



FEATURES

- **High Accuracy, in half the size and weight of existing designs**
- High resolution Touch-Screen
- Up to 80 dB Harmonic Rejection
- Fast settling time, fully programmable
- Ethernet, USB & IEEE-488
- LVDT/RVDT Measurement Capability
- **Independent Front and Rear panel connections**
- Replaces all legacy NAI PAV's
- Optional 6VA Internal Reference

DESCRIPTION

This precision Instrument measures Total, Fundamental, Harmonics, In-phase, Quadrature, Frequency, THD, Ratio and Phase angle. All displayed at the same time. The isolated inputs enable null, ratio, and gain measurements.

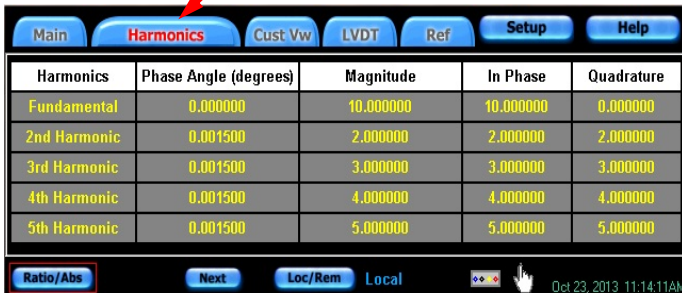
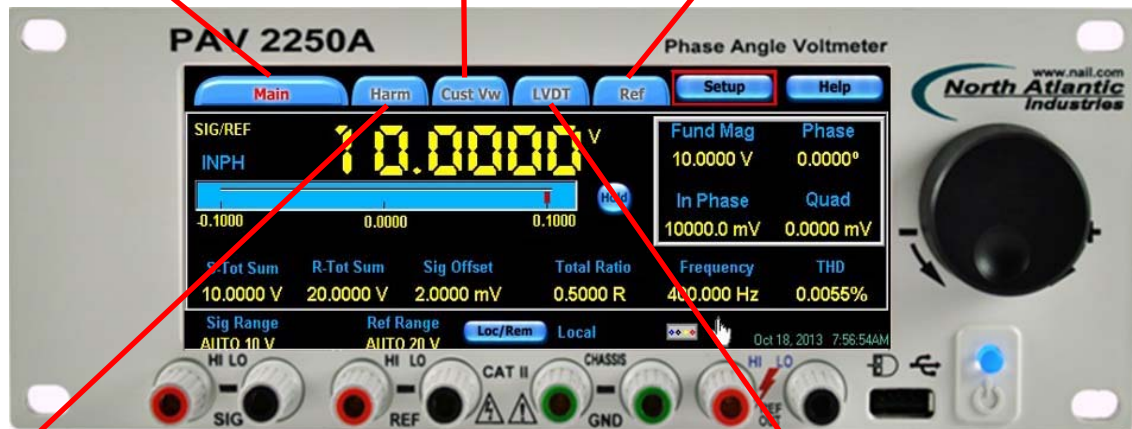
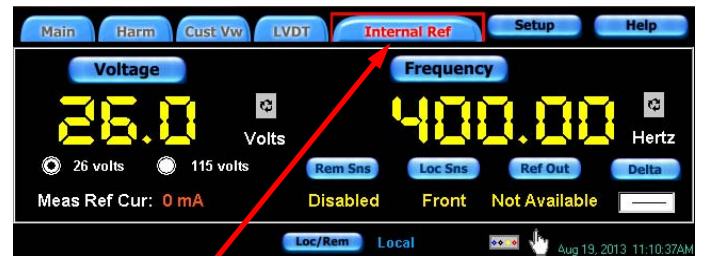
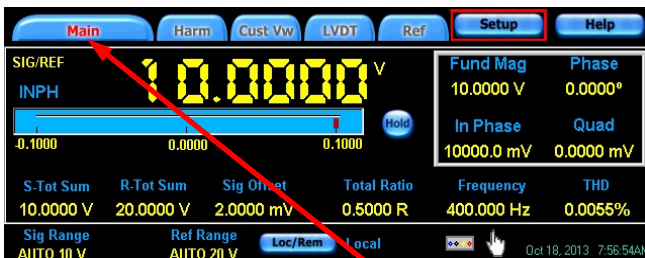
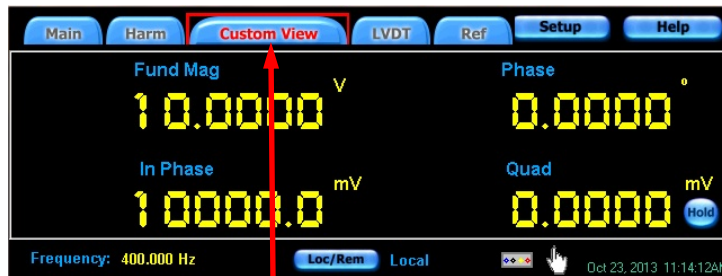
This second generation **2250A** Phase Angle Voltmeter (PAV) is based on the latest DSP and FPGA technologies, and thus substantially extends and simplifies the capabilities of the legacy 2250. Our unique design allows local programming to be done either via a color integrated touch-screen, front panel USB mouse interface, or with the multi-purpose increment/setup knob. The large (2.3" x 5.8") screen can display up to 16 parameters at the same time. In addition, a sensitive analog null meter is included as a standard feature. Not only is our new design smaller, lighter and requires less power, but it also includes communication via Ethernet, IEEE-488 and USB, AND a greatly improved settling time and accuracy.

