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Introduction

Summary

This PDF is not a full user review but primarily documents the problems which remain after installing firmware 1.12.00.

For those considering purchase of the 125B:

- o If you plan to just observe readings, do screen captures, or to use Flukeview Scopemeter 2 to log readings over time, the 125B works well.
- o If you intend to RECORD and review on the 125B, some issues are documented below.

Ed Elliott

Software Versions
125B firmware: 1.12.00
FlukeView 2 ScopeMeter (FV2): 1.2.1.0
Fluke Connect iOS app: 1.54
FlukeView for 190 series and 120 series, a.k.a., SW90W: 5.4 (This is the original FlukeView. A SW90W license is not included with purchase of a 120B-series.)

Change Log for this document

2016.05		o initial version based upon firmware 1.00.03
2016.06.28	v04	o still based upon firmware 1.00.03
2017.01.18	v06	o after installing firmware 1.10.01
2017.03.30	v09	o improve readability of the PDF
		o delete documentation for bugs which were fixed by firmware 1.10.01
		o document bugs discovered during additional testing
		o correct my previous statement regarding DPF
		o add programming workarounds for a couple 125B bugs (missing VA and missing cosφ)
2017.04.21	v10	o incorporate Fluke Engineering's 2017.04.20 responses to the v09 pdf
	v11	o update in response to 2017.04.20 responses from Fluke Engineering, e.g., an item is no long classified as a bug
2017.09.23	v12	o after installing firmware 1.11.01. I only re-tested items which the release notes stated were fixed.
2017.11.25	v13	o after installing firmware 1.12.00 and FlukeView 2 ScopeMeter 1.2.1.0. This document version (v13) continues to include items fixed as of the previous version (v12) because I did not post v12 to EEVBLOG (and because Fluke had not yet made FV2 1.1.0.0 available to everyone; Fluke has now made FV2 1.2.1.0 available instead).

