# Precision Multi-Channel PXe-2640 Series

PX Electronics' PXe-2640 is three power analyzers in a single chassis with a single interface. The PXe-2640 may have up to 4 Channels installed or optionally with the MU option combine units to grow to thousands of channels, which may be any combination of channel cards and with any combination of available current input options.

#### **Quality and Reliability**

PX Electronics, is the premier source of precision power testing and measuring equipment for industrial and consumer product development and manufacturing. PX Electronics' sophisticated technology provides companies the edge in design verification and product manufacturability.



### **History Displays**



### **Harmonics Displays with Limits**



#### **Standby Power**



#### **INDUSTRIES SERVED**

- Automated Production Testing Ballast Testing Consumer Products Engineering Labs
- Instrument Maintenance & Repair Peak Power & Consumption Measurements
- Light Output Verification Product Compliance Testing Test Labs

#### Vector Diagrams



USD DERVIC LEAN OLSSZAW DATEMENTERN HEARDENET RESIDY HOT CONNECTED 12/05/2011 STREPED HEARDENET Oscilloscope Displays





PXe-2640 channels may be configured in any one (or none) of the 3 virtual power analyzers. Each virtual power analyzer may be configured for up to all channels installed. Each VPA is independently configured for multi-channel wiring configuration, signal filtering, default measurement coupling, display results smoothing and significant digits, VA/VAR combine method, and efficiency grouping. VPAs may optionally be configured to be synchronized to each other.



#### **XVIEW Software**

While all PX Electronics precision test equipment are designed to be used in a completely stand-alone manner, there are times when external tools can aid or enhance the operation of an instrument.

XView software tools and drivers are designed to help easily configure an instrument from a single screen, or are used to view a complete set of measurements in a single screen.

Other XView tools are designed for data collection where results can be recorded in an Excel-compatible file for post-processing, insertion into reports, or simply for archival purposes.

	Ordering Info	rmation	
822-XT2640AD (STD)	Basic Power Analyzer chassis, with 26A element, 220-260ksps, 24bit effective resolution, 0.025% rdg (V) (1 thru 4 Channel)	892-26GPIB	IEEE-488/GPIB interface option (note: this replaces the USB and Ethernet interfaces)
822-XT2640WD	Basic Power Analyzer chassis, with 26W element, 850-1100ksps, 24bit effective resolution, 0.2% rdg, (V) (1 thru 4 Channel)	892-26xx OPT D (STD)	Standard current option, 2 ranges, 20Arms max
822-XT2640SD	Basic Power Analyzer chassis, with 26S element, 220-260ksps, 22bit effective resolution, 0.1% rdg (V) (1 thru 4 Channel)	892-26xx OPT H	High current option, 1 range, 35Arms max
	Basic Power Analyzer chassis, with 26E element, 220-260ksps,	892-26xx OPT X	External current option, 2 ranges, 15Vrms input max
822-XT2640FD	24bit effective resolution, 0.05% rdg, (V), IEC 61000-3-2 compliant harmonic measurement (1 thru 4 Channel)	892-26xx OPT H500	Allows up to 500 harmonics on all W cards in a unit
	Power Analyzer A Element 220-260ksps 24bit effective	892-26xx OPT MU	Multi Unit Option
822-26AD (Card)	resolution, 0.025% rdg (V)	892-26xx OPT EN	Built-in EN61000 compliance firmware for all cards
000 00WD (0 II	Power Analyzer W Element, 850-1100ksps, 24bit effective		in a unit
822-26WD (Card)	resolution, 0.2% rdg, (V)	892-HC-7	Hard carrying case, pelican-type
822-26SD (Card)	Power Analyzer S Element, 220-260ksps, 22bit effective resolution, 0.1% rdg (V)	892-RM-7	4U (7in height) rackmount kit for 4 channel units
822-26ED (Card)	Power Analyzer E Element, 220-260ksps, 24bit effective	892-280x Cable IEC	Connection Cable
occ coco (ouru)	100010001, 0.0070 109, (1)	LS-XT2640	Lead Set



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Please visit www.pxelectronic.com for ordering information.

# 1 DIMENSIONAL, ENVIRONMENTAL AND POWER SUPPLY SPECIFICATIONS

## 1.1 DIMENSIONAL

Nominal Dimensions137mmH x 248mmW x 284mmD (5.4" x 9.75" x 11.2") with feet notNominal Weightextended 3.2kg (7lb) net, 5kg (11lb) shipping

## **1.2 ENVIRONMENTAL**

Storage Environment	-20 to 75C (-4 to 167F) (non-condensing)
Operating Environment	0 to 40C (32 to 104F), <85% RH (non-condensing), Pollution
Operating Altitude	Degree 2 0 to 2000m (6560ft) ASL

## 1.3 POWER SUPPLY

Line Power

Installation Category II; 85-264Vrms, 45 to 65Hz, 40VA max. Internally fused with a non-user serviceable fuse

# 2 ELECTRICAL CHANNEL INPUT AND ACCURACY SPECIFICATIONS

Note:

All percentages are % of reading unless otherwise described.

## 2.1 INPUT ISOLATION SPECIFICATIONS

Valid for any V terminal to PXE2640 chassis ground; any A terminal to PXE2640 chassis ground; and between any V and any A terminal. Impedance  $>1G\Omega \parallel <30pF$ 

Max. Voltage

4500V<sub>PK</sub> max without damage

2500V<sub>RMS</sub> max for <1s without damage

1000V<sub>RMS</sub> max continuous rated working voltage (CAT I/

II) 600V<sub>RMS</sub> max continuous rated working voltage (CAT

III) 300V<sub>RMS</sub> max continuous rated working voltage (CAT

# 2.2 VOLTAGE MEASUREMENT SPECIFICATIONS

The specifications for voltage are independent of the current input option installed in the respective channel.

