16	19	3	23
10	0	-10	8	4	-10	4	2	-3	11	18	-2	15
15	11	0	22	15	0	19	13	7	24	28	11	28
20	-3	-13	8	1	-13	5	0	-5	10	15	-2	16
30	9	-6	20	12	-6	17	12	1	23	26	6	25
40	5	-9	15	8	-8	13	8	-1	17	22	3	24
50	7	-15	12	11	-15	10	10	-6	15	23	0	19
60	13	2	14	16	2	12	16	11	15	32	14	20
100	14	4	13	16	4	14	19	13	16	33	16	22
120	17	6	14	19	5	14	21	13	16	35	19	21
180	5	-5	4	7	-7	3	10	4	5	25	7	12
200	7	-3	6	10	-8	4	12	4	6	27	8	14

Average	7	-5	14	10	-5	11	9	3	15	24	7	21
Minimum	-3	-15	4	1	-15	1	-2	-9	5	14	-4	12
Maximum	17	7	29	20	7	25	21	13	29	35	19	36

Overall	Unity PF	0.5 Lag	0.5 Lead
Average	12	0	15
Minimum	-3	-15	1
Maximum	35	19	36

# Calibration Report

RX-33-PQ/AS Xytronic Portable Standard

Function.....VA-hour RMS      60 Hz

Date..... 11-Dec-18

Serial Number..... 000000

The following data was collected by a Radian Research RS-933 Automated Calibration System. The RS-933 VA-hour calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards, traceable to the SI through the National Institute of Standards and Technology (NIST) and/or other National Metrology Institute (NMI). Test time is 5 seconds and stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as  $\mu\text{VAh}/\text{VAh}$ . The RS-933 Automated Calibration System has at least a 2 times greater accuracy than the instrument under test. The results presented on this page are compliant with ANSI/NC SL Z540-1-1994. They are not within Radian 's 17025 Scope of Accreditation.

## Voltage & Phase Angle

		120	120	120	240	240	240	480	480	480	600	600	600
		Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead
<b>Phase A:</b>	<b>Amps</b>												
	<b>0.005</b>	7	-9	-4	6	-2	7	15	-25	10	12	-4	42
	<b>0.02</b>	-8	-14	-12	-13	-23	-13	-18	-30	-17	1	-11	5
	<b>0.05</b>	6	4	3	6	0	6	-1	-8	-3	21	10	17
<b>Phase B:</b>	<b>Amps</b>												
	<b>0.005</b>	17	11	17	17	8	19	11	18	33	31	31	45
	<b>0.02</b>	-3	0	-3	6	-4	2	1	-6	1	21	14	17
	<b>0.05</b>	14	8	11	16	15	14	12	9	13	35	31	30
<b>Phase C:</b>	<b>Amps</b>												
	<b>0.005</b>	0	-28	-15	5	-3	-10	-1	-31	10	-10	12	9
	<b>0.02</b>	-5	-7	-4	-12	-17	-11	-17	-23	-15	-1	-4	2
	<b>0.05</b>	2	2	3	3	-1	0	-1	-11	-7	15	8	10
<b>Total:</b>	<b>Amps</b>												
	<b>0.005</b>	8	-9	-1	10	1	5	9	-13	18	11	13	32
	<b>0.02</b>	-5	-7	-6	-6	-14	-7	-11	-20	-10	7	0	8
	<b>0.05</b>	7	5	6	8	4	6	3	-3	1	24	16	19
<b>Average</b>	3	-4	0	4	-3	1	0	-12	3	14	10	20	
<b>Minimum</b>	-8	-28	-15	-13	-23	-13	-18	-31	-17	-10	-11	2	
<b>Maximum</b>	17	11	17	17	15	19	15	18	33	35	31	45	

<u>Overall</u>	Unity PF	0.5 Lag	0.5 Lead
<b>Average</b>	5	-2	6
<b>Minimum</b>	-18	-31	-17
<b>Maximum</b>	35	31	45

# Calibration Report

## RX-33-PQ/AS Xytronic Portable Standard

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

Date..... 11-Dec-18      Uncertainty at Unity..... 12

Serial Number..... 000000      Uncertainty at 60° Phase Angle.... 23

The following data was collected by a Radian Research RS-933 Automated Calibration System. The RS-933 VA calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards, traceable to the SI through the National Institute of Standards and Technology (NIST) and/or other National Metrology Institute (NMI). Test time is 2 seconds and stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as  $\mu\text{VA}/\text{VA}$ . The RS-933 Automated Calibration System has at least a 2 times greater accuracy than the instrument under test. The results presented on this page are compliant with ANSI/NCSL Z540-1-1994. Results are accredited to ISO/IEC 17025:2005.

### Voltage & Phase Angle

Amps	120	120	120	240	240	240	480	480	480	600	600	600
	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead
0.2	17	2	25	18	5	23	17	13	26	30	16	34
0.25	25	15	35	30	15	31	25	19	37	36	26	42
0.5	17	-2	19	17	0	19	13	6	21	29	7	27
1	22	18	34	22	17	32	21	24	38	34	24	40
2.5	4	-3	10	4	-2	7	2	4	10	16	5	18
3	4	-12	11	7	-8	7	7	-5	11	20	-3	18
5	17	9	28	19	8	27	17	13	31	30	16	34
10	14	4	21	16	4	17	14	11	23	28	8	25
15	19	11	32	24	10	29	23	16	34	37	20	37
20	7	-1	19	10	-2	15	10	6	21	23	7	25
30	16	4	27	19	2	23	19	9	29	29	12	32
40	17	5	27	18	4	24	19	11	28	32	14	32
50	17	-1	21	24	-3	19	19	3	23	30	11	27
60	22	14	22	24	12	19	25	20	21	38	23	25
100	13	7	11	13	3	10	14	12	13	29	11	19
120	16	7	12	18	4	9	17	12	13	28	14	16
180	7	-2	4	7	-4	2	9	5	4	22	9	11
200	9	0	2	11	-6	2	11	5	3	22	7	12

<b>Average</b>	15	4	20	17	3	18	16	10	21	29	13	26
<b>Minimum</b>	4	-12	2	4	-8	2	2	-5	3	16	-3	11
<b>Maximum</b>	25	18	35	30	17	32	25	24	38	38	26	42

