



**POWERMETRIX**

## Product Overview

# PowerMetric 3300 Verification Meter

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**POWERMETRIX**

# Brief History of Powermetrix

1994 - Founded in Knoxville, TN USA

1995 - Introduced the Powermate 330

First True 3-Phase Analyzing Standard in North America that Measured Full Harmonic Content

1998 - Merged with Technology for Energy Corporation

4 Divisions - Electric Power, Nuclear, Materials Testing & Aviation

2001 - Introduced the Powermate 730

Powermate 330 with Integrated 3-Phase Current Source

2008 - Introduced the PowerMaster 7 & 5 Series

State of the Art Technology, Accuracy & Functionality

2014 - Introducing the PowerMaster 3 Series

State of the Art Technology, Lightweight, Basic Functionality



# Where it all began for Powermetrix “Integrated *Site* Testing”

## Why do we test the whole site?

- Verify accuracy to protect the utility’s revenue stream.
- Assure site is wired safely and to codes.
- Meet government or regulatory mandated requirements.
- Verify accuracy to ensure we fairly *bill* the customer.

# Integrated Site Testing

Even if the meter is perfect in the lab, the *billing* may not be correct because of other errors.

Sources of billing errors include:

- CTs – bad...over burdened...shunted...mislabeled... wrong size, spec, or accuracy class for the installation
- PTs – bad...overburdened...not correct accuracy class
- Faulty or incorrect wiring
- Meters not accurate under actual customer load conditions
- Administrative errors
- Theft

# How Do We Find Errors?

## Installation and Wiring Errors, Site Diagnostics

- Vector Diagrams, Waveforms, RMS Data Table, Harmonics Analysis

## Meter Errors

- Customer Load and Phantom Load Meter Tests

## CT Errors

- CT Ratio Tests

## PT Errors

- PT Ratio Tests

## Administrative Errors & Theft

- Database Control - Billing System Validation - Test in the Field

# Meeting our Customers' Needs

- Need ultra compact meter site testing solution
- Easy to operate
- Basic functionality
- Only test under customer load (in-service) conditions
- True three phase standard
- Affordable price point to equip all metermen
- IEC & ANSI Compatible

2014 Powermetrix Introduces

The 3 Series



# PowerMaster 3 Series

Ultra Compact Three Phase Analyzing Reference Standard



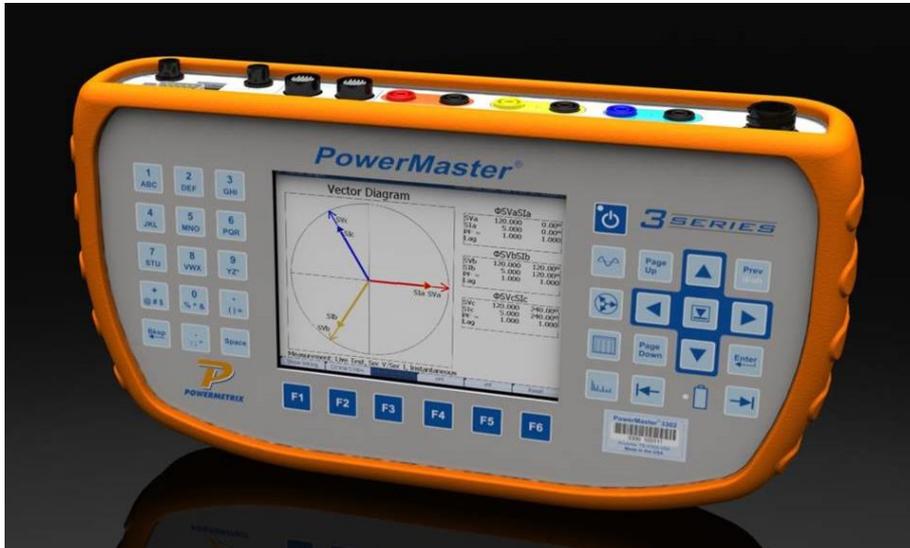
± 0.05% Accuracy Class

Customer Load (In-Service) Testing

11.6" x 6.2" x 2" (295mm x 157mm x 51mm)