The 2250A is the recommended replacement for all prior NAI PAV versions, including 2250, 2251, 225, 321 and 213C.

Optional Reference: This design can also incorporate a 6 VA programmable reference generator that is used for stand-alone applications (See Ordering Information).

DISPLAY SELECTION

Main Display, Harmonics, Custom View, LVDT or Reference is easily selected by pressing the corresponding tab by using either the touch screen, mouse or increment/setup knob. Below figures show each display select button along with the corresponding display.





SPECIFICATIONS

Channels:	Two, Galvanic Isolation (<i>One for Signal and one for Reference inputs</i>)
Coupling:	DC
Voltage Ranges, Programmable	
Signal:	50 _{mV} - 500 _{Vrms} (<i>In Dedicated Ranges or Auto-Ranging</i>)
Reference:	50 _{mV} - 500 _{Vrms} (<i>In Dedicated Ranges or Auto-Ranging</i>)
	13 ranges – Per standard 1,2,5 base ranges
Impedance, Input	
Signal:	1 Meg Ohms (<i>min.</i>)
Reference:	1 Meg Ohms (<i>min.</i>)
Frequency Range	
Total:	10Hz - 1MHz
Fundamental Modes:	10Hz - 100kHz
Phase Accuracy:	Refer to "Table 1"
Phase Input Ranges:	0.0000° - 359.9999° or ±179.9999°
Phase Resolution:	0.0001°
Voltage Accuracy:	Refer to "Table 2"
Voltage Resolution:	Up to 6 Digits
Harmonic Rejection:	>80dB
CMRR (Common Mode Rejection Ratio):	Refer to "Table 3"

	10Hz-1kHz	1kHz-6.25kHz	6.25kHz -20kHz	20kHz-50kHz	50kHz-200kHz
Phase accuracy	±0.01°	±0.015°	±0.02°	±0.05°	±0.10°

Table 1 – Phase Accuracy

Voltage Accuracy: % of reading + % of full scale over specified Voltage and Frequency ranges.

Range (RMS):	10Hz-2kHz	2k-5kHz	5k-20kHz	20k-50kHz	50k-100kHz	100k-300kHz	300k-1MHz
50mV to 100mV	0.04 + 0.04	0.07 + 0.09	0.1 + 0.08	0.25 + 0.15	0.85 + 0.4		
200mV to 20V	0.04 + 0.04	0.07 + 0.09	0.08 + 0.08	0.25 + 0.15	0.85 + 0.4	0.5 + 0.5	2.0 + 0.5
50V	0.04 + 0.04	0.04 + 0.09	0.08 + 0.08	0.15 + 0.15	0.4 + 0.4	0.5 + 0.5	
100V	0.04 + 0.04	0.03 + 0.05	0.09 + 0.08	0.15 + 0.15	0.4 + 0.4	0.5 + 0.5	
200V	0.08 + 0.05	0.08 + 0.05	0.09 + 0.08	0.3 + 0.15	0.6 + 0.4		
500V	0.08 + 0.05	0.08 + 0.05	0.09 + 0.08	0.3 + 0.2	0.5 + 0.6		

Table 2 – Voltage Accuracy

	5Hz-1kHz	1kHz-5kHz	5kHz -32kHz	32kHz-150kHz
CMRR (Common Mode Rejection ratio)	126 db	110 db	100 db	91 db