<b>Overall</b>	Unity PF	0.5 Lag	0.5 Lead
<b>Average</b>	19	8	21
<b>Minimum</b>	2	-12	2
<b>Maximum</b>	38	26	42

# Calibration Report

## RX-33-PQ/AS Xytronic Portable Standard

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

Date..... 11-Dec-18      Uncertainty at Unity..... 12

Serial Number..... 000000      Uncertainty at 60° Phase Angle.... 23

The following data was collected by a Radian Research RS-933 Automated Calibration System. The RS-933 VA calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards, traceable to the SI through the National Institute of Standards and Technology (NIST) and/or other National Metrology Institute (NMI). Test time is 2 seconds and stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as  $\mu\text{VA}/\text{VA}$ . The RS-933 Automated Calibration System has at least a 2 times greater accuracy than the instrument under test. The results presented on this page are compliant with ANSI/NCSL Z540-1-1994. Results are accredited to ISO/IEC 17025:2005.

### Voltage & Phase Angle

Amps	120	120	120	240	240	240	480	480	480	600	600	600
	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead
0.2	3	-8	19	1	-11	8	-1	-7	9	15	-1	16
0.25	15	8	31	15	4	21	14	9	24	32	12	31
0.5	6	-14	13	5	-13	3	3	-8	6	21	-3	14
1	2	-1	19	4	-3	14	-2	-2	17	16	6	21
2.5	0	-6	5	0	-9	-3	-5	-7	2	10	-1	8
3	0	-15	9	-1	-19	1	-3	-14	3	13	-7	10
5	0	-11	10	-1	-14	3	-4	-11	8	11	-5	17
10	-6	-15	3	-7	-18	-5	-8	-14	0	10	-10	7
15	7	-6	18	6	-7	10	4	-2	13	20	2	20
20	-8	-18	4	-6	-22	-3	-10	-16	0	5	-10	7
30	4	-11	15	3	-14	9	1	-8	12	18	-1	16
40	0	-15	12	2	-16	5	-1	-9	9	14	-3	17
50	4	-20	10	2	-24	4	1	-15	7	17	-7	13
60	10	-3	11	11	-6	7	8	2	8	24	6	15
100	6	-8	7	6	-11	2	7	-2	3	22	4	11
120	10	0	12	10	-5	6	11	4	7	28	11	15
180	3	-8	6	3	-14	0	4	-2	2	22	3	7
200	4	-6	10	3	-13	1	5	-2	2	23	4	10

Average	3	-9	12	3	-12	5	1	-6	7	18	0	14
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Minimum	-8	-20	3	-7	-24	-5	-10	-16	0	5	-10	7
Maximum	15	8	31	15	4	21	14	9	24	32	12	31

Overall	Unity PF	0.5 Lag	0.5 Lead
Average	6	-7	10
Minimum	-10	-24	-5
Maximum	32	12	31

# Calibration Report

## RX-33-PQ/AS Xytronic Portable Standard

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

Date..... 11-Dec-18      Uncertainty at Unity..... 12

Serial Number..... 000000      Uncertainty at 60° Phase Angle.... 23

The following data was collected by a Radian Research RS-933 Automated Calibration System. The RS-933 VA calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards, traceable to the SI through the National Institute of Standards and Technology (NIST) and/or other National Metrology Institute (NMI). Test time is 2 seconds and stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as  $\mu\text{VA}/\text{VA}$ . The RS-933 Automated Calibration System has at least a 2 times greater accuracy than the instrument under test. The results presented on this page are compliant with ANSI/NCSL Z540-1-1994. Results are accredited to ISO/IEC 17025:2005.

### Voltage & Phase Angle

Amps	120	120	120	240	240	240	480	480	480	600	600	600
	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead
0.2	0	-15	13	7	-7	13	7	0	15	20	7	24
0.25	9	-2	21	16	3	23	16	13	27	30	16	36
0.5	-1	-22	5	1	-16	4	4	-8	8	20	-4	15
1	-2	-6	13	5	-1	12	4	7	23	20	12	24
2.5	-8	-15	-1	0	-9	0	-2	-2	5	16	4	15
3	-4	-19	2	5	-16	4	3	-9	8	18	-2	15
5	-9	-19	6	-1	-13	6	-1	-4	9	15	-3	17
10	-9	-19	-1	3	-16	1	0	-6	9	16	-3	15
15	7	-6	18	16	-2	19	13	6	24	28	9	26
20	-8	-21	2	-1	-15	3	0	-5	8	16	-4	17
30	5	-12	18	15	-7	18	15	2	25	29	7	28
40	-3	-16	7	4	-12	10	7	-5	14	19	0	22
50	0	-24	3	7	-20	7	10	-8	14	22	-3	18
60	8	-5	8	14	-2	10	14	11	15	33	14	21
100	23	13	22	29	19	28	34	29	31	46	33	37
120	24	11	19	30	15	25	34	23	28	48	31	33
180	3	-8	1	11	-2	6	15	6	8	30	9	17
200	7	-4	4	15	-4	8	19	8	11	34	13	19

Average	2	-10	9	10	-6	11	10	3	16	25	7	22
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Minimum	-9	-24	-1	-1	-20	0	-2	-9	5	15	-4	15
Maximum	24	13	22	30	19	28	34	29	31	48	33	37

Overall	Unity PF	0.5 Lag	0.5 Lead
Average	12	-1	14
Minimum	-9	-24	-1
Maximum	48	33	37

# Calibration Report

## RX-33-PQ/AS Xytronic Portable Standard

Function..... VA RMS      60 Hz      Total

Date..... 11-Dec-18      Uncertainty at Unity..... 20

Serial Number..... 000000      Uncertainty at 60° Phase Angle.... 38

The following data was collected by a Radian Research RS-933 Automated Calibration System. The RS-933 VA calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards, traceable to the SI through the National Institute of Standards and Technology (NIST) and/or other National Metrology Institute (NMI). Test time is 2 seconds and stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as  $\mu\text{VA}/\text{VA}$ . The RS-933 Automated Calibration System has at least a 2 times greater accuracy than the instrument under test. The results presented on this page are compliant with ANSI/NCSL Z540-1-1994. Results are accredited to ISO/IEC 17025:2005.