3.5 lbs. (1.6kg)

# PowerMaster 3 Series



- 5.7" Ultra Bright Full Color VGA Display (640x480)
- Full Navigation Keypad
- Battery Operated (Can Charge from Site Voltage)
- Ergonomic Design
- Rubberized Overmold for Comfort, Grip and Protection

# PowerMaster 3 Series

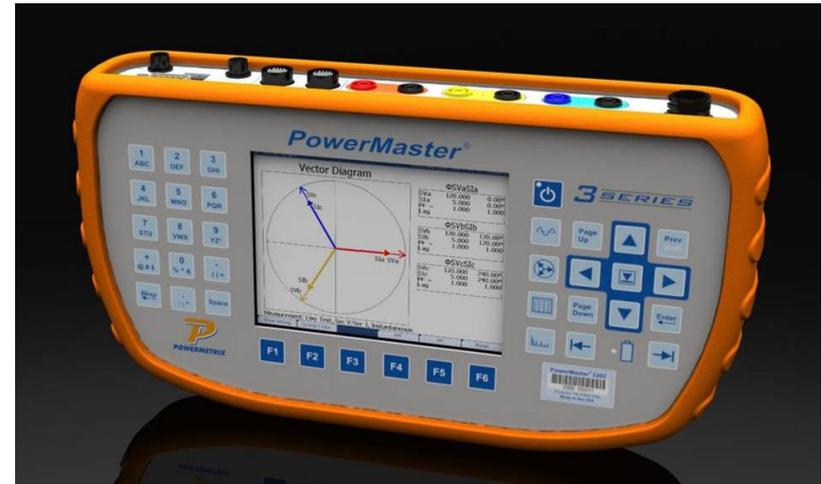
## Functionality

### Model 3301

- Current Clamp-On Probes Only
- In-Service Meter Testing
- Meter Register / Demand Testing
- Vectors, Waveforms, Harmonics, RMS Data Table
- Database Control & PC Software

### Model 3302

- Add Direct Current Measurement (20A)
- Add In-Service CT & PT Ratio Testing
- Add in-Service CT & PT Burden Measurement



# PowerMaster 3 Series

Probe Set 2  
(Model 3302 Only)

Probe Set 1

Direct Current Inputs (20A)  
Locking 4mm Banana Jacks  
(Model 3302 Only)

Voltage Input  
(600V)

Meter Pulse Input

Battery  
Charger  
(240V)



# PowerMaster 3 Series

The Most Innovative Field Testing Device...EVER!

Site Editor Selected Site: \*NONE\*

Site ID: 123456789 Billing Mult: 320

Service Type: 3-Phase, 4-Wire, Wye (3V, 3C) TR - S000F09

Test Setup: TEC Pri Volts: 480

Customer: POWERMETRIX Next Test: 2010 Aug 26

Account No: 12345ABCDE City: KNOXVILLE

Address 1: 10737 LEXINGTON DR State/Prov: TN Zip: 37932

Address 2: Country: USA

Substation: TEC Phone: Locator:

User 1: User 2:

Meter

Mfr	Modl	Cat#	Frq	Ty	Rt	Acc
General Elec	KV	744X900001	9S	TR	1.8	0.2

Meter SN: 123456 Comm ID:

Meter No: 987654 Kt: 1.8 IP Addr:

Section Next Page Save & Exit

## Completely Database Driven

- Store all Site Information (CTs, PTs, AMR, etc.)
- Pass/Fail Dependent on Manufacturer's Specs.
- Search Installation Base for Numerous Details
- Store Historical Information
- Built-In Error Detection
- Create Specific Test Conditions
- Recall Test Data Easily
- Increase Efficiency with Integrated Site Testing