What's Included

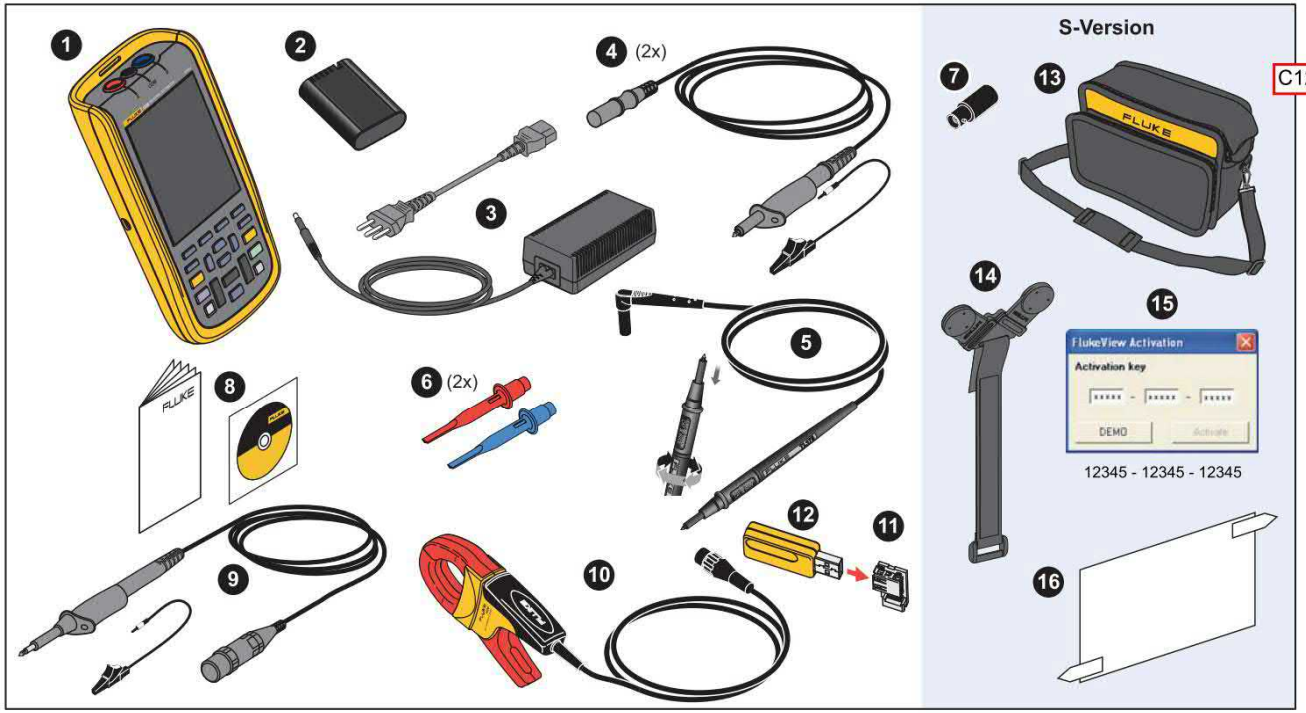
Test Tool Kit Contents

Table 2 is a list of the items included in your Test Tool kit.
Also see Figure 1.

Table 2. Packing List

Item	Description	12x-B	12x-B/S
1	Fluke Test Tool	123B, 124B or 125B	123B/S, 124B/S or 125B/S
2	Rechargeable Li-ion Battery Pack	●	●
3	Switch Mode Power Supply, Adapter/Battery Charger	●	●
4	Shielded Test Leads with Black Ground Leads	●	●
5	Test Lead Black (for Grounding)	●	●
6	Hook Clips (red, blue)	●	●
7	Banana-to-BNC Adapters (black)	● (x1)	● (x2)
8	Safety Information + CD-ROM with Users Manuals	●	●
9	10:1 Voltage Probe	124B, 125B	124B/S, 125B/S
10	i400s AC Current Clamp	125B	125B
11	USB Angled Adapter	●	●
12	WiFi USB Adapter	depends on version	included in 125B/NA/S *
13	Soft Carrying Case		●
14	Magnetic Hanger		●
15	FlukeView® ScopeMeter® Software for Windows®		●
16	Screen Protector		●
	OC4USB Optical Cable	optional	optional

* 20170420: Regarding my statement "*WiFi adapter – included in 125B/S"*, Fluke states "Note that the Wi-Fi adapter comes with all models."



In addition to the two hooks (#6) for the 1:1 probes (#4) there is a additional black one for the 10:1 probe (#9).

Figure 1. Test Tool Kit

o Wi-Fi adapter: As its name implies, it communicates via Wi-Fi rather than Bluetooth like most FC-capable instruments.

o The Wi-Fi adapter which came with my 125B/NA/S is the D-Link DWA-131 (UPC = 7 90069 32884 8; H/W Ver = E1; F/W Ver = 5.01).

o The accessories are the usual high quality one expects from Fluke.

o The AC adapter seems unnecessarily bulky. It weighs much less than one would expect given its size.

o 2017.04.20: Fluke states that the bulk is necessary to make the adapter compliant with Cat IV.

o The C120B soft case is very nice and has four interior compartments in addition to the side pouch which can be seen in the image above. Plenty of room for everything in the 125B/NA/S kit. Because there are lots of accessories, I store related accessories in five ZipLoc bags.

o Documentation

o The included CD contains the user manual pdf in various languages. It can also be downloaded (at least the English version) from Fluke.

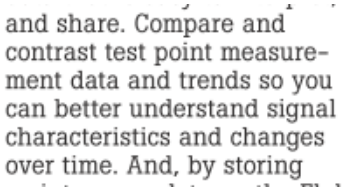
o On the CD is also a pdf for the details of BusHealth (aka FieldBus). That pdf seems to be identical (or close) to the documentation at the end of the original 120 series user manual. The 120B user manual pdf states (pdf p. 52) that this BusHealth/FieldBus data is in Appendix A but there is no Appendix A in the 120B user manual pdf itself.

o If you are looking for a definition of terms the best starting point is probably the 43B Applications Guide pdf. The 43B Applications Guide is also a useful reference for how to set up various measurement scenarios.

o I bought the 125B/NA/S because I was looking for a portable replacement for my 196C ScopeMeter (still works great). I wanted a higher resolution color display in a somewhat smaller package. And Power Quality and Harmonics functionality. And a lithium battery. I considered the Keysight, Tek, and Chinese offerings but all came up short in one way or another (the lack of programming interface documentation being one of my concerns). The 125B display is perfect.