### Voltage & Phase Angle

Amps	120	120	120	240	240	240	480	480	480	600	600	600
	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead
0.2	7	-7	19	9	-4	14	8	2	17	21	7	25
0.25	16	7	29	20	7	25	18	13	29	32	18	36
0.5	7	-13	12	7	-10	9	7	-3	12	23	0	18
1	7	4	22	10	5	19	8	10	26	23	14	29
2.5	-2	-8	5	1	-7	1	-2	-2	6	14	3	14
3	0	-15	8	4	-14	4	2	-9	7	17	-4	14
5	3	-7	15	5	-6	12	4	-1	16	19	3	23
10	0	-10	8	4	-10	4	2	-3	11	18	-2	15
15	11	0	22	15	0	19	13	7	24	28	10	28
20	-3	-13	8	1	-13	5	0	-5	10	15	-2	16
30	8	-6	20	12	-6	17	12	1	22	25	6	25
40	5	-9	15	8	-8	13	8	-1	17	22	3	24
50	7	-15	12	11	-15	10	10	-7	15	23	0	19
60	13	2	14	16	1	12	16	11	15	32	14	20
100	14	4	13	16	4	13	18	13	15	32	16	22
120	17	6	14	19	5	14	21	13	16	35	19	21
180	4	-6	4	7	-7	3	9	3	5	25	7	12
200	7	-3	5	10	-8	3	12	4	6	26	8	13

Average	7	-5	14	10	-5	11	9	3	15	24	7	21
Minimum	-3	-15	4	1	-15	1	-2	-9	5	14	-4	12
Maximum	17	7	29	20	7	25	21	13	29	35	19	36

Overall	Unity PF	0.5 Lag	0.5 Lead
Average	12	0	15
Minimum	-3	-15	1
Maximum	35	19	36

# Calibration Report

RX-33-PQ/AS Xytronic Portable Standard

Function..... VA RMS      60 Hz

Date..... 11-Dec-18

Serial Number..... 000000

The following data was collected by a Radian Research RS-933 Automated Calibration System. The RS-933 VA calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards, traceable to the SI through the National Institute of Standards and Technology (NIST) and/or other National Metrology Institute (NMI). Test time is 5 seconds and stabilization time in between points is 5 seconds. For lagging power factors the current lags the voltage. All results are listed as  $\mu\text{VA}/\text{VA}$ . The RS-933 Automated Calibration System has at least a 2 times greater accuracy than the instrument under test. The results presented on this page are compliant with ANSI/NCSS Z540-1-1994. They are not within Radian 's 17025 Scope of Accreditation.

## Voltage & Phase Angle

Phase A:		120	120	120	240	240	240	480	480	480	600	600	600
		Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead
Amps													
0.005		7	-8	-5	6	-1	7	15	-25	10	13	-4	42
0.02		-7	-15	-12	-13	-23	-13	-18	-30	-17	1	-12	5
0.05		7	4	3	6	0	6	-1	-8	-4	21	11	16
Phase B:		120	120	120	240	240	240	480	480	480	600	600	600
		Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead
Amps													
0.005		17	11	18	17	7	20	13	18	32	32	31	46
0.02		-2	-1	-3	5	-4	1	0	-7	1	22	14	17
0.05		14	9	11	16	15	13	12	9	13	35	30	31
Phase C:		120	120	120	240	240	240	480	480	480	600	600	600
		Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead
Amps													
0.005		0	-28	-16	6	-3	-8	1	-30	10	-10	13	9
0.02		-5	-8	-4	-12	-17	-11	-17	-23	-15	-1	-4	2
0.05		2	2	3	3	-1	0	-1	-10	-7	15	8	10
Total:		120	120	120	240	240	240	480	480	480	600	600	600
		Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead	Unity PF	0.5 Lag	0.5 Lead
Amps													
0.005		8	-9	-1	9	1	6	9	-13	17	12	13	32
0.02		-5	-8	-6	-7	-15	-8	-12	-20	-10	7	0	8
0.05		8	5	5	8	4	6	3	-3	1	24	16	19
Average		3	-4	-1	4	-3	2	0	-12	3	14	10	20
Minimum		-7	-28	-16	-13	-23	-13	-18	-30	-17	-10	-12	2
Maximum		17	11	18	17	15	20	15	18	32	35	31	46

<u>Overall</u>	Unity PF	0.5 Lag	0.5 Lead
Average	5	-2	6
Minimum	-18	-30	-17
Maximum	35	31	46

# Calibration Report

**RX-33-PQ/AS Xytronic Portable Standard**

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

**Date..... 11-Dec-18**

**Serial Number..... 000000**

The following data was collected by a Radian Research RS-933 Automated Calibration System. The RS-933 Volt calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards, traceable to the SI through the National Institute of Standards and Technology (NIST) and/or other National Metrology Institute (NMI). 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  $\mu\text{V}/\text{V}$ . The RS-933 Automated Calibration System has at least a 2 times greater accuracy than the Instrument under test. The results presented on this page are compliant with ANSI/NCSL Z540-1-1994. They are not within Radian 's 17025 Scope of Accreditation.

**Voltage**

	<b>V RMS</b>	<b>Vh RMS</b>	<b>V2h RMS</b>
<b>60</b>	-1	-1	-1
<b>80</b>	-1	-1	-2
<b>100</b>	-17	-17	-35
<b>120</b>	0	0	-1
<b>140</b>	3	3	5
<b>160</b>	-6	-6	-13
<b>180</b>	-2	-2	-5
<b>200</b>	-4	-4	-7
<b>220</b>	-3	-4	-7
<b>240</b>	0	0	1
<b>260</b>	2	2	5
<b>280</b>	3	3	7
<b>300</b>	7	7	13
<b>320</b>	-5	-5	-9
<b>340</b>	-9	-9	-18
<b>360</b>	-6	-6	-12
<b>380</b>	-6	-6	-12
<b>400</b>	-8	-8	-16
<b>420</b>	-5	-5	-10
<b>440</b>	-3	-2	-5
<b>460</b>	-1	-1	-2
<b>480</b>	-3	-3	-6
<b>500</b>	0	0	0
<b>520</b>	2	2	3
<b>540</b>	2	2	3
<b>560</b>	4	4	8
<b>580</b>	8	8	16
<b>600</b>	13	13	26
<b>Average</b>	<b>-1</b>	<b>-1</b>	<b>-3</b>
<b>Minimum</b>	<b>-17</b>	<b>-17</b>	<b>-35</b>
<b>Maximum</b>	<b>13</b>	<b>13</b>	<b>26</b>



# Calibration Report

## RX-33-PQ/AS Xytronic Portable Standard

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

**Date..... 11-Dec-18**

**Serial Number..... 000000**

The following data was collected by a Radian Research RS-933 Automated Calibration System. The RS-933 Volt calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards, traceable to the SI through the National Institute of Standards and Technology (NIST) and/or other National Metrology Institute (NMI). 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  $\mu\text{V/V}$ . The RS-933 Automated Calibration System has at least a 2 times greater accuracy than the Instrument under test. The results presented on this page are compliant with ANSI/NCSL Z540-1-1994. They are not within Radian 's 17025 Scope of Accreditation.