Site Editor Selected Site: \*NONE\*

CT

CT	Mfr	Model	Cat#	MFR:1	Bur	Acc	ame
CT-A	ABB	CBT-H	7882A78G10	400	0.3		<input checked="" type="checkbox"/>
CT-B	ABB	CBT-H	7882A78G10	400	0.3		<input checked="" type="checkbox"/>
CT-C	ABB	CBT-H	7882A78G10	400	0.3		<input checked="" type="checkbox"/>

SN-A: 123456 SN-B: 123456 SN-C: 123456

PT

PT	Mfr	Model	Cat#	MFR:1	Bur	Acc	Same
PT-A	ABB	PPD	7526A05G04	4	X 25.0 VA	1	<input checked="" type="checkbox"/>
PT-B	ABB	PPD	7526A05G04	4	X 25.0 VA	1	<input checked="" type="checkbox"/>
PT-C	ABB	PPD	7526A05G04	4	X 25.0 VA	1	<input checked="" type="checkbox"/>

SN-A: 987654 SN-B: 987654 SN-C: 98654

AMR

AMR	Mfr	Mod	Cat#
AMR	Hunt Technologies, Inc.	TS2	FASY-0580-AAD

SN: 123789

Section Next Page Save & Exit



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Integrated Site Test Review BETA TEST - p18.96M/v15.25M/c#317.04K - Selected Site: 123

Service Type: 3-Phase, 4-Wire, Wye (3V, 3C) TR

Test Setup: Default 1

Customer Load

Test Mode: Wh

imp/kWh: 1000.00

Do Demand Test

Test Time: 0 Seconds

Test Revs: 3

Register Test

CT Burden Measure

PT Burden Measure

CT Ratio Test

Double Wrap

PT Ratio Test

Reset Next

## Integrated Site Testing

- Create Specific Site Test Setups
- User-Definable
- Increase Efficiency
- Run ONE Test per site  
NOT Multiple Tests

Simply check which tests  
you wish to perform!

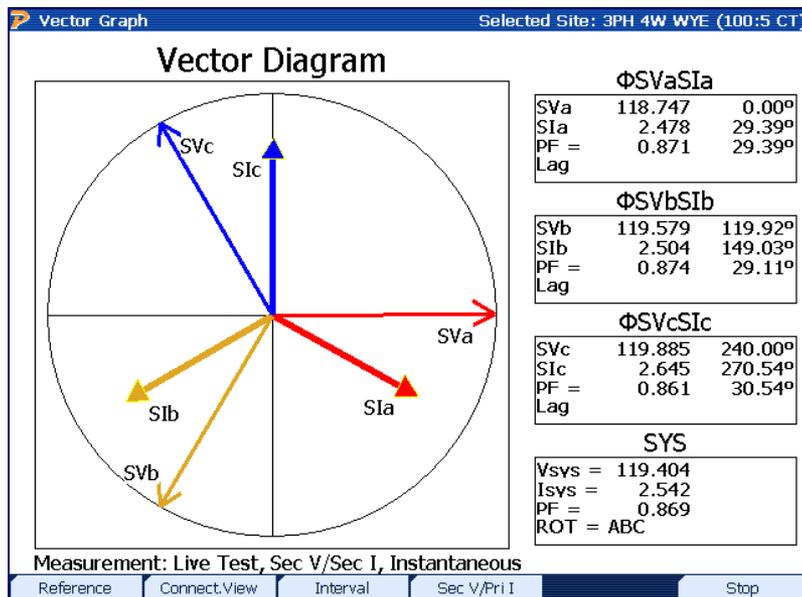
# PowerMaster 3 Series

The Most Innovative Field Testing Device...EVER!