Logging

o The Fluke Connect iOS app only sees 125B screen images, which are automatically refreshed. The user can request capture and save of a screen image. The app does not support logging 125B measurement data either standalone or in conjunction with other FC-capable instruments. This is contrary to my interpretation of the claims in the 120B datasheet:


and share. Compare and contrast test point measurement data and trends so you can better understand signal characteristics and changes over time. And, by storing

o FV2 supports logging.

o FV2 is limited to a max of two data elements via Wi-Fi and via the OC4USB.

o FV2 does not presently support FFT analysis (unlike the original SW90W FlukeView for ScopeMeter software) but the 125B does Power Quality (including harmonics) measurements real time.

- o FlukeView for ScopeMeter was due for a refresh and FV2 looks like a step in the right direction. Although you can still save to a file (.fv2, .bmp, .csv) FV2 has its own database (SQL-based I think) where you can specify some attributes such as equipment description and measurement/test description. I haven't used the database.

20170420: Re the next three bullets (SW90W, FlukeView Forms, sw3000FC), Fluke states "The 120B series is supported by the FlukeView 2 ScopeMeter software. Not supported with FV5.4, FlukeView Forms or SW3000FC. Improved logging functionality is available in upcoming FV2 release with beta version available next week." (I discuss the beta further along in this pdf.)

o If you have a license for SW90W (original FlukeView for ScopeMeter for 190 and 120 series), FV5.4 reliably logs up to four data elements, two for Channel A and two for Channel B. You will need an OC4USB cable. Or the PM9080 cable will work if you already have one. My PM9080 version 1 cable works fine with FV5.4 (but not with FlukeView 2, even when using an FTDI-based USB-to-serial adapter).

- o But FV5.4 cannot capture 125B screen images.
  - o But the 125B can be connected concurrently to FV5.4 via the OC4USB and to FV2 via Wi-Fi. Just make the OC4USB connection to FV5.4 first; otherwise FV2 will connect via the OC4USB at startup.
- o If FV5.4 does not connect successfully using its default process, used Advanced settings to set the baud rate to 19200.
- o Be careful to orient the optical connection correctly. The 125B has the optical LED's toward the rear whereas the 196C has the optical LED's toward the front. Based upon years of experience with the 196C I was accustomed to the Fluke label facing a certain direction but this resulted in the PM9080 being 180° out of alignment on the 125B.

o FlukeView Forms (came with the 289 kit) does not support the 125B via the pc3000FC (or the OC4USB).

- o Why bother to test this? Version 3.8.0003 of FV Forms is supposed to support most 3000FC-type Fluke Connect instruments. A pc3000FC is required.

o sw3000FC. Device detection does not discover the 125B.

o TrendPlot. The 120B series datasheet does not mention TrendPlot for good reason – it's not supported. But those experienced with the original 120 series or with the 190 series might expect the 125B to support TrendPlot. Even the much-less-expensive 289 has similar logging capabilities. And each product's corresponding FlukeView version supports retrieval of the saved TrendPlot memories (two TrendPlot measurement memories on the 196C, for example). But with the 125B, you will have to log to a PC if you want a permanent record of TrendPlot-style Meter measurements, e.g., volts and amps over an extended period (e.g., minutes, hours, days). Even with FV2 fixed (1.2.0.0), my preferred logging solution is FV5.4 via the OC4USB.

o 20170420: Fluke states "TrendPlot is replaced by the Meter Recorder feature. The ability to transfer Meter Recorder loggings to a PC is planned for an upcoming release this summer."