**Voltage**

	<b>V RMS</b>	<b>Vh RMS</b>	<b>V2h RMS</b>
<b>60</b>	-1	-1	-2
<b>80</b>	6	5	11
<b>100</b>	2	2	5
<b>120</b>	4	4	8
<b>140</b>	9	9	19
<b>160</b>	0	0	1
<b>180</b>	-1	-1	-3
<b>200</b>	2	2	5
<b>220</b>	1	2	3
<b>240</b>	1	1	2
<b>260</b>	5	5	10
<b>280</b>	8	8	16
<b>300</b>	9	9	19
<b>320</b>	-4	-4	-7
<b>340</b>	-4	-4	-9
<b>360</b>	-3	-3	-5
<b>380</b>	-5	-5	-10
<b>400</b>	-4	-5	-10
<b>420</b>	-2	-1	-2
<b>440</b>	-1	-1	-2
<b>460</b>	2	2	5
<b>480</b>	1	2	3
<b>500</b>	2	2	4
<b>520</b>	5	6	11
<b>540</b>	7	8	15
<b>560</b>	9	9	18
<b>580</b>	12	12	24
<b>600</b>	15	15	30
<b>Average</b>	<b>3</b>	<b>3</b>	<b>6</b>
<b>Minimum</b>	-5	-5	-10
<b>Maximum</b>	15	15	30

# Calibration Report

**RX-33-PQ/AS Xytronic Portable Standard**

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

**Date..... 11-Dec-18**

**Serial Number..... 000000**

The following data was collected by a Radian Research RS-933 Automated Calibration System. The RS-933 Volt calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards, traceable to the SI through the National Institute of Standards and Technology (NIST) and/or other National Metrology Institute (NMI). 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  $\mu\text{V}/\text{V}$ . The RS-933 Automated Calibration System has at least a 2 times greater accuracy than the Instrument under test. The results presented on this page are compliant with ANSI/NCSL Z540-1-1994. They are not within Radian 's 17025 Scope of Accreditation.

**Voltage**

	<b>V RMS</b>	<b>Vh RMS</b>	<b>V2h RMS</b>
<b>60</b>	1	1	3
<b>80</b>	-3	-4	-7
<b>100</b>	-5	-5	-9
<b>120</b>	-3	-3	-6
<b>140</b>	-1	-1	-2
<b>160</b>	-2	-2	-5
<b>180</b>	-3	-3	-7
<b>200</b>	-5	-5	-10
<b>220</b>	-4	-4	-8
<b>240</b>	-1	-1	-3
<b>260</b>	-1	-1	-1
<b>280</b>	2	1	3
<b>300</b>	6	6	12
<b>320</b>	-6	-6	-12
<b>340</b>	-5	-5	-11
<b>360</b>	-7	-7	-13
<b>380</b>	-6	-6	-12
<b>400</b>	-6	-6	-12
<b>420</b>	-4	-4	-8
<b>440</b>	-1	-1	-2
<b>460</b>	-4	-3	-7
<b>480</b>	0	0	0
<b>500</b>	1	2	3
<b>520</b>	3	3	6
<b>540</b>	5	5	10
<b>560</b>	7	7	13
<b>580</b>	9	9	17
<b>600</b>	11	11	22
<b>Average</b>	-1	-1	-2
<b>Minimum</b>	-7	-7	-13
<b>Maximum</b>	11	11	22

# Calibration Report

**RX-33-PQ/AS Xytronic Portable Standard**

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

**Date..... 11-Dec-18**

**Serial Number..... 000000**

The following data was collected by a Radian Research RS-933 Automated Calibration System. The RS-933 Amp calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards, traceable to the SI through the National Institute of Standards and Technology (NIST) and/or other National Metrology Institute (NMI). 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  $\mu\text{A/A}$ . The RS-933 Automated Calibration System has at least a 2 times greater accuracy than the Instrument under test. The results presented on this page are compliant with ANSI/NCSL Z540-1-1994. They are not within Radian 's 17025 Scope of Accreditation.

**Amps**

	<b>A RMS</b>	<b>Ah RMS</b>	<b>A2h RMS</b>
<b>0.2</b>	9	9	18
<b>0.25</b>	24	24	48
<b>0.5</b>	11	11	23
<b>1</b>	17	16	33
<b>2.5</b>	-2	-2	-4
<b>3</b>	2	2	4
<b>5</b>	6	7	13
<b>10</b>	7	7	14
<b>15</b>	13	13	26
<b>20</b>	2	2	5
<b>30</b>	12	13	25
<b>40</b>	5	6	12
<b>50</b>	9	9	17
<b>60</b>	13	13	25
<b>100</b>	7	7	14
<b>120</b>	8	8	17
<b>180</b>	-3	-2	-5
<b>200</b>	2	2	4

<b>Average</b>	<b>8</b>	<b>8</b>	<b>16</b>
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<b>Minimum</b>	<b>-3</b>	<b>-2</b>	<b>-5</b>
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<b>Maximum</b>	<b>24</b>	<b>24</b>	<b>48</b>
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# Calibration Report

**RX-33-PQ/AS Xytronic Portable Standard**

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

**Date..... 11-Dec-18**

**Serial Number..... 000000**

The following data was collected by a Radian Research RS-933 Automated Calibration System. The RS-933 Amp calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards, traceable to the SI through the National Institute of Standards and Technology (NIST) and/or other National Metrology Institute (NMI). 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  $\mu A/A$ . The RS-933 Automated Calibration System has at least a 2 times greater accuracy than the Instrument under test. The results presented on this page are compliant with ANSI/NCSL Z540-1-1994. They are not within Radian 's 17025 Scope of Accreditation.