# 2.2.1 VOLTAGE INPUT CAPABILITY AND CHARACTERISTICS

Specification		S Channel Type	A Channel Type	L Channel Type	W Channel Type
	<1ms	<3000VRM	MS and VPK	<500V <sub>RMS</sub> and 3000V <sub>PK</sub>	$<3000V_{RMS}$ and $V_{PK}$
No Domono	<100ms	<200	OV <sub>RMS</sub>	<300V <sub>RMS</sub>	<1500V <sub>RMS</sub>
No Damage	<5s	<150	OV <sub>RMS</sub>	<250V <sub>RMS</sub>	<1000V <sub>RMS</sub>
voltage hange	Continuous	<1000V <sub>RMS</sub>		<160V <sub>RMS</sub>	<650V <sub>RMS</sub>
	PXE2640	As a		above	
Measurable Voltage Range	Unpowered	<1803V <sub>RM</sub>	MS and VPK	$< 182.3 V_{\text{RMS}}$ and $V_{\text{PK}}$	$< 1803 V_{RMS}$ and $V_{PK}$
Specified Voltage Range		<1000V <sub>RMS</sub> a	and <1750V <sub>PK</sub>	$<160V_{RMS}$ and $<175V_{PK}$	${<}650V_{\text{RMS}}$ and ${<}1750V_{\text{PK}}$
Impedance Burden		1.201MG	2 ± 0.25%	121kΩ ± 0.25%	399.5kΩ ± 0.25%
3dB Bandwidth (typical)			900kHz		3MHz

Please visit www.pxelectronic.com for ordering information.

## 2.2.2 VOLTAGE MEASUREMENT ACCURACY

The charts below show guaranteed maximum voltage errors for DC, MAINS, AVIONICS, and 50kHz throughout a 1V to 1000V range of applied voltages expressed as % of reading and are valid within  $\pm$ 5C of the calibration temperature (add 0.005% per C beyond this) and where no significant common-mode is present. Following the charts is a table which can be used to calculate the guaranteed accuracies for applications other than shown in the charts and also for the computation of numerical errors.



Please visit www.pxelectronic.com for ordering information.



# 2.2.2.1 PRIMARY VOLTAGE MEASUREMENT ACCURACY TABLE

Add relevant errors from the table below for the maximum error in primary voltage measurements (e.g. DC, AC, AC+DC, Rectified, Peak, Valley, Peak-Valley).

			MAXIMUM S	CALING ERRORS		
		App If signal contair	bly to all results as shown b is significant levels at multi	elow as a percentage of the ole frequencies, apply to eac	reading h level & frequency	
Spee	cification		S Channel Type	A Channel Type	L Channel Type	W Channel Type
Base Scaling Error Apply to all results			0.1%	0.0	3%	0.1% (0.2% if 2ms LF/PERIOD)
		AVIONICS	None	0.00	05%	None
		LF or VLF		0.01%		0.05%
E		<10kHz		F*0.005%		E*0 002%
Apply to all results other than	Caling Error	10k-40kHz		0.05%+(F-10)*0.012%		F 0.002 <i>9</i> 8
Apply to all results other than	DO OF MIAINO	40k-100kHz		0.41%+(F-40)*0.025%		0.08%+(F-40)*0.004%
		100k-1MHz		Typically (F/1000)2*100%		0.32%+(F-100)*0.013%
		>1MHz		Not specified		Typically (F/3500)2*100%
Self-Heating Scaling Err Apply to all results (only si voltages) 1 minute nomina	<b>or</b> gnificant at high al time constant	er	0.05%*(V <sub>A</sub>	C+DC/1000) <sup>2</sup>	0.5%*(V <sub>AC+DC</sub> /1000) <sup>2</sup>	0.15%*(V <sub>AC+DC</sub> /1000) <sup>2</sup>
Temperature Scaling Err Apply to all results if outsin calibration temperature	or de of ±5C from			0.005% per C outside of ±5	C from calibration temperate	ure
Bandwidth Limit Scaling Error Apply if using USER bandwidth setting				10%*(F/F <sub>Bw</sub> ) <sup>2</sup> , unspe	ecified for $F > 0.3^*F_{BW}$	
		Apply to all re	MAXIMUM FL sults as shown below in Vo	OOR ERRORS ofts (generally only significant	t at low input	
Spee	cification		S Channel Type	A Channel Type	L Channel Type	W Channel Type
Base Floor Error Apply to all results			1.8mV	450µV	45µV	1.8mV
DC Floor Error Apply to DC and RECTIFII Apply to AC+DC results at	ED results fter multiplying t	by V <sub>DC</sub> /V <sub>AC +DC</sub>	3mV	1mV	100µV	5mV
AC Floor Error	MAINS, LF, VLF	F & F <sub>BW</sub> ≤10kHz	100µV/V <sub>RDG</sub>	100µV/V <sub>RDG</sub>	4µV/V <sub>RDG</sub>	200µV/V <sub>RDG</sub>
Apply to AC, AC+DC,	AVIONICS	& F <sub>BW</sub> ≤50kHz	300µV/V <sub>RDG</sub>	300µV/V <sub>RDG</sub>	8µV/V <sub>RDG</sub>	650µV/V <sub>RDG</sub>
and RECTIFIED results		Otherwise	1.1mV/V <sub>RDG</sub>	1.1mV/V <sub>RDG</sub>	11µV/V <sub>RDG</sub>	1.5mV/V <sub>RDG</sub>
Peak Floor Error Apply	MAINS, LF, VLF	& F <sub>BW</sub> ≤10kHz	40mV	40mV	8mV	60mV
to PK, VLY and PK-VLY	AVIONICS	& F <sub>BW</sub> ≤50kHz	75mV	75mV	11mV	125mV
results	Otherwise		125mV	125mV	17mV	175mV
Common Mode Error Apply to AC, AC+DC, and RECTIFIED results Apply using voltage on V LO terminal relative to chassis ground. Error has 90° phase shift to common-mode voltage		ults ive to t to	1μV pe (11.5mV@2	er V.Hz 230V/50Hz)	100nV per V.Hz (1.15mV@230V/50Hz)	700nV per V.Hz (8.05mV@230V/50Hz)
Adjacent Channel Error Apply to AC, AC+DC, and RECTIFIED results Apply using adjacent channel A LO or V LO terminal voltage relative to chassis ground. Error has 90° phase shift to adjacent channel voltage		300nV per V.Hz (3.45mV@230V/50Hz)		30nV per V.Hz (345µV@230V/50Hz)	210nV per V.Hz (2.415mV@230V/50Hz)	