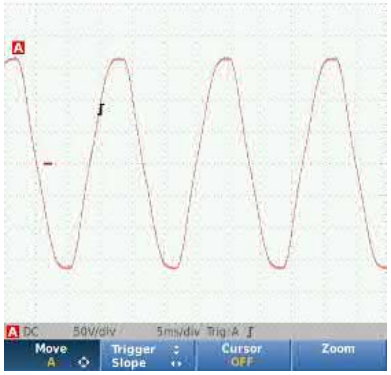
o Reminder to self: When FV2 retrieval of Recorder readings is ultimately supported, verify whether the scope can RECORD Power Harmonics measurements and FV2 can retrieve them.

o 20171127: FV2 1.2.0.0 still does not support transferring the RECORD results from the 125B to the PC.

Functionality Problems (as opposed to Programming Interface Problems)

~~*Bug: The easy reset process resets the date format*~~

- o 20170923: This bug was fixed with firmware 1.11.01.
- ~~o The easy reset process (Hold MENU > Press and release Power > Release MENU) resets the date format.~~
  - ~~o 20170118: Bug still exists.~~
  - ~~o 20170420: Fluke states "Indeed a bug. Release where this will be fixed is tbd at the moment."~~



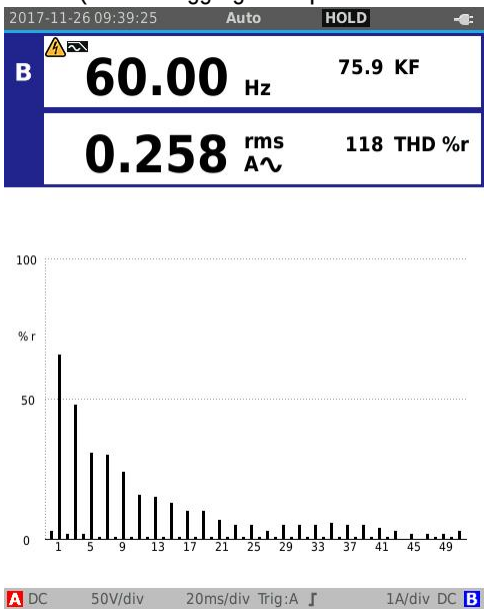
*FlukeView **2** ScopeMeter Version 1.2.1.0*

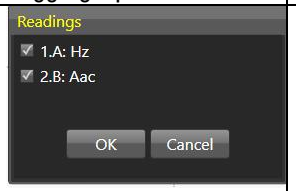
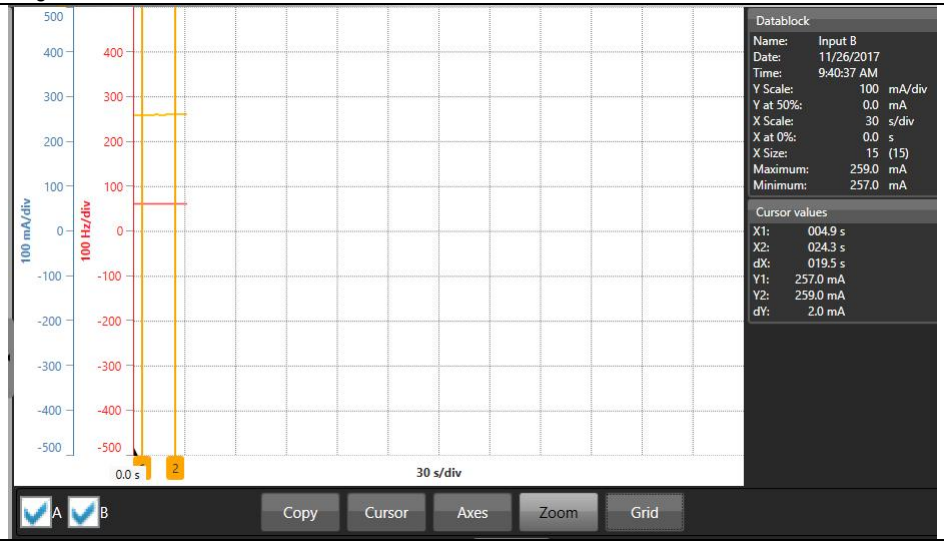
~~Bug: The Channel **A** readings are overlaid with the values (but not units) from Channel B~~
~~Bug: 0.0 values are erroneously recorded for **a** temporary period for both channels~~
~~Bug: the logging display stops updating but later resumes~~