**Amps**

	<b>A RMS</b>	<b>Ah RMS</b>	<b>A2h RMS</b>
<b>0.2</b>	1	1	2
<b>0.25</b>	21	22	43
<b>0.5</b>	8	8	16
<b>1</b>	3	4	7
<b>2.5</b>	0	0	0
<b>3</b>	3	4	7
<b>5</b>	-3	-3	-7
<b>10</b>	-6	-6	-11
<b>15</b>	9	8	16
<b>20</b>	-7	-7	-13
<b>30</b>	6	6	12
<b>40</b>	-5	-5	-11
<b>50</b>	1	1	2
<b>60</b>	8	9	17
<b>100</b>	-1	-1	-1
<b>120</b>	3	3	5
<b>180</b>	-1	0	-1
<b>200</b>	4	4	8

**Average**

<b>3</b>	<b>3</b>	<b>5</b>
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**Minimum**

<b>-7</b>	<b>-7</b>	<b>-13</b>
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**Maximum**

<b>21</b>	<b>22</b>	<b>43</b>
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# Calibration Report

**RX-33-PQ/AS Xytronic Portable Standard**

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

**Date..... 11-Dec-18**

**Serial Number..... 000000**

The following data was collected by a Radian Research RS-933 Automated Calibration System. The RS-933 Amp calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards, traceable to the SI through the National Institute of Standards and Technology (NIST) and/or other National Metrology Institute (NMI). 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  $\mu A/A$ . The RS-933 Automated Calibration System has at least a 2 times greater accuracy than the Instrument under test. The results presented on this page are compliant with ANSI/NCSL Z540-1-1994. They are not within Radian 's 17025 Scope of Accreditation.

**Amps**

	<b>A RMS</b>	<b>Ah RMS</b>	<b>A2h RMS</b>
<b>0.2</b>	1	2	3
<b>0.25</b>	21	21	42
<b>0.5</b>	8	8	16
<b>1</b>	4	4	8
<b>2.5</b>	-1	-1	-2
<b>3</b>	3	3	6
<b>5</b>	-5	-5	-10
<b>10</b>	-6	-6	-13
<b>15</b>	10	10	19
<b>20</b>	-6	-6	-12
<b>30</b>	9	9	18
<b>40</b>	-3	-3	-7
<b>50</b>	3	4	7
<b>60</b>	11	11	23
<b>100</b>	18	18	37
<b>120</b>	19	19	37
<b>180</b>	0	0	0
<b>200</b>	0	0	1

<b>Average</b>	<b>5</b>	<b>5</b>	<b>10</b>
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<b>Minimum</b>	<b>-6</b>	<b>-6</b>	<b>-13</b>
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<b>Maximum</b>	<b>21</b>	<b>21</b>	<b>42</b>
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# Calibration Report

## RX-33-PQ/AS Xytronic Portable Standard

**Function..... Amps RMS      60 Hz**

**Date..... 11-Dec-18**

**Serial Number..... 000000**

The following data was collected by a Radian Research RS-933 Automated Calibration System. The RS-933 Amp calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards, traceable to the SI through the National Institute of Standards and Technology (NIST) and/or other National Metrology Institute (NMI). 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  $\mu A/A$ . The RS-933 Automated Calibration System has at least a 2 times greater accuracy than the Instrument under test. The results presented on this page are compliant with ANSI/NCSL Z540-1-1994. They are not within Radian 's 17025 Scope of Accreditation.

**Phase A:**

**Amps**

	<b>A RMS</b>	<b>Ah RMS</b>	<b>A2h RMS</b>
<b>0.005</b>	3	6	15
<b>0.02</b>	-2	-3	8
<b>0</b>	4	8	4

**Phase B:**

**Amps**

	<b>A RMS</b>	<b>Ah RMS</b>	<b>A2h RMS</b>
<b>0.005</b>	-9	-18	-9
<b>0.02</b>	-6	-12	2
<b>0.05</b>	5	9	-8

**Phase C:**

**Amps**

	<b>A RMS</b>	<b>Ah RMS</b>	<b>A2h RMS</b>
<b>0.005</b>	-19	-37	-5
<b>0.02</b>	-10	-21	-11
<b>0.05</b>	-1	-2	-9

<b>Average</b>	-4	-8	-1
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<b>Minimum</b>	-19	-37	-11
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<b>Maximum</b>	5	9	15
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# Calibration Report

## RX-33-PQ/AS Xytronic Portable Standard

**Mode.....**      **Frequency**                      **Phase A**

**Date.....**                      **11-Dec-18**

**Serial Number.....**      **000000**

The following data was collected by a Radian Research RS-933 Automated Calibration System. The RS-933 time base calibration is derived directly from a Keysight Technologies 53220A Universal Counter/Timer, traceable to the SI through the National Institute of Standards and Technology (NIST) and/or other National Metrology Institute (NMI). Test Time is 2 seconds with a stabilization of 2 seconds in between points. All Results are listed as Hz/MHz. The RS-933 Automated Calibration System has at least a 2 times greater accuracy than the instrument under test. The results presented on this page are compliant with ANSI/NCSL Z540-1-1994. They are not within Radian 's 17025 Scope of Accreditation.

### Frequency

<b>45</b>	-0.06
<b>46</b>	-0.03
<b>47</b>	-0.05
<b>48</b>	-0.02
<b>49</b>	-0.04
<b>50</b>	-0.03
<b>51</b>	-0.03
<b>52</b>	-0.01
<b>53</b>	-0.06
<b>54</b>	0.06
<b>55</b>	0.04
<b>56</b>	0.04
<b>57</b>	0.05
<b>58</b>	0.05
<b>59</b>	0.01
<b>60</b>	0.05
<b>61</b>	0.03
<b>62</b>	0.06
<b>63</b>	0.05
<b>64</b>	0.00
<b>65</b>	0.00

**Average**      **0.01**

**Minimum**      **-0.06**

**Maximum**      **0.06**

# Calibration Report

## RX-33-PQ/AS Xytronic Portable Standard

Mode..... Frequency Phase B

Date..... 11-Dec-18

Serial Number..... 000000

The following data was collected by a Radian Research RS-933 Automated Calibration System. The RS-933 time base calibration is derived directly from a Keysight Technologies 53220A Universal Counter/Timer, traceable to the SI through the National Institute of Standards and Technology (NIST) and/or other National Metrology Institute (NMI). Test Time is 2 seconds with a stabilization of 2 seconds in between points. All Results are listed as Hz/MHz. The RS-933 Automated Calibration System has at least a 2 times greater accuracy than the instrument under test. The results presented on this page are compliant with ANSI/NCSL Z540-1-1994. They are not within Radian 's 17025 Scope of Accreditation.