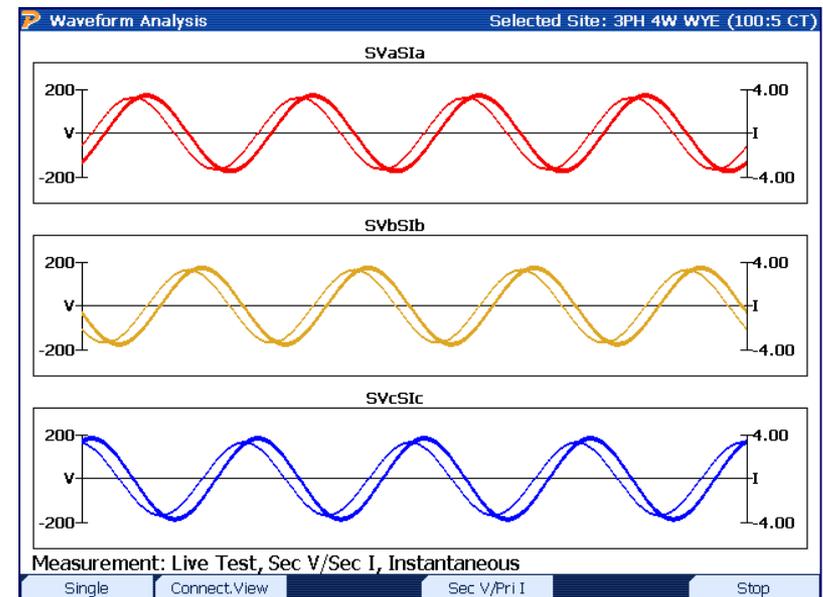
Wiring Verification and Site Diagnostics

The largest percentage of errors on sites

Vector Diagrams



Waveforms



# PowerMaster 3 Series

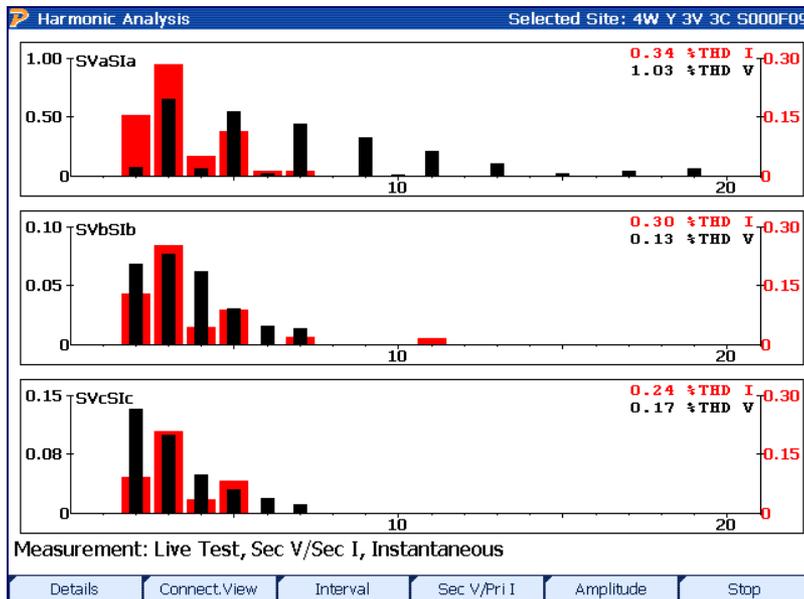
The Most Innovative Field Testing Device...EVER!

Wiring Verification and Site Diagnostics

The largest percentage of errors on sites

Harmonics Analysis (up to 20<sup>th</sup>)

RMS Data Table



Power Meter Selected Site: 4W Y 3V 3C S000F09

**SYSTEM OVERALL SUMMARY**

	ΦSVaSIa	ΦSVbSIb	ΦSVcSIc	SYSTEM
V(FDRMS)	118.5935	119.4417	119.7183	119.2512
V(Fund)	118.5872	119.4416	119.7181	119.2490
I(FDRMS)	2.506571	2.544676	2.672775	2.574674
A(Fund)	2.506556	2.544665	2.672768	2.574663
Vθ	0.0000°	119.8656°	239.9556°	
Iθ	359.9395°	119.8011°	241.0687°	
DPFθ	-0.060506°	-0.064425°	1.113085°	
PF(PF1a)	0.999999	0.999999	0.999811	0.999937
<b>W(P1)</b>	<b>297.2454</b>	<b>303.9387</b>	<b>319.9184</b>	<b>921.1025</b>
VA(S1)	297.2456	303.9389	319.9788	921.1633
VAR(Q1)	-0.314487	-0.341550	6.216074	5.560037
THD V	1.030761%	0.125475%	0.173148%	0.443128%
THD I	0.337406%	0.297266%	0.238195%	0.290956%
FREQ	60.00011	60.00008	60.00012	60.00011