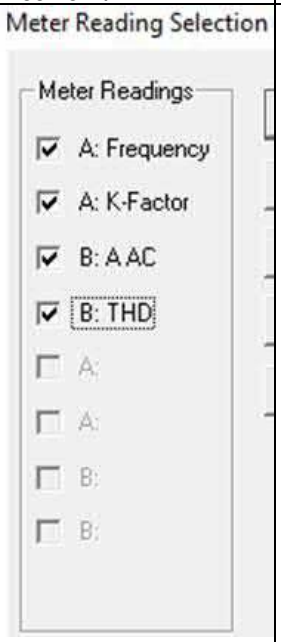
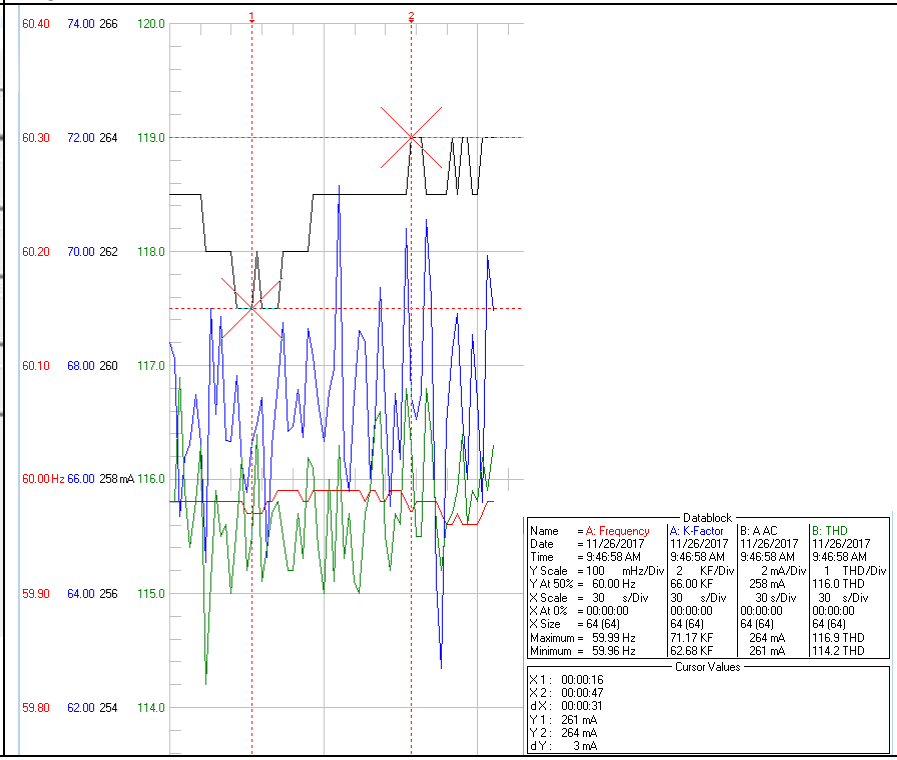
20171125: Version 1.2.1.0 has eliminated the three logging bugs (above).

o The FV2 application, however, can only log, at most, the two Main readings whereas SW90W v5.4 can log, optionally, the Main and Sub readings.
o The workaround for FV2's inability to log the Sub readings might be to use SCOPEMETER mode and ensure that the desired readings (maximum = 2) are the Main readings.
o SW90W also provides flexibility in individually scaling the various Y-axes (although its error checking logic is sometimes flakey and it can get locked into a permanent loop popping error dialogs).
o Both FV2 and SW90W support logging in POWER HARMONICS mode in addition to SCOPEMETER mode.

o Active screen (for the logging examples on the next two pages):



Software	Logging Options	Log
FV2 1.2.1.0	 There are no checkboxes to log either of the Sub readings. Only Main readings can be logged.	