### Frequency

45	-0.07
46	-0.03
47	-0.05
48	0.00
49	-0.07
50	-0.03
51	-0.03
52	-0.02
53	-0.06
54	0.03
55	0.04
56	0.04
57	0.07
58	0.04
59	0.02
60	0.06
61	0.03
62	0.02
63	0.05
64	0.00
65	0.00

Average 0.00

Minimum -0.07

Maximum 0.07



# Calibration Report

## RX-33-PQ/AS Xytronic Portable Standard

**Mode..... Frequency Phase C**

**Date..... 11-Dec-18**

**Serial Number..... 000000**

The following data was collected by a Radian Research RS-933 Automated Calibration System. The RS-933 time base calibration is derived directly from a Keysight Technologies 53220A Universal Counter/Timer, traceable to the SI through the National Institute of Standards and Technology (NIST) and/or other National Metrology Institute (NMI). Test Time is 2 seconds with a stabilization of 2 seconds in between points. All Results are listed as Hz/MHz. The RS-933 Automated Calibration System has at least a 2 times greater accuracy than the instrument under test. The results presented on this page are compliant with ANSI/NCSL Z540-1-1994. They are not within Radian 's 17025 Scope of Accreditation.

### Frequency

45	-0.06
46	-0.03
47	-0.05
48	-0.02
49	-0.07
50	-0.03
51	-0.04
52	0.01
53	-0.07
54	0.06
55	0.06
56	0.04
57	0.05
58	0.04
59	0.00
60	0.05
61	0.03
62	0.03
63	0.01
64	0.00
65	0.00

**Average**

<b>0.00</b>
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**Minimum**

-0.07
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**Maximum**

0.06
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# Calibration Report

## RX-33-PQ/AS Xytronic Portable Standard

Function..... Phase      60 Hz                      Phase A  
 Date.....                      11-Dec-18  
 Serial Number.....      000000

The following data was collected by a Radian Research RS-933 Automated Calibration System. The RS-933 phase calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards, traceable to the SI through the National Institute of Standards and Technology (NIST) and/or other National Metrology Institute (NMI). The test time is 2 seconds and the stabilization time in between points is 2 seconds. For lagging power factors the current lags the voltage. All results are listed as  $\mu\text{rad}/\text{rad}$ . The RS-933 Automated Calibration System has at least a 2 times greater accuracy than the instrument under test. The results presented on this page are compliant with ANSI/NCSL Z540-1-1994. They are not within Radian's 17025 scope of accreditation.

### Voltage & Current

	120 1	120 5	120 15	120 30	120 50	240 1	240 5	240 15	240 30	240 50	480 1	480 5	480 15	480 30	480 50
Phase															
-180	-1	0	0	1	0	-1	0	0	0	1	0	0	0	-1	0
-150	0	0	1	1	0	-1	0	0	0	1	-1	0	0	0	0
-120	0	1	1	0	0	0	0	1	0	0	0	0	1	1	1
-90	0	1	1	0	0	0	0	1	0	0	0	0	1	2	1
-60	0	0	1	-1	0	-1	0	0	0	1	0	1	1	3	2
-30	0	0	0	0	0	-1	0	0	0	0	0	0	2	2	2
0	-1	0	0	0	0	-1	-1	0	0	0	-1	0	0	2	1
30	-1	0	0	0	0	-1	-1	0	0	0	-1	-1	0	0	1
60	-1	-1	0	1	1	-2	-1	-1	1	0	-2	-1	0	0	0
90	-2	-1	0	1	0	-2	-1	-1	1	0	-1	-1	-1	0	-1
120	-2	-1	-1	1	1	-2	-1	-1	0	0	-1	-1	0	-1	-1
150	-1	0	0	1	1	-1	-1	0	1	1	-1	-1	0	0	0
180	-1	0	0	1	0	-1	-1	0	0	0	-1	0	0	-1	0
<b>Average</b>	-1	0	0	0	0	-1	0	0	0	0	-1	0	0	0	1
<b>Minimum</b>	-2	-1	-1	-1	0	-2	-1	-1	0	0	-2	-1	-1	-1	-1
<b>Maximum</b>	0	1	1	1	1	0	0	1	1	1	0	1	2	3	2

# Calibration Report

## RX-33-PQ/AS Xytronic Portable Standard

Function..... Phase      60 Hz                      Phase B

Date..... 11-Dec-18

Serial Number..... 000000

The following data was collected by a Radian Research RS-933 Automated Calibration System. The RS-933 phase calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards, traceable to the SI through the National Institute of Standards and Technology (NIST) and/or other National Metrology Institute (NMI). The test time is 2 seconds and the stabilization time in between points is 2 seconds. For lagging power factors the current lags the voltage. All results are listed as  $\mu\text{rad}/\text{rad}$ . The RS-933 Automated Calibration System has at least a 2 times greater accuracy than the instrument under test. The results presented on this page are compliant with ANSI/NCSL Z540-1-1994. They are not within Radian's 17025 scope of accreditation.