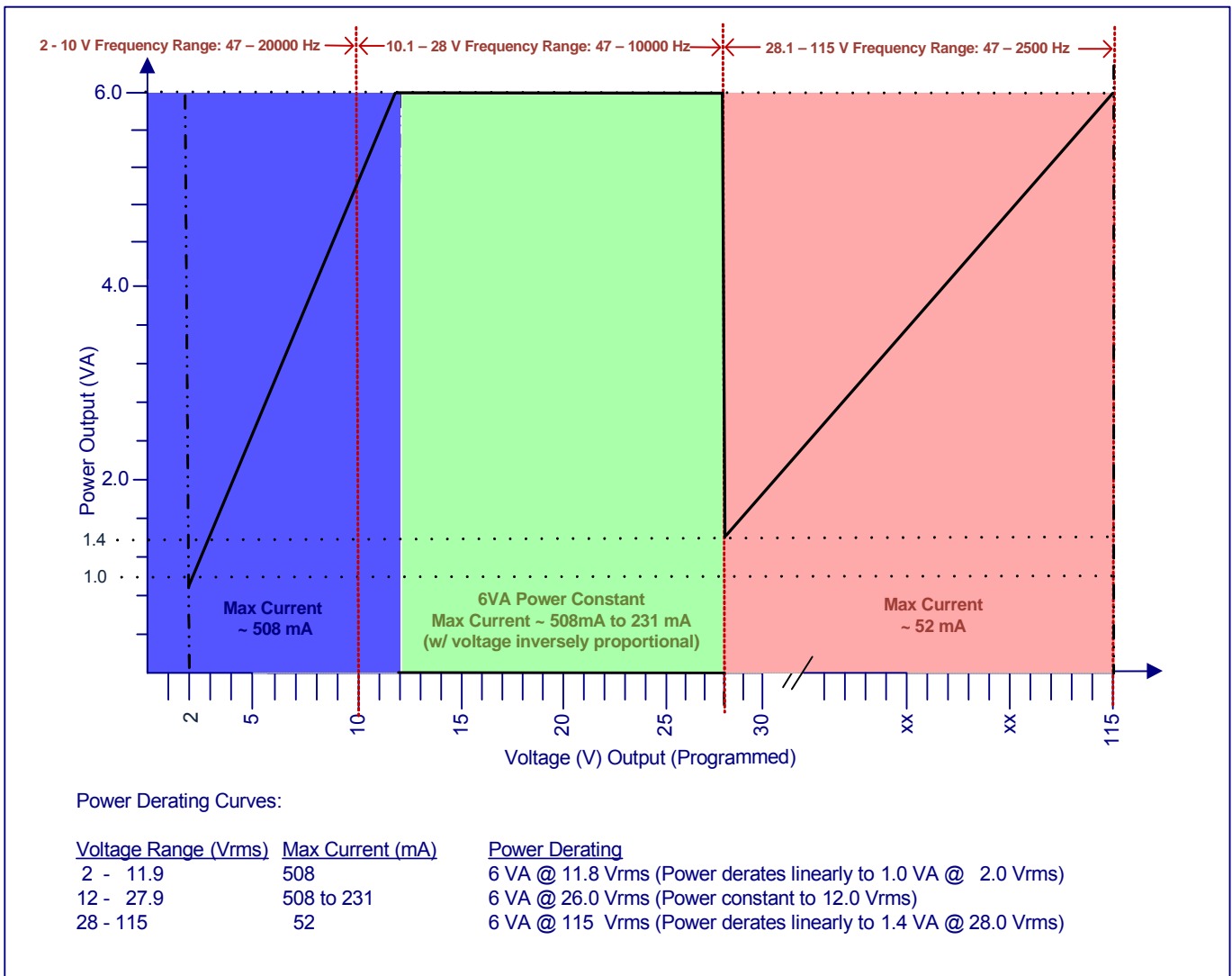
Table 3 – Common Mode Rejection Ratio

GENERAL

Communication Interfaces:	Ethernet (<i>10/100/1000 Base-TX</i>), USB-A (<i>USB 2.0</i>) and IEEE-488 (<i>Standard</i>)
Temperature Range:	0 - 50°C operating; 0 to +70°C storage
Input Power:	85 VRMS to 265 VRMS, 47 to 440 Hz
Weight:	< 7.5 lbs.(3.40 Kg)
Dimensions:	13.5" L (34.29 cm) x 9.5" W (24.13 cm) x 3.5" H (8.89 cm)