Software	Logging Options	Log
SW90W 5.4	 Main and/or Sub readings may be logged.	

RECORD

No way to document RECORD session

o 20171127: FV2 1.2.0.0 eliminated the Open > Instrument > Saved function, probably because the functionality did not work, i.e., it would neither transfer RECORD results from the 125B to the PC nor would it correctly load the RECORD results on the 125B (as if you had pressed MENU > F3 on the 125B). I had reported this problem to Fluke on 20170704 as a result of my testing of FV2 1.1 beta.

o 20170420: Re my statement "*No way to document RECORD session*", Fluke states "This is planned to be supported for an upcoming release this summer."

o 20170923: This capability to SAVE a RECORD on the scope was improved with firmware 1.11.01. (This section previously reported deficient SAVE functionality.)

o There appears to be no way to retrieve a RECORD session with FlukeView 2 ScopeMeter.

Tedious/difficult to navigate RECORD results

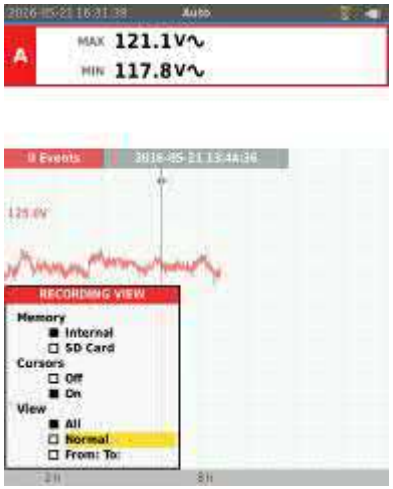
20170420: Fluke states "Valid comments. Release where this will be fixed is tbd at the moment."

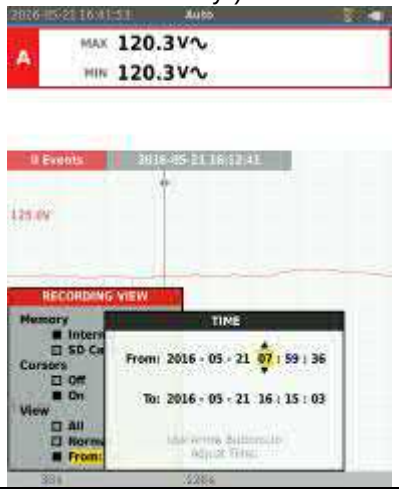
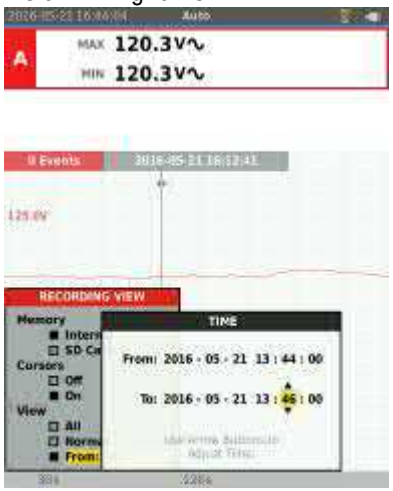
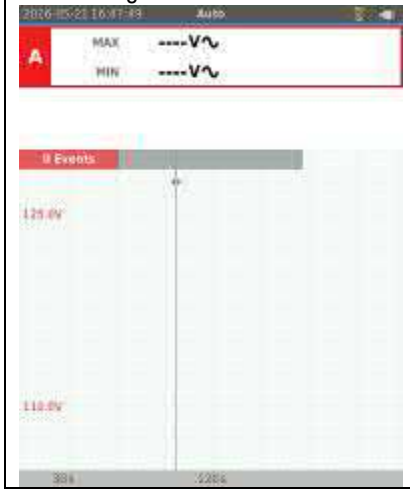
o The design makes it unnecessarily tedious to zoom in on an area of interest. (continued on next page)

(The following points which I make are still valid but after sending this to Fluke I concluded that the workaround is to stay in Normal view, use the 

button to adjust the scale, and use the cursor keys to navigate. 20170119: an attempt to use the 

button as a workaround did not work.)