## 2.2.2.2 SECONDARY VOLTAGE MEASUREMENT ACCURACY TABLE

Specification		S Channel Type	A Channel Type	L Channel Type	W Channel Type	
Crest Factor Error		(	(Total Floor Error from prece	ding table for PK results) / V	AC	
Form Factor Error		(Tota	I Floor Error from preceding	table for AC+DC results) / VF	RECTIFIED	
Inter-Channel Error For 120° between equal amplitudes (Relevant Voltage Errors from preceding table at the inter-channel voltage) + 0.00					age) + 0.0015%*F	
		AC Voltage   + (if not funda	Errors from preceding table + (H/N) <sup>2*</sup> 0. amental) from below using th	at V and F of the harmonic c .3% of reading e frequency of the harmonic	or spectrum point	
Harmonic or Spectrum Error	<10kHz	0.01% of V <sub>AC+DC</sub> 0.006% of V <sub>AC+DC</sub>		0.015% of V <sub>AC+DC</sub>		
	10k-115kHz		0.05% of V <sub>AC+DC</sub>			
	115k-435kHz		0.08% of V <sub>AC+DC</sub>			
Inter-Channel Fundamental Phase Err	ror	0.02°+0.15°*F			0.01°+0.07°*F	
Harmonic-Fundamental Phase Error ( BANDWIDTH configured as UNFILTE	(typical, RED)		0.02°+0.1°*F+0.001°*H 0.02°+0.03°*F+0.001°*H			
%THD Error		(0.005+0.000025*N)*%THD+0.00005*N*√N + from below using the frequency of highest included harm			nonic	
Errors shown are all expressed in %	<10kHz	0.025+1.25/V <sub>AC</sub>	0.015+1/V <sub>AC</sub>	0.015+0.2/	0.03+1.5/V <sub>AC</sub>	
THD units	10k-115kHz	V <sub>AC</sub> 0.1	15+3.5/V <sub>AC</sub>	0.15	0.06+4/V <sub>AC</sub>	
115k-435kHz		+0.35/	0.15+4/V <sub>AC</sub>			

# 2.3 CURRENT MEASUREMENT SPECIFICATIONS

# 2.3.1 CURRENT INPUT CAPABILITY AND CHARACTERISTICS

Specification		Channel Type	Option H	Option D HI Range or Auto-Range when on HI Range	Option D LO Range or Auto-Range when on LO Range	Option X HI Range	Option X LO Range
	<8ms	All	<200A <sub>RMS</sub> and <300А <sub>РК</sub>	<150A <sub>RMS</sub> and <250A <sub>PK</sub>	<60A <sub>RMS</sub> and <150A <sub>PK</sub>	${<}200V_{RMS}$ and ${<}300V_{PK}$	${<}20V_{\text{RMS}}$ and ${<}30V_{\text{PK}}$
No Damage	<40ms	All	<75A <sub>RMS</sub>	<50A <sub>RMS</sub>	<40A <sub>RMS</sub>	<50V <sub>RMS</sub>	<10V <sub>RMS</sub>
Current Range	<1s	All	<50A <sub>RMS</sub>	<30A <sub>RMS</sub>	<5A <sub>RMS</sub>	<30V <sub>RMS</sub>	<5V <sub>RMS</sub>
	Continuous	All	<30A <sub>RMS</sub>	<20A <sub>RMS</sub>	<2A <sub>RMS</sub>	<25V <sub>RMS</sub> and V <sub>PK</sub>	<5V <sub>RMS</sub> and V <sub>PK</sub>
	PXE2640 Unpowered	All	As Above	<2A <sub>RMS</sub> and <150A <sub>PK</sub>		$<25V_{RMS}$ and $<300V_{PK}$	
Meas	urable Current Range	All	<225ARMs and APK	<150A <sub>RMS</sub> and A <sub>PK</sub>	<1.02A <sub>RMS</sub> and A <sub>PK</sub>	<23.1V <sub>RMS</sub> and V <sub>PK</sub>	<0.576V <sub>RMS</sub> and V <sub>PK</sub>
Specified Currer	nt Range	All	<30A <sub>RMS</sub> and <200A <sub>PK</sub>	<20A <sub>RMS</sub> and <140A <sub>PK</sub>	<1 ARMS and APK	<15V <sub>RMS</sub> and <20V <sub>PK</sub>	<0.55V <sub>RMS</sub> and V <sub>PK</sub>
Impedance Burc	den	All	2.5m $\Omega$ to 7m $\Omega$	4mΩ to 12mΩ	$0.562\Omega \pm 0.75\%$	20.5kΩ ± 0.25%	10.25kΩ ± 0.25%
3dB Bandwidth (typical)		S, A or L			1.25MHz		
		W		5MHz		3M	3MHz

# 2.3.2.CURRENT MEASUREMENT ACCURACY

The charts below show guaranteed maximum current errors for DC, MAINS, AVIONICS, and 50kHz throughout a 100 $\mu$ A to 30Arange of applied currents expressed as % of reading and are valid within ±5C of the calibration temperature (add 0.005% per C beyond this) and where no significant common-mode is present. Following the charts is a table which can be used to calculate









# 2.3.2.1 PRIMARY CURRENT MEASUREMENT ACCURACY TABLE

Add relevant errors from the table below for the maximum error in primary current measurements (e.g. DC, AC, AC+DC, Rectified, Peak, Valley, Peak-Valley).