Measurement: Live Test, Sec V/Sec I, Instantaneous

Connect.View Interval Sec V/Pri I Stop

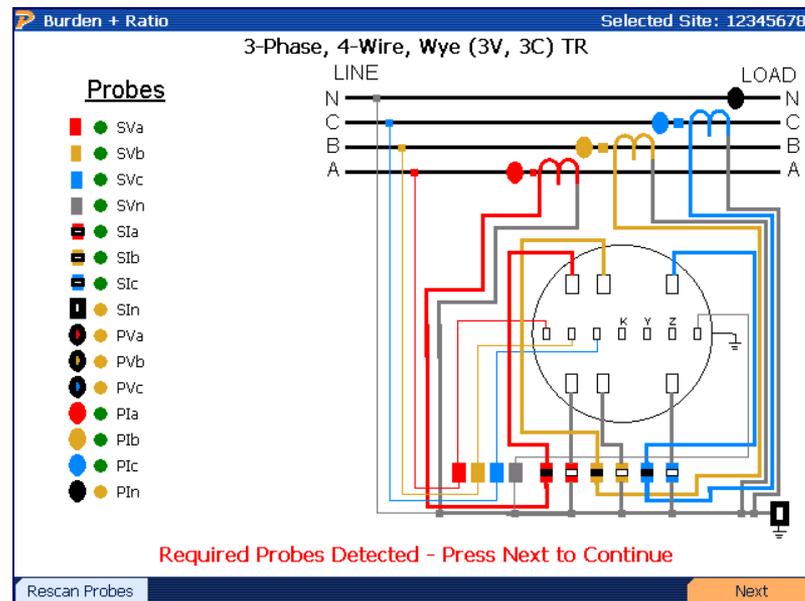
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Wiring Verification and Site Diagnostics

The largest percentage of errors on sites

Connection Diagrams



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Meter Testing  
“The Cash Register”

Customer Load Test Results Selected Site: 101

**Customer Load Meter Test**  
Wh Test

<b>% Accuracy</b>		<b>100.007</b>	
Test Info		Sys Info	
Time(sec)	16.749	Wh	3.5997
Time Left	3.251	VAh	3.6041
Pulses Exp	2.000	VARh	-0.0872
Pulses Act	2.000	V	116.435
Meter PF	0.998	I	2.2275

Restart Test in Progress

## Customer Load Meter Testing

Test the meter under its normal operating conditions.

For example:

Imbalanced Loads  
Varying Loads  
Large Harmonic Distortion  
Large Power Factors  
Extreme Temperatures

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## Meter Testing Pickups



IR, Visible LED  
Adjustable Arm



IR, Visible LED  
Suction Cup



Mechanical  
Disk Pickup



KYZ Pickup

New Magnetically Coupled  
IR and Visible LED Models



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## CT Testing

- Ratio Testing
- Connect all Primary and Secondary Probes
- Customer Load (In Service Testing)
- Built-In Error Detection
- Automatic Probe Recognition / Wiring Check
- Diagnose Loose Connections
- Diagnose Wiring Errors