REFERENCE GENERATOR SPECIFICATIONS

Voltage Output:	2 Vrms to 115 Vrms, Programmable with a resolution of 0.1 V <ul style="list-style-type: none"> • 2.0 to 10.0 Vrms / 47 Hz to 20 KHz frequency range • 10.1 to 28.0 Vrms / 47 Hz to 10 KHz frequency range • 28.1 to 115.0 Vrms / 47 Hz to 2.5 KHz frequency range
Accuracy (No Load):	±5% of setting < 15 KHz ±10% of setting ≥ 15 KHz
Regulation	±5% (No Load to Full Load)
Output Drive:	6 VA maximum (See detailed description of Output Drive)
Output Protection:	Over-current (10x automatic retry; @ 1.3 sec int.; afterwards, shutdown w/ manual reset)
Frequency:	47 Hz to 20 KHz Programmable with 0.1 Hz steps
Frequency accuracy:	The greater of ±0.1% of frequency programmed or ±1 Hz.
THD:	±3% maximum
Reference Output Drive:	Isolated, single output (See detailed characterization)



Above figure: Reference output drive detailed characterization



INTERFACES, COMMUNICATIONS

The 2250A includes several different interfaces that include Ethernet, USB, & IEEE-488.

Detailed programming commands/information is included in “**2250A Programmer’s Reference Guide**”.
The Ethernet and the USB connectors are industry standard.

J2 CONNECTOR:

IEEE- 488 PIN DESIGNATIONS (Standard IEEE Interface Connector)

Pin	Designation	Pin	Designation	Pin	Designation	Pin	Designation
1	DIO1	7	NRFD	13	DIO5	19	Gnd., NRFD
2	DIO2	8	NDAC	14	DIO6	20	Gnd., NDAC
3	DIO3	9	IFC	15	DIO7	21	Gnd., IFC
4	DIO4	10	SRQ	16	DIO8	22	Gnd., SRQ
5	EOI	11	ATN	17	REN	23	Gnd., ATN
6	DAV	12	Shield	18	Gnd., DAV	24	Gnd., Logic

J3 CONNECTOR:

USB-A (USB 2.0) “Rear Panel” Connector, for communications only
Ethernet (10/100/1000 Base-TX)

J4 CONNECTOR:

USB-A “Front Panel” Connector for Display cursor only (mouse)

J5 CONNECTOR:

BNC “Rear Panel” Connector, for Signal Input only*

J6 CONNECTOR:

BNC “Rear Panel” Connector, for Reference Input only*

J7 CONNECTOR:

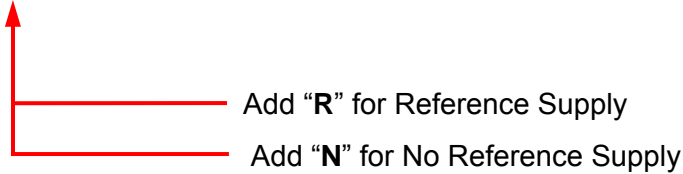
BNC “Rear Panel” Connector, for optional On-Board “Output” Reference Source only**

***Note: Front and Rear Panel connectors are independent of each other.**

****Note: When enabled, the reference output signal is available both at the Front and Rear connectors.**

ORDERING INFORMATION

2250A - * 0



Accessories:

Included with the 2250A is an accessory kit NAI part number 2250A-ACCESSORY-KIT. Kit includes the following items:

2250A- Accessory Kit	NAI P/N
Fuse, 5 x 20mm, 2A, slow-blow (2)	99-0146
Line Cord	202-0002