		lf	MAX Apply to all results signal contains significa	XIMUM SCALING E as shown below as a pe nt levels at multiple free	RRORS ercentage of the reading quencies, apply to each l	evel &				
Specif	fication	Channel Type	Option H	Option D HI Range	Option D LO Range	Option X HI Range	Option X LO Range			
Base Scaling Er	rror	A or L		•	0.03%					
Apply to all resul	lts	S or W		0.	1% (0.2% if 2ms LF/PER	IOD)				
	LF or VLF	S, A or L			0.01%					
	2. 0. 72.	W	0.05%							
	AVIONICS	A or L			0.002%					
Frequency		SorW			None					
Dependent Scal	lina <10kHz	S, A or L			F*0.003%					
Error	ĭ	S A or I								
Apply to all result	ts 10k-40kHz	W W			E*0 0015%					
other than DC or	r	SAorl			0 24%+(F-40)*0 02%					
MAINS	40k-100kHz	W		0.06%+(F-40)*0.003%	0.21701(1-10) 0.0270	0.06%+(F-4	0)*0.004%			
		S. A or L				0.00701(1-1	0/ 0100 1/0			
	100k-1MHz	W		0.24%+(F-100)*0.0129	6	0.3%+(F-10	0)*0.015%			
	>1MHz	W	1	Typically (F/5000)2*1009	/ /	Typically (F/30	000)2*100%			
Self-Heating Sc	aling Error			,, ( ,		, , , , , , , , , , , , , , , , , , ,				
Apply to all result significant at high minute nominal t	ts (only her currents) 3 ime constant	All	0.00015%*A <sub>AC+DC</sub> <sup>2</sup>	0.0002%*A <sub>AC+DC<sup>2</sup></sub>		None				
Temperature So Apply to all result ±5C from calibra	caling Error Its if outside of Ition temperature	All		0.005% per C	outside of ±5C from calib	ration temperature				
Bandwidth Limit Error Apply if us bandwidth settin	it Scaling sing USER	All		10%*(F	F/F <sub>BW</sub> ) <sup>2</sup> , unspecified abov	е 0.3*F <sub>вw</sub>				
	×	Арј	MA oly to all results as show	XIMUM FLOOR EF	RORS rally only significant at lo	w input				
Specif	fication	Channel Type	Option H	Option D HI Range	Option D LO Range	Option X HI Range	Option X LO Range			
Base Floor Erro	r	A or L	56µA	38µA	250nA	6µV	150nV			
Apply to all result	ts	S or W	225µA	150µA	1µA	23µV	600nV			
DC Floor Error		A or L	0.23mA	0.15mA	1µA	40µV	5µV			
Apply to DC and		S	0.45mA	0.3mA	2μΑ	80µV	6µV			
Apply to AC+DC after multiplying	results by A <sub>DC</sub> /A <sub>AC+DC</sub>	W	0.68mA	0.45mA	ЗµА	120µV	8µV			
	MAINS, LF, VLF &	S, A or L	3.3µA/A <sub>RDG</sub>	1.5µA/A <sub>RDG</sub>	90pA/A <sub>RDG</sub>	35nV/A <sub>RDG</sub>	20pV/A <sub>RDG</sub>			
AC Floor Error	F <sub>BW</sub> ≤10kHz	W	5µA/A <sub>RDG</sub>	2.5µA/A <sub>RDG</sub>	125pA/A <sub>RDG</sub>	50nV/A <sub>RDG</sub>	50pV/A <sub>RDG</sub>			
Apply to AC, $\Delta C + DC$ and	AVIONICS &	S, A or L	33µA/A <sub>RDG</sub>	15µA/A <sub>RDG</sub>	0.9nA/A <sub>RDG</sub>	350nV/A <sub>RDG</sub>	200pV/A <sub>RDG</sub>			
RECTIFIED	F <sub>BW</sub> ≤50kHz	W	50µA/A <sub>RDG</sub>	25µA/A <sub>RDG</sub>	1.25nA/A <sub>RDG</sub>	500nV/A <sub>RDG</sub>	500pV/A <sub>RDG</sub>			
results	Otherwise	S, A or L	330µA/A <sub>RDG</sub>	150µA/A <sub>RDG</sub>	9nA/A <sub>RDG</sub>	3.5µV/A <sub>RDG</sub>	2nV/A <sub>RDG</sub>			
	e anei mee	W	500µA/A <sub>RDG</sub>	250µA/A <sub>RDG</sub>	12.5nA/A <sub>RDG</sub>	5µV/A <sub>RDG</sub>	5nV/A <sub>RDG</sub>			
Peak Floor	MAINS, LF, VLF &	S, A or L	8mA	5mA	40µA	0.75mV	25µV			
Error	F <sub>BW</sub> ≤IUKHZ	VV O A sul	10mA	6.5MA	50µA	0.9mV	30µV			
Apply to PK,	AVIONICS &	S, A or L	25mA	17mA	125µA	2.5mV	65µV			
VLY and PK-	FBW≤OUKHZ	VV C A cml	30mA	20mA	150µA	3mv	80µV			
VLY results	Otherwise	S, A OF L	75MA	50MA	400µA	1.0mV	200µV			
Common Mode	Error	VV	3011A	OUTIA	300μΑ	TOTIN	230μν			
Apply to all results Apply using voltage on A LO terminal relative to chassis ground. Error has 90° phase shift to common-mode voltage		All	500pA per V.Hz (5.75µA@230V/50Hz)	400pA per V.Hz (4.6µA@230V/50Hz)	20pA per V.Hz (0.23µA@230V/50Hz)	15nV per V.Hz (0.172mV@230V/50Hz)	0.5nV per V.Hz (5.75µV@230V/50Hz)			
shift to common-mode voltage         Adjacent Channel Error         Apply to all results         Apply using adjacent channel A         LO or V LO terminal voltage         relative to chassis ground. Error         has 90° phase shift to adjacent         channel voltage		All	150pA per V.Hz (1.725µA@230V/50Hz)	120pA per V.Hz (1.38µA@230V/50Hz)	7pA per V.Hz (80.5nA@230V/50Hz)	7nV per V.Hz (80.5µV@230V/50Hz)	0.2nV per V.Hz (2.3µV@230V/50Hz)			