### Voltage & Current

	120 1	120 5	120 15	120 30	120 50	240 1	240 5	240 15	240 30	240 50	480 1	480 5	480 15	480 30	480 50
Phase															
-180	0	0	1	1	0	0	0	1	1	2	1	2	2	3	2
-150	1	1	2	2	1	0	0	2	1	2	1	2	2	2	2
-120	1	1	2	2	2	1	1	1	2	1	1	1	1	1	1
-90	0	1	2	2	2	0	1	1	3	1	2	1	2	0	2
-60	0	0	1	1	1	0	1	1	2	1	2	2	3	0	2
-30	0	0	0	0	0	0	0	1	1	1	1	2	2	2	2
0	1	0	1	0	0	0	0	1	0	1	0	2	1	2	1
30	0	1	1	0	0	0	0	1	-1	0	0	1	1	2	1
60	0	1	1	-1	0	0	0	0	0	-1	1	1	2	2	1
90	-1	0	0	-1	-1	-1	0	0	0	-1	1	1	2	3	2
120	-1	0	0	-1	-1	-1	-1	0	0	0	1	2	2	4	2
150	0	0	1	1	0	0	-1	1	0	1	0	2	2	2	1
180	1	1	1	1	0	0	0	1	1	1	0	2	1	2	1
<b>Average</b>	0	0	1	0	0	0	0	1	1	1	1	2	2	2	2
<b>Minimum</b>	-1	0	0	-1	-1	-1	-1	0	-1	-1	0	1	1	0	1
<b>Maximum</b>	1	1	2	2	2	1	1	2	3	2	2	2	3	4	2

# Calibration Report

## RX-33-PQ/AS Xytronic Portable Standard

Function..... Phase      60 Hz                      Phase C

Date.....                      11-Dec-18

Serial Number.....      000000

The following data was collected by a Radian Research RS-933 Automated Calibration System. The RS-933 phase calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards, traceable to the SI through the National Institute of Standards and Technology (NIST) and/or other National Metrology Institute (NMI). The test time is 2 seconds and the stabilization time in between points is 2 seconds. For lagging power factors the current lags the voltage. All results are listed as  $\mu\text{rad}/\text{rad}$ . The RS-933 Automated Calibration System has at least a 2 times greater accuracy than the instrument under test. The results presented on this page are compliant with ANSI/NCSL Z540-1-1994. They are not within Radian's 17025 scope of accreditation.

### Voltage & Current

	120 1	120 5	120 15	120 30	120 50	240 1	240 5	240 15	240 30	240 50	480 1	480 5	480 15	480 30	480 50
Phase															
-180	0	0	-1	-1	0	0	0	-1	0	0	-1	-2	0	-1	-1
-150	0	1	-1	-1	0	0	-1	-2	0	-1	-1	-2	0	1	0
-120	1	0	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	0	1
-90	1	0	1	0	1	0	0	0	0	1	-1	-1	-1	1	-1
-60	1	0	1	2	1	0	0	0	1	1	-1	-1	-1	0	-1
-30	0	1	0	1	2	0	0	0	2	0	0	-1	-1	-1	-1
0	0	0	-1	1	0	-1	-1	-1	2	0	0	-2	-1	-1	-3
30	0	0	-1	0	0	-1	-2	-1	0	-1	-1	-3	-2	-2	-1
60	0	-1	-1	-1	0	-2	-2	-2	-1	-1	-2	-2	-3	-3	-2
90	0	-1	-1	-1	0	-1	-2	-1	-1	0	-1	-2	-3	-2	-3
120	0	-1	-1	0	0	0	-1	-1	-1	-1	-1	-2	-2	-2	-2
150	-1	0	-1	-1	0	0	-2	-1	-1	-2	-1	-2	-1	-1	0
180	0	0	-1	0	0	0	-2	-2	-2	-2	-1	-2	-1	-1	0
<b>Average</b>	0	0	-1	0	0	0	-1	-1	0	-1	-1	-2	-1	-1	-1
<b>Minimum</b>	-1	-1	-1	-1	0	-2	-2	-2	-2	-2	-2	-3	-3	-3	-3
<b>Maximum</b>	1	1	1	2	2	0	0	0	2	1	0	-1	0	1	1

# Calibration Report

## RX-33-PQ/AS Xytronic Portable Standard

**Function..... Watt-hour 60 Hz**  
**Date..... 11-Dec-18 Pulse Output**  
**Serial Number..... 000000**

The following data was collected by a Radian Research RS-933 Automated Calibration System. The RS-933 watt-hour calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards, traceable to the SI through the National Institute of Standards and Technology (NIST) and/or other National Metrology Institute (NMI). Test time is 3 seconds and the stabilization time in between points is 3 seconds. For lagging power factors the current lags the voltage. All results are listed as  $\mu\text{Wh}/\text{Wh}$ . The RS-933 Automated Calibration System has at least a 2 times greater accuracy than the Instrument under test. The results presented on this page are compliant with ANSI/NCSS Z540-1-1994. They are not within Radian 's 17025 Scope of Accreditation.

### Voltage & Phase Angle

**Phase A:**

	120 Unity PF	120 0.5 Lag	120 0.5 Lead	240 Unity PF	240 0.5 Lag	240 0.5 Lead	480 Unity PF	480 0.5 Lag	480 0.5 Lead	600 Unity PF	600 0.5 Lag	600 0.5 Lead
<b>Amps</b>												
5	-8	-28	-4	4	5	7	3	9	1	20	22	19
120	10	20	3	10	17	9	8	21	5	21	38	14

**Phase B:**

	120 Unity PF	120 0.5 Lag	120 0.5 Lead	240 Unity PF	240 0.5 Lag	240 0.5 Lead	480 Unity PF	480 0.5 Lag	480 0.5 Lead	600 Unity PF	600 0.5 Lag	600 0.5 Lead
<b>Amps</b>												
5	-8	-7	-11	-8	-3	-11	-8	22	-30	6	41	-18
120	3	9	-3	1	1	13	3	13	1	16	25	4

**Phase C:**

	120 Unity PF	120 0.5 Lag	120 0.5 Lead	240 Unity PF	240 0.5 Lag	240 0.5 Lead	480 Unity PF	480 0.5 Lag	480 0.5 Lead	600 Unity PF	600 0.5 Lag	600 0.5 Lead
<b>Amps</b>												
5	-3	-12	7	-7	-12	13	-7	-22	14	5	-5	23
120	16	26	25	23	27	18	16	30	27	34	27	48

<b>Average</b>	2	1	3	4	6	8	3	12	3	17	25	15
<b>Minimum</b>	-8	-28	-11	-8	-12	-11	-8	-22	-30	5	-5	-18
<b>Maximum</b>	16	26	25	23	27	18	16	30	27	34	41	48