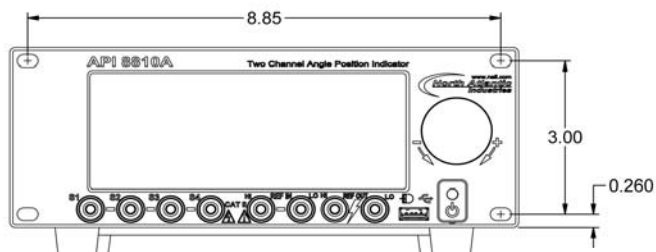
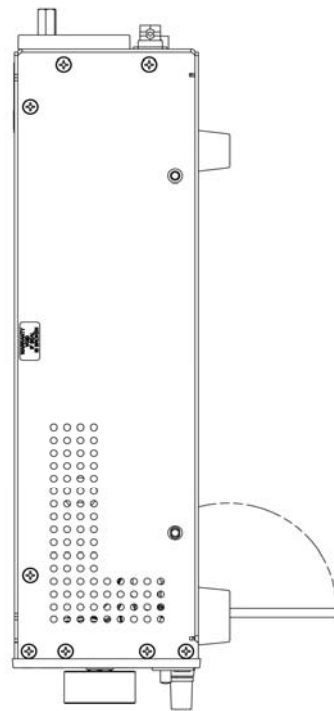
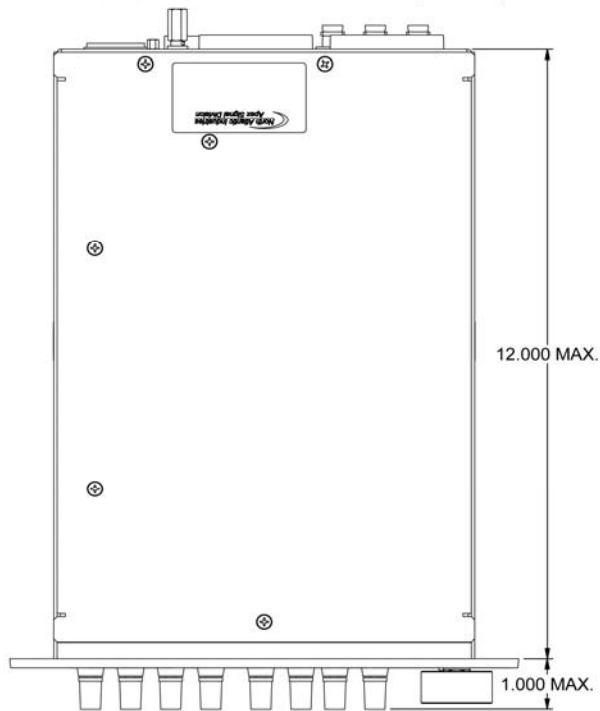
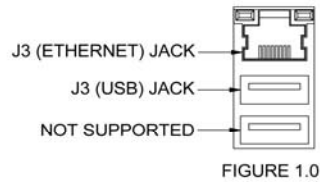
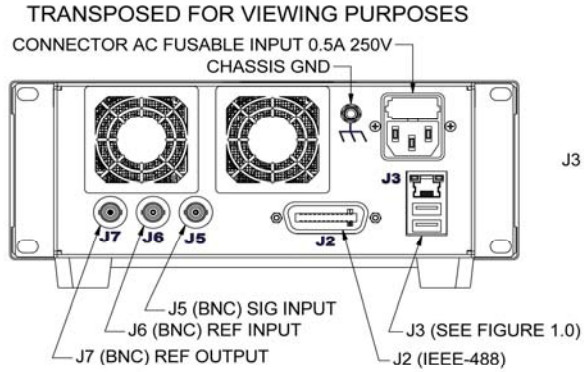
Optional Mounting Accessories

The 2250A can be ordered with mounting adapters for mounting either one or two units in a standard 19" equipment rack (3.5" Rack Height). The table below describes Full Rack and Tandem Full Rack* mounting accessories:

Type of Mount	Description	NAI P/N
Full Rack Mounting	Mounts one unit in a 19" Rack (3.5" Rack Height)	783893
Tandem, Full Rack Mounting (2250A with 8810A)	Mounts 2250A & 8810A (Angle Position Indicator) side by side in a 19" Rack (3.5" Rack Height)	8810A_5330A_TM
Tandem, Full Rack Mounting (2250A with 5330A)	Mounts 2250A & 5330A (Synchro/Resolver Simulator) side by side in a 19" Rack (3.5" Rack Height)	5330A_5330A_TM
Tandem, Full Rack Mounting (2250A with 2250A)	Mounts 2250A & 2250A (Phase Angle Voltmeter) side by side in a 19" Rack (3.5" Rack Height)	5330A_5330A_TM

*Note: 2250A Tandem Full Rack options is only utilized with the 8810A, 5330A and another 2250A

MECHANICAL OUTLINE, MODEL 2250A





REVISION HISTORY

Revision	Description of Change	Engineer	Date
A	Initial Release per ECO C02330	RS	11/07/13
B	ECO C02356 - Changed Reference Generator output voltage range: From: 1 - 115Vrms To: 2 - 115Vrms	RS	12/02/13