## 2.3.2.2 SECONDARY CURRENT MEASUREMENT ACCURACY TABLE

Specifie	cation	Channel Type Option H Option D HI Range Option D LO Range Option X HI Range Option			Option X LO Range					
Crest Factor Erro	or	All		(Total Current Floor Error from preceding table for PK results) / AAC						
Form Factor Erro	r	All	(	Total Current Floor Erro	r from preceding table	for AC+DC results) / AREC	TIFIED			
			Relevant Current Errors from preceding table for A <sub>pA</sub>							
	A <sub>N</sub> (2ø3w)	All		+ Relevant C	Current Errors from pree	ceding table for				
Multi-Channel				Aø	в + 0.0005% of (А <sub>øA</sub> + А	А₀в)*F				
Error				Relevant Cur	rent Errors from preced	ling table for A <sub>ØA</sub>				
For similar	A <sub>øC</sub> (3ø3w 2ch)	All		+ Relevant C	Current Errors from pre	ceding table for				
current level and				A <sub>0</sub>	B + 0.0015% of (A <sub>0A</sub> + /	A₀B)^F Karataka fan A				
phase in each				Relevant Cur	rent Errors from preced	ling table for A <sub>ØA</sub>				
phase.	A <sub>N</sub> (3ø4w)	All			at Current Errors from	proceeding table for				
				for Δ <sub>ec</sub>	$\pm 0.0015\%$ of ( $\Delta_{ab} \pm \Delta_{c}$	$\mu = \Delta_{ac} + \Delta_{ac} + E$				
			AC	Current Errors from pre	ceding table at A and I	of the harmonic or spec	trum point			
		All	7.0		+ (H/N)2*0.3% of re	ading				
			+ (if	not fundamental) from b	pelow using the frequer	ncy of the harmonic or sp	ectrum point			
	<10kHz		, i i i i i i i i i i i i i i i i i i i	0.006% of A <sub>AC+DC</sub>						
Harmonic or	10k-115kHz	A or L	0.05% of A <sub>AC+DC</sub>							
Spectrum Error	<10kHz	Hz 0.01% of A <sub>AC+DC</sub>								
	10k-115kHz	5	S 0.05% of A <sub>AC+DC</sub>							
	<10kHz		0.015% of A <sub>AC+DC</sub>							
	10k-115kHz	W		0.03% of A <sub>AC+DC</sub>						
	115k-435kHz			0.08% of A <sub>AC+DC</sub>						
Current-Voltage		S, A or L	0.005° + 0.015°*F							
Fundamental Pha	ase Error	W	0.005° + 0.007°*F							
Harmonic-Funda	mental Phase	S, A or L			0.02°+0.1°*F+0.001°	*H				
Error (typical, BA	NDWIDTH	W			0.02°+0.03°*F+0.001°	*H				
configured as UN	IFILTERED)									
		All		0.005) from below usi +	+0.000025*N)*%THD+( ng the frequency of hig	).00005*N*√N hest included harmonic				
	<10kHz	Aorl	0.015+0.2/A <sub>AC</sub>	0.015+0.15/A <sub>AC</sub>	0.015+0.001/A <sub>AC</sub>	0.015+0.025/A <sub>AC</sub>	0.015+0.0006/A <sub>AC</sub>			
%THD Error	10k-115kHz	AUL	0.15+2/A <sub>AC</sub>	0.15+1.5/A <sub>AC</sub>	0.15+0.01/A <sub>AC</sub>	0.15+0.25/A <sub>AC</sub>	0.15+0.006/A <sub>AC</sub>			
all expressed in	<10kHz	S	0.025+0.2/A <sub>AC</sub>	0.025+0.15/A <sub>AC</sub>	0.025+0.001/A <sub>AC</sub>	0.025+0.025/A <sub>AC</sub>	0.025+0.0006/A <sub>AC</sub>			
%THD units.	10k-115kHz	3	0.15+2/A <sub>AC</sub>	0.15+1.5/A <sub>AC</sub>	0.15+0.01/A <sub>AC</sub>	0.15+0.25/A <sub>AC</sub>	0.15+0.006/A <sub>AC</sub>			
, a trib drifto.	<10kHz		0.03+0.25/A <sub>AC</sub>	0.03+0.18/A <sub>AC</sub>	0.03+0.0012/A <sub>AC</sub>	0.03+0.03/A <sub>AC</sub>	0.03+0.001/A <sub>AC</sub>			
	10k-115kHz	W	0.06+2.5/A <sub>AC</sub>	0.06+1.8/A <sub>AC</sub>	0.06+0.012/A <sub>AC</sub>	0.06+0.3/A <sub>AC</sub>	0.06+0.01/A <sub>AC</sub>			
115k-435kHz			0.15+2.5/A <sub>AC</sub>	0.15+1.8/A <sub>AC</sub>	0.15+0.012/A <sub>AC</sub>	0.15+0.3/A <sub>AC</sub>	0.15+0.01/A <sub>AC</sub>			

# 2.4 WATTS, VAR AND VA MEASUREMENT SPECIFICATIONS

The charts below show guaranteed maximum Watts errors for DC, MAINS, AVIONICS, and 50kHz from  $100\mu$ W up to the highest available using a D option current measurement (H and X option current accuracies are similar within their respective range of currents and are not shown for clarity), expressed as % of Watts reading and are valid within ±5C of the calibration temperature (add 0.005% per C beyond this) and where no significant common-mode is present. Following the charts is a table which can be used to calculate the guaranteed accuracies for applications other than shown in the charts and also for the computation of







# 2.4.1 WATTS, VAR AND VA MEASUREMENT SPECIFICATIONS 2.4.1.1 PRIMARY WATTS, VAR AND VA MEASUREMENT ACCURACY TABLE

Add relevant errors from the table below for the maximum error in all Watts, VA and VAR measurements except harmonic Watts.