<b>Overall</b>	Unity PF	0.5 Lag	0.5 Lead
<b>Average</b>	6	11	7
<b>Minimum</b>	-8	-28	-30
<b>Maximum</b>	34	41	48

# Calibration Report

**RX-33-PQ/AS Xytronic Portable Standard**

**Function..... VAR-hour 60 Hz**

**Date..... 11-Dec-18                      Pulse Output**

**Serial Number..... 000000**

The following data was collected by a Radian Research RS-933 Automated Calibration System. The RS-933 VAR-hour calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards, traceable to the SI through the National Institute of Standards and Technology (NIST) and/or other National Metrology Institute (NMI). Test time is 3 seconds and the stabilization time in between points is 3 seconds. For lagging power factors the current lags the voltage. All results are listed as  $\mu$ VARh/VARh. The RS-933 Automated Calibration System has at least a 2 times greater accuracy than the Instrument under test. The results presented on this page are compliant with ANSI/NCSL Z540-1-1994. They are not within Radian 's 17025 Scope of Accreditation.

### Voltage & Phase Angle

**Phase A:**

	120 90°Lag	120 30°Lag	240 90°Lag	240 30°Lag	480 90°Lag	480 30°Lag	600 90°Lag	600 30°Lag
<b>Amps</b>								
<b>5</b>	-7	-42	-8	-18	-3	-13	10	-3
<b>120</b>	7	-2	5	0	3	-7	18	11

**Phase B:**

	120 90°Lag	120 30°Lag	240 90°Lag	240 30°Lag	480 90°Lag	480 30°Lag	600 90°Lag	600 30°Lag
<b>Amps</b>								
<b>5</b>	-9	-10	-7	-16	-7	-29	5	-22
<b>120</b>	-1	-3	2	-6	4	-21	15	-2

**Phase C:**

	120 90°Lag	120 30°Lag	240 90°Lag	240 30°Lag	480 90°Lag	480 30°Lag	600 90°Lag	600 30°Lag
<b>Amps</b>								
<b>5</b>	-11	-8	-10	5	-9	11	6	24
<b>120</b>	11	16	12	19	12	23	22	28

<b>Average</b>	-1	-8	-1	-3	0	-6	13	6
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<b>Minimum</b>	-11	-42	-10	-18	-9	-29	5	-22
<b>Maximum</b>	11	16	12	19	12	23	22	28

<u>Overall</u>	90°Lag	30°Lag
<b>Average</b>	3	-3
<b>Minimum</b>	-11	-42
<b>Maximum</b>	22	28

# Calibration Report

RX-33-PQ/AS Xytronic Portable Standard

Function..... VA-hour      60 Hz  
 Date..... 11-Dec-18      Pulse Output  
 Serial Number..... 000000

The following data was collected by a Radian Research RS-933 Automated Calibration System. The RS-933 VA-hour calibration is derived directly from (3) Radian RD-22-RTS Dytronic Transfer Standards, traceable to the SI through the National Institute of Standards and Technology (NIST) and/or other National Metrology Institute (NMI). Test time is 3 seconds and the stabilization time in between points is 3 seconds. For lagging power factors the current lags the voltage. All results are listed as  $\mu\text{VAh}/\text{VAh}$ . The RS-933 Automated Calibration System has at least a 2 times greater accuracy than the Instrument under test. The results presented on this page are compliant with ANSI/NCSS Z540-1-1994. They are not within Radian 's 17025 Scope of Accreditation.

## Voltage & Phase Angle

**Phase A:**

	120 Unity PF	120 0.5 Lag	120 0.5 Lead	240 Unity PF	240 0.5 Lag	240 0.5 Lead	480 Unity PF	480 0.5 Lag	480 0.5 Lead	600 Unity PF	600 0.5 Lag	600 0.5 Lead
<b>Amps</b>												
5	-21	-8	-4	-3	-5	-3	-3	-4	-3	10	19	14
120	9	3	4	4	4	3	1	5	3	16	20	18

**Phase B:**

	120 Unity PF	120 0.5 Lag	120 0.5 Lead	240 Unity PF	240 0.5 Lag	240 0.5 Lead	480 Unity PF	480 0.5 Lag	480 0.5 Lead	600 Unity PF	600 0.5 Lag	600 0.5 Lead
<b>Amps</b>												
5	-8	-4	-6	-9	-5	-4	-6	-5	-8	7	10	6
120	2	2	1	0	6	2	2	4	1	13	13	14

**Phase C:**

	120 Unity PF	120 0.5 Lag	120 0.5 Lead	240 Unity PF	240 0.5 Lag	240 0.5 Lead	480 Unity PF	480 0.5 Lag	480 0.5 Lead	600 Unity PF	600 0.5 Lag	600 0.5 Lead
<b>Amps</b>												
5	-8	-7	-7	-7	-6	-7	-7	-5	-7	6	8	5
120	21	17	23	14	24	19	23	21	25	32	37	28

<b>Average</b>	-1	0	2	0	3	1	2	3	2	14	18	14
<b>Minimum</b>	-21	-8	-7	-9	-6	-7	-7	-5	-8	6	8	5
<b>Maximum</b>	21	17	23	14	24	19	23	21	25	32	37	28

<b>Overall</b>	Unity PF	0.5 Lag	0.5 Lead
<b>Average</b>	4	6	5
<b>Minimum</b>	-21	-8	-8
<b>Maximum</b>	32	37	28

# Calibration Report

RX-33-PQ/AS Xytronic Portable Standard

Mode..... Analog Sense                      Total

Date..... 11-Dec-18

Serial Number..... 000000

The following data was collected using a precision DC Current Source and a Hewlett Packard 8 Digit Multi-Meter Model 3458A (traceable to NIST). Calibration Temperature is 23 degrees Centigrade. The test time is 5 seconds and the stabilization time in between points is 5 seconds. All results are listed as Percent Error. The Analog Sense worst case DC current measurement error specification is 85ppm  $\pm$  1uA. The results presented on this page are compliant with ANSI/NCSL Z540-1-1994. They are not within Radian's 17025 scope of accreditation.

## DC Current (mA)

-20	18
-10	-16
-1	45
-0.1	390
0.1	-850
0.2	-1742
0.5	228
1	43
2	65
5	14
10	-11
20	2

Average                      -151

Minimum                      -1742

Maximum                      390