CT Testing Results		BETA TEST - p10.51M/v10.19M/c#348.52K - Selected Site: TEST			
<b>Measured Ratio: 99.98</b>	<b>PASS</b>	<b>A</b>			
Nameplate Ratio: 100 : 5	Primary Amps: 48.49				
Ratio Error (%): -0.02%	Secondary Amps: 2.425				
Phase Error (degrees): 0.169°	Phase Error (minutes): 10' 7"				
<b>Measured Ratio: 100.08</b>	<b>PASS</b>	<b>B</b>			
Nameplate Ratio: 100 : 5	Primary Amps: 48.23				
Ratio Error (%): 0.08%	Secondary Amps: 2.410				
Phase Error (degrees): 0.373°	Phase Error (minutes): 22' 23"				
<b>Measured Ratio: 99.88</b>	<b>PASS</b>	<b>C</b>			
Nameplate Ratio: 100 : 5	Primary Amps: 48.83				
Ratio Error (%): -0.12%	Secondary Amps: 2.444				
Phase Error (degrees): 0.143°	Phase Error (minutes): 8' 33"				
<b>Test Complete</b>					
Retest	Retest All	Demagnetize	Graphs	Data	Done

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Capture Burden Measurement BETA TEST - p21.45M/v17.19M/c#317.52K - Selected Site: 9

CT Burden Measurement

	Voltage	Current	Burden (Ohms)
Phase A:	0.5	4.90	0.1020
Phase B:	0.9	4.70	0.1915
Phase C:	2.3	4.97	0.4628

Test Failed

Retest Save

**NEW FEATURE!**

## CT & PT Burden Measurement

- Verify burden present
- Validate if circuit is currently overburdened
- Diagnose Loose Connections
- Diagnose Degraded Wiring

Capture Burden Measurement ST - p19.80M/v15.81M/c#319.25K - Selected Site: 9 With CTs

PT Burden Measurement

	Voltage	Current	Burden (VA)
Phase A:	122.7	2.33	285.891
Phase B:	119.3	2.55	304.215
Phase C:	119.6	2.39	285.844

Test Failed

Retest Save

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## CT Testing Probes



Primary Current  
Low Voltage (<600V)  
Flex CTs (3000A)



Primary Current  
Low Voltage (<600V)  
SR752 Probes (1000A)



Primary Current  
High Voltage (up to 150kV)  
Amp Litewire (2000A)



Secondary Current  
Low Voltage (<600V)  
MN375 Probes (.05 to 10A)

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PT Testing Results    BETA TEST - p16.81M/v13.56M/c#373.30K - Selected Site: 95

<b>Measured Ratio: 3.99</b>	<b>PASS</b>	<b>A</b>
Nameplate Ratio: 4 : 1	Primary Volts: 454.96	
Ratio Error (%): -0.27%	Secondary Volts: 114.051	
Phase Error (degrees): -0.018°	Phase Error (minutes): -1' 3"	

<b>Measured Ratio: 3.99</b>	<b>PASS</b>	<b>B</b>
Nameplate Ratio: 4 : 1	Primary Volts: 454.89	
Ratio Error (%): -0.30%	Secondary Volts: 114.061	
Phase Error (degrees): -0.050°	Phase Error (minutes): -3' 1"	

<b>Measured Ratio: 3.99</b>	<b>PASS</b>	<b>C</b>
Nameplate Ratio: 4 : 1	Primary Volts: 455.07	
Ratio Error (%): -0.26%	Secondary Volts: 114.062	
Phase Error (degrees): 0.064°	Phase Error (minutes): 3' 50"	

Test Complete

Retest    Retest All    Done

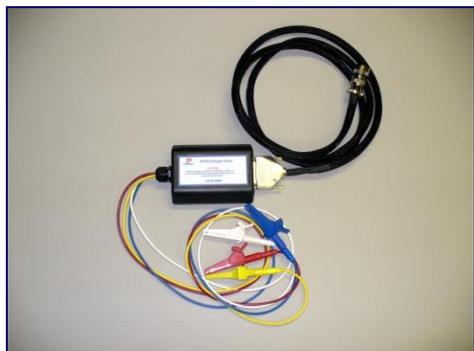
## PT Testing

- Ratio Testing
- Low Voltage Probes (<600 Volts)
- High Voltage Probes (up to 40kV)
- In Service Testing

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PT Testing Probes



Primary Voltage  
Low Voltage (<600V)  
VP600 Probe



Primary Voltage  
High Voltage (up to 40kV)  
Volt Litewire Probe

# Questions?