Note that by definition DC Watts and DC VA are identical, and DC VAR is zero

		A	MAXIM pply to all results as sh	UM SCALING ERRO	ORS ntage of the reading	N 8			
Specification	1	Channel	Option H	Option D HI Range	Option D LO Range	Option X HI Range	Option X LO Range		
Base Scaling Error		A or L		0.045%					
	LF or VLF	S or W S, A or L	0.15% (0.3% if 2ms LF/PERIOD) 0.01%						
	AVIONICS	A or L			0.005%				
Frequency Dependent	<10kHz	S or W S, A or L			None F*0.006%				
Scaling Error Apply to AC component	10k-40kHz	VV S, A or L			F^0.0025% 0.06%+(F-10)*0.014%				
DC or MAINS	40k-100kHz	W S, A or L			F*0.0025% 0.48%+(F-40)*0.032%				
	100k-1MHz	W S, A or L	(	0.1%+(F-40)*0.005% T	ypically (F/1100) <sup>2*150%</sup>	0.1%+(F-40) %	*0.0055%		
	>1MHz	W W	0 Тур	.4%+(F-100)*0.018% bically (F/5000) <sup>2*</sup> 150%		0.43%+(F-10 Typically (F/30	00)*0.02% 00)²*150%		
Self-Heating Scaling Error Apply as % of Power reading results using voltage and c Heating Errors from previou	ng to all urrent Self- us tables	All		Add Volta	ge and Current Self-He	ating Errors			
Temperature Scaling Error Apply to all results if outsid from calibration temperature	e of ±5C re	All		0.005% per C ou	utside of $\pm 5C$ from calib	pration temperature			
Bandwidth Limit Scaling Er to AC component of all res using USER bandwidth set	ror Apply ults if ting	All		$20\%^*(F/F_{BW})^2,$ unspecified above $0.3^*F_{BW}$					
	Apply to all r	esults as	MAXIN shown below in Watts.	VA or VAR as applicab	RS	icant at low input			
Specification	1	Channel Type	Option H Option D HI Range Option D LO Range Option X HI Range Option X LO Ra						
		L	(V <sub>AC+DC</sub> *56μA) + (A <sub>AC+DC</sub> *45μV)	(V <sub>AC+DC</sub> *38µA) + (А <sub>AC+DC</sub> *45µV)	(V <sub>AC+DC</sub> *250nA) + (A <sub>AC+DC</sub> *45µV)	(V <sub>AC+DC</sub> *6μA) + (A <sub>AC+DC</sub> *45μV)	(V <sub>AC+DC</sub> *0.15μA) + (A <sub>AC+DC</sub> *45μV)		
Base Floor Error Apply to all results		А	(V <sub>AC+DC</sub> *56µA) + (A <sub>AC+DC</sub> *450µV)	(V <sub>AC+DC</sub> *38μA) + (A <sub>AC+DC</sub> *450μV)	(V <sub>AC+DC</sub> *250nA) + (A <sub>AC+DC</sub> *450μV)	(V <sub>AC+DC</sub> *6μA) + (A <sub>AC+DC</sub> *450μV)	(V <sub>AC+DC</sub> *0.15μA) + (A <sub>AC+DC</sub> *450μV)		
		S or W	(V <sub>AC+DC</sub> *225µA) + (A <sub>AC+DC</sub> *1.8mV)	(V <sub>AC+DC</sub> *150µA) + (A <sub>AC+DC</sub> *1.8mV)	(V <sub>AC+DC</sub> *1µA) + (A <sub>AC+DC</sub> *1.8mV)	(V <sub>AC+DC</sub> *23µA) + (A <sub>AC+DC</sub> *1.8mV)	(V <sub>AC+DC</sub> *0.6μA) + (A <sub>AC+DC</sub> *1.8mV)		
DC Floor Error Apply to DC and AC+DC re the Voltage and Current DC Errors from previous tables	esults using C Floor	All	(V <sub>DC</sub> *Current DC Fl	oor Error) + (A <sub>DC</sub> *Voltag	e DC Floor Error) + (Cu	rrent DC Floor Error*Vo	oltage DC Floor Error)		
AC Floor Error (VA and VAF to AC and AC+DC VA & VA using voltage and current A Errors from previous tables	R only) Apply AR results AC Floor	All	(V <sub>AC</sub> *Current AC Floor Error) + (A <sub>AC</sub> *Voltage AC Floor Error)						
Common Mode Error (VA a Apply to AC component of results using the Voltage ar Common Mode Errors from tables.	de Error (VA and VAR only) component of VA and VAR the Voltage and Current de Errors from previous All (V <sub>AC</sub> *Current Common Mode Error) + (A <sub>AC</sub> *Voltage Common Mode Error)			ror)					
Common Mode Error (Watt to AC component of Watts the Voltage Common Mode previous table	s only) Apply results using e Error from	All	(A <sub>AC</sub> *Voltage Common Mode Error)						
Adjacent Channel Error Apply to AC component of using the Voltage and Curro Channel Errors from previo	all results ent Adjacent ous tables	All	(VA	<sub>C</sub> *Current Adjacent Cha	annel Error) + (A <sub>AC</sub> *Volta	age Adjacent Channel I	Error)		
Channel Errors from previous tables		S, A or L	А	VA <sub>FUND</sub> *(P Iternately, as a worst ca	PFUND - COS(COS <sup>-1</sup> (PFFUNI ase (at PF=0) this can e	<ul> <li>b) + 0.015°*F))</li> <li>xpressed as F*0.028%</li> </ul>	of VA		
	ily) Apply to		Alternately, as a worst case (at PF=0) this can expressed as F*0.028% of VA VA <sub>FUND</sub> *(PF <sub>FUND</sub> - cos(cos <sup>-1</sup> (PF <sub>FUND</sub> ) + 0.007°*F))						

## 2.4.1.2 HARMONIC WATTS MEASUREMENT ACCURACY TABLE

Specific	cation	Channel Type	Option H	Option D HI Range	Option D LO Range	Option X HI Range	Option X LO Range	
All			AC Watts Errors o	AC Watts Errors other than Phase Floor Error from preceding table at levels and F of the harmonic or spectrum point + (H/N) <sup>2</sup> *0.5% of reading + from below using the frequency of the harmonic or spectrum point				
Harmonic or	<10kHz	Aorl		0.00	6% + (0.004%+0.028%	%*F)/PF		
Spectrum Watts	10k-115kHz	AUL		0.05	5% + (0.004%+0.028%	*F)/PF		
Error	<10kHz	c c	0.01% + (0.004%+0.028%*F)/PF					
	10k-115kHz	3		0.05	5% + (0.004%+0.028%	»*F)/PF		
	<10kHz			0.01	5% + (0.004%+0.013%	6*F)/PF		
	10k-115kHz	W		0.03% + (0.004%+0.013%*F)/PF				
	115k-435kHz			0.08% + (0.004%+0.013%*F)/PF				

## 2.5.1 PF MEASUREMENT ACCURACY TABLE

Add relevant errors from the table below for the maximum error in PF measurements. For PF<sub>FUND</sub> apply only the Base Floor and Phase Errors.

Note: DC PF is 1.0 by definition and has no error; the table below applies to AC, AC+DC and FUND PF results.

Specification	Channel Type	Option H	Option D HI Range	Option D LO Range	Option X HI Range	Option X LO Range
	L	(56μΑ/Α <sub>AC+DC</sub> ) + (45μV/V <sub>AC+DC</sub> )	(38µA/A <sub>AC+DC</sub> ) + (45µV/V <sub>AC+DC</sub> )	(250nA/A <sub>AC+DC</sub> ) + (45µV/V <sub>AC+DC</sub> )	(6µA/A <sub>AC+DC</sub> ) + (45µV/V <sub>AC+DC</sub> )	(0.15µA/A <sub>AC+DC</sub> ) + (45µV/V <sub>AC+DC</sub> )
Base Floor Error Apply to all PF	А	(56µA/A <sub>AC+DC</sub> ) + (450µV/V <sub>AC+DC</sub> )	(38μΑ/A <sub>AC+DC</sub> ) + (450μV/V <sub>AC+DC</sub> )	(250nA/A <sub>AC+DC</sub> ) + (450µV/V <sub>AC+DC</sub> )	(6µA/A <sub>AC+DC</sub> ) + (450µV/V <sub>AC+DC</sub> )	(0.15µA/A <sub>AC+DC</sub> ) + (450µV/V <sub>AC+DC</sub> )
results	S or W	(225µA/A <sub>AC+DC</sub> ) + (1.8mV/V <sub>AC+DC</sub> )	(150µA/A <sub>AC+DC</sub> ) + (1.8mV/V <sub>AC+DC</sub> )	(1µA/A <sub>AC+DC</sub> ) + (1.8mV/V <sub>AC+DC</sub> )	(23µA/A <sub>AC+DC</sub> ) + (1.8mV/V <sub>AC+DC</sub> )	(0.6µA/A <sub>AC+DC</sub> ) + (1.8mV/V <sub>AC+DC</sub> )
AC Floor Error Apply to all PF results using voltage and current AC Floor Error from previous tables, this error always causes a reduced PF reading	All		-PF <sub>RDG</sub> *((Current AC Fle	oor Error/A <sub>RDG</sub> ) + (Volta	ge AC Floor Error/V <sub>RDG</sub> )	)
	L	(0.23mA/A <sub>AC+DC</sub> ) + (0.1mV/V <sub>AC+DC</sub> )	(0.15mA/A <sub>AC+DC</sub> ) + (0.1mV/V <sub>AC+DC</sub> )	(1µA/A <sub>AC+DC</sub> ) + (0.1mV/V <sub>AC+DC</sub> )	(40µA/A <sub>AC+DC</sub> ) + (0.1mV/V <sub>AC+DC</sub> )	(5µA/A <sub>AC+DC</sub> ) + (0.1mV/V <sub>AC+DC</sub> )
DC Floor Error	А	(0.23mA/A <sub>AC+DC</sub> ) + (1mV/V <sub>AC+DC</sub> )	(0.15mA/A <sub>AC+DC</sub> ) + (1mV/V <sub>AC+DC</sub> )	(1µA/A <sub>AC+DC</sub> ) + (1mV/V <sub>AC+DC</sub> )	(40µA/A <sub>AC+DC</sub> ) + (1mV/V <sub>AC+DC</sub> )	(5µA/A <sub>AC+DC</sub> ) + (1mV/V <sub>AC+DC</sub> )
after multiplying by (1-PF)	S	(0.45mA/A <sub>AC+DC</sub> ) + (3mV/V <sub>AC+DC</sub> )	(0.3mA/A <sub>AC+DC</sub> ) + (3mV/V <sub>AC+DC</sub> )	(2µA/A <sub>AC+DC</sub> ) + (3mV/V <sub>AC+DC</sub> )	(80µA/A <sub>AC+DC</sub> ) + (3mV/V <sub>AC+DC</sub> )	(6µA/A <sub>AC+DC</sub> ) + (3mV/V <sub>AC+DC</sub> )
	W	(0.68mA/A <sub>AC+DC</sub> ) + (5mV/V <sub>AC+DC</sub> )	(0.45mA/A <sub>AC+DC</sub> ) + (5mV/V <sub>AC+DC</sub> )	(3µA/A <sub>AC+DC</sub> ) + (5mV/V <sub>AC+DC</sub> )	(120µA/A <sub>AC+DC</sub> ) + (5mV/V <sub>AC+DC</sub> )	(8µA/A <sub>AC+DC</sub> ) + (5mV/V <sub>AC+DC</sub> )
Phase Error	S, A or L		(PF <sub>FL</sub> Alternately, as a wor	<sub>JND</sub> - cos(cos <sup>-1</sup> (PF <sub>FUND</sub> ) = st case (at PF=0) this c	± 0.015°*F)) an expressed as F*0.00	0028
Apply to all PF results	W		(PF <sub>FL</sub> Alternately, as a wor	und - cos(cos <sup>-1</sup> (PF <sub>FUND</sub> ) = st case (at PF=0) this c	± 0.007°*F)) an expressed as F*0.00	0013



## 2.6 FREQUENCY MEASUREMENT SPECIFICATIONS

Frequency Range	FUND setting of MAINS: 45Hz to 65Hz FUND setting of AVIONICS: 300Hz to 900Hz Otherwise-
	LF/PERIOD setting of VLF: 0.0099Hz to 65Hz LF/PERIOD setting of LF: 0.19Hz to 1kHz LF/PERIOD setting of 300ms period: 9Hz to 305kHz (W channel type) or 80kHz (other channel types) LF/PERIOD setting of 100ms period: 19Hz to 305kHz (W channel type) or 80kHz (other channel types) LF/PERIOD setting of 20ms period: 44Hz to 305kHz (W channel type) or 80kHz (other channel types) LF/PERIOD setting of 10ms period: 145Hz to 305kHz (W channel type) or 80kHz (other channel types) LF/PERIOD setting of 2ms period: 495Hz to 305kHz (W channel type) or 80kHz (other channel types) IF BANDWIDTH set to USER setting then upper limit is 0.5*setting
DC Level	DC offset is automatically eliminated
Min. Input (typical)	Voltage: 0.5Vrms (W, S or A channel type) or 75mVrms (L channel type) at fundamental Current, H option: 0.05Arms at fundamental Current, D option: 0.04Arms (HI range) or 0.3mArms (LO range) at fundamental Current, X option: 5mVrms (HI range) or 150µVrms (LO range) at fundamental
Min. Pulse Width (typical)	Greater of - 1.25µs (W channel type) or 5µs (other channel types) 0.001% of measurement period 10% of signal period
Update Period (nominal)	As shown below for FREQ SPEED settings of FAST/NORMAL/SLOW respectively - LF/PERIOD setting of VLF: greater of 1/2/15s or 1 cycle LF/ PERIOD setting of LF: greater of 1/1/5s or 1 cycle LF/ PERIOD setting of 300ms period: 0.25s/0.75s/2s LF/PERIOD setting of 100ms period: 55ms/250ms/1s LF/PERIOD setting of 20ms period: 25ms/200ms/700ms LF/PERIOD setting of 10ms period: 10ms/100ms/300ms LF/PERIOD setting of 2ms period: 2ms/50ms/150ms
Resolution	W Channel Type: 0.000125%/Update Period in seconds Otherwise: 0.0005%/Update Period in seconds
(nominal) Maximum	0.01% + Resolution
Settling Time (nominal) Error	Greater of (x2 if significant DC content) - a) 2 amplitude periods b) 2 frequency measurement periods c) 4 cycles of the signal

## 3 MECHANICAL CHANNEL INPUT AND ACCURACY SPECIFICATIONS

(MT TYPE)

# 3.1 INPUT CAPABILITIES AND CHARACTERISTICS

Input Terminals	SPD (Speed) input TRQ (To digital input D	: BNC (isolat orque) : BNC DIR (Direction)	ed from PXE2640 (isolated from PX ) : BNC (isolated fro	chassis), cor E2640 chassi om PXE2640	ifigurable as analog is), configurable as chassis), digital inp	ı or digital analog or ut
Input Common-Mode	Up to -15Vpk to +15Vpk specified Up to -30Vpk to +30Vpk with no damage					
Analog Input Range	Up Up Up to -30Vpk	to to to +30Vpk w	-12Vdc -15Vpk <i>v</i> ith no damage	to to	+12Vdc +15Vpk	specified specified
Digital Input Range	LO: <0.8V (no HI: >2V (nom Up to -30Vpk	ominal) inal) to +30Vpk w	vith no damage			
Input Impedance	Each input no	ominally 150k	$\Omega$ to PXE2640 cha	assis ground		

# 3.2 DIGITAL INPUT MEASUREMENT SPECIFICATIONS

Digital Frequency Timing	Signal must be LO for >500ns Signal must be HI for >500ns	
	Frequency measurement up to 500kHz (typically 900kHz) Minimum measurable frequency limited by user set measurement period	
DIR Setup/Hold Timing	DIR must be stable for >550ns prior to and after active edge of SPD input	
Maximum Frequency Error Measurement Period >10ms: 0.01%		
	Measurement Period ≤10ms: 0.015%	

## 3.3 ANALOG INPUT MEASUREMENT SPECIFICATIONS

Maximum Input Error

Add (0.005% + 50 $\mu$ V) per C outside of ±5C from calibration temperature

# **4 ANALYSIS SPECIFICATIONS**

## 4.1 INTEGRATION SPECIFICATIONS

0.05% + 1mV

Start Delay Time	Zero to 99 days, 99 hours, 99 minutes, 99 seconds (1 second resolution) 0.01% + 8ms maximum error
Integration Time	Manual (unrestricted period of time), or 1 second to 99 days, 99 hours, 99 minutes, 99 seconds 0.01% + 1ms maximum error
Maximum Data	(0.01% + 1ms) (not for integrated average data) + (0.03/measurement period in seconds)% per year error

## 4.2 HARMONIC ANALYSIS SPECIFICATIONS

Method	DFT performed at each frequency on same set of sampled signals (there is no discontinuity throughout the analysed frequency range)
Window Maximum	F > (2/measurement period): Hann (also called Hanning) Otherwise: Rectangular
Harmonic	The smaller of - a) A frequency of 435kHz (W type channels) or 115kHz (otherwise) b) 500 <sup>th</sup> (harmonics over the 100 <sup>th</sup> requires option H500) c) HARMONICS setting d) If BANDWIDTH set to USER: 0.5*setting/fundamental frequency
Harmonic Bandwidth	Nominally the greater of- a) The smaller of fundamental frequency or 2/(LF/PERIOD measurement period) b) If FUND set to AVIONICS: 20Hz c) (Fundamental Frequency*Maximum Harmonic/2250)
Measurement	Nominally (1/Harmonic Bandwidth)
Period Update	Nominally the greater of -
Interval	<ul> <li>a) LF/PERIOD measurement period</li> <li>b) Harmonic Measurement Period (from above)</li> <li>c) 0.25ms x Σ(Maximum Harmonic for each channel configured for harmonics)</li> </ul>
Data Available	Volts, Amps and Watts amplitudes for each configured harmonic Volts and Amps as a percentage of the fundamental of the same signal Volts and Amps THD as a percentage of the fundamental of the same signal Volts and Amps THD as a percentage of the AC+DC amplitude of the same signal V and A Phase of fundamental relative to the voltage fundamental of the lowest numbered channel in the VPA V and A Phase of each non-fundamental harmonic relative to the fundamental of the same signal
Accuracy	See relevant Voltage, Current and Watts accuracy specifications

# 4.3 SPECTRUM ANALYSIS SPECIFICATIONS

Method	DFT performed at each frequency on same set of sampled signals (there is no discontinuity throughout the analysed frequency range)
Window	Hann (also called Hanning)
Frequency	0.01Hz to 1kHz
Resolution	Nominally (1/ Frequency Resolution)
Measurement Period	Minimum is 100 x Frequency Resolution
Maximum Frequency	Maximum is the lowest of nominally -
	a) 16384 x Frequency Resolution (under some circumstances as low as 8192 x Frequency Resolution) b) 435kHz (W type channels) or 115kHz (otherwise)
Data Available	Volts, Amps and Watts amplitudes for each configured spectrum
Accuracy	frequency See relevant Voltage, Current and Watts accuracy specifications

# 4.4 CYCLE VIEW SPECIFICATIONS

Signal Range

As specifications for Voltage and Current

Cycle Period Time	From 2.3us (W type channels), 8.7us (otherwise) up to 100 seconds
Resolution Method	1/512 <sup>th</sup> of a cycle
Maximum Error	Mean cycle formed by asynchronously sampling all cycles within measurement period
	As Voltage and Current Specifications for PK data (Watts = multiplication of V and A waveforms)

# 4.5 SCOPE SPECIFICATIONS

Signal Range	As specifications for Voltage and Current
Timebase	1/2/5 settings from 5us/div to 20s/div
Capture Depth	Up to 32k points per signal
Capture Resolution	< 0.00005% of specified maximum measurable peak Voltage or Current
Sampling Period (nominal)	Greater of - 1.1µs (W type channels) or 4.1µs (otherwise) 0.03% of timebase setting
Maximum Error	As Voltage and Current Specifications for PK data (Watts = multiplication of V and A waveforms)

# 4.6 HISTORICAL DATA COLLECTION SPECIFICATIONS

Collection Time	Automatically continuously variable between 1 measurement period and 584.5 million years (collection is automatically stopped after this time has elapsed but this is untested at the time of writing)
Time	Note: this is the resolution by which you can determine when an event occurred, not that of the PXE2640 detecting events. All events are captured.
Resolution	The greater of- a) 1 pixel of displayed data (front panel) or 1 increment of the requested time interval (interface) b) 1 measurement period of the data being recorded c) A maximum of 1/4096 <sup>th</sup> of the elapsed historical data collection time (typically 1/8192 <sup>th</sup> ).
Data Capture	Every measurement is included in the maximum, average and minimum data for each increment of the time resolution interval regardless of the time resolution.

# 4.7 DATA LOGGING SPECIFICATIONS

Logged Measurements	Up to 16 measurement data per record (each of which can be 1 measurement or up to 500 harmonic measurements)
Data per Record	Up to 8003 data per record
Internal FIFO	32Mbyte (always in binary format, 4 bytes per data)
Buffer Internal	≥2Gbyte (always in binary format, 4 bytes per data) non-volatile Typically
Memory	5Mbytes/sec maximum sustained mean write rate
External Data File Format	ASCII (CSV, scientific format) or Binary
Timestamp	Record number + optional date and time (1 second resolution)
Maximum File Size	4Gbyte
Maximum Records	Only limited by maximum file size
Start Delay Time	Zero to 99 days, 99 hours, 99 minutes, 99 seconds (1 second resolution) 0.01% + 8ms maximum error
Run Time	Manual (unrestricted period of time), or 1 second to 99 days, 99 hours, 99 minutes, 99 seconds (1 second resolution) 0.01% + 8ms maximum error
Log Interval	0.002 second, or 0.01 second to 99 hours, 99 minutes, 99.99 seconds (0.01 second resolution) 0.01% maximum error $\pm$ 2ms non-accumulating error



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