Let's examine that Min. Presently the View = All so the plan is to position the Cursor over the Min then switch to View = Normal to zoom in. 	So we position the Cursor over the Min at 13:44:36. 	We attempt to zoom in by using View > View = Normal. 

Whoops. The Normal view has its own Cursor with its own date/time so we're zoomed in at 16:12:41 rather than 13:44:36. 	So maybe we can use the View = From: To:. It's tedious compounded by the fact the scrolling the seconds field (59->00 or 00->59) will change the minutes and similarly scrolling the minutes will change the hour (unlike most other UI's these days). 	Did you remember to write down that 13:44:36? So we've set a time range which we think might work. 
After all of this unnecessarily complicated effort we get... ???? 	A friendlier UI, for example, might use the up/down arrow buttons (they are available) to zoom in/out while keeping the Cursor at the same date/time.	

Bug: Powering on resets Harmonics setting to %r

o Even a reset leaves this settings unchanged, which is probably the behavior preferred by most users.

o 20170923: bug still exists.

20170420: Flukes states “Valid comments. Release where this will be fixed is tbd at the moment.”.

Bug: Powering on resets Power setting to FUNDAMENTAL

o Even a reset leaves this setting unchanged, which is probably the behavior preferred by most users.

o 20170923: bug still exists.

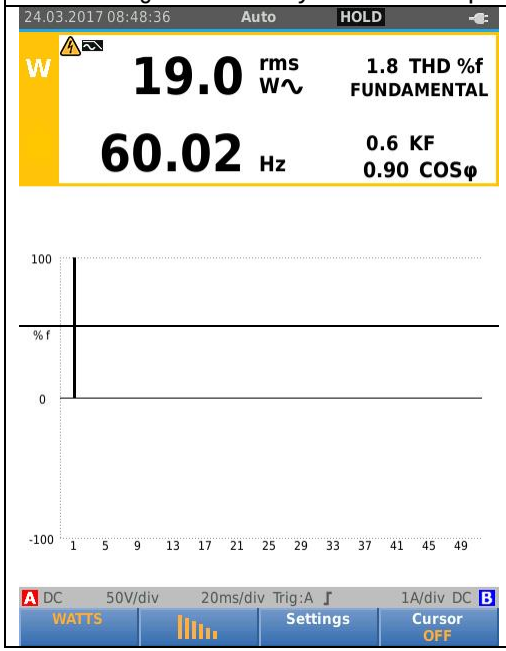
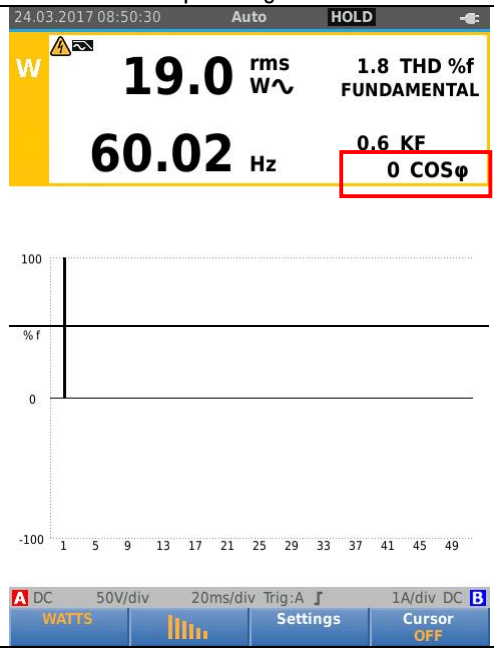
20170420: Flukes states “Valid comments. Release where this will be fixed is tbd at the moment.”

~~*Bug: Sometimes cosϕ is zeroed*~~

o 20170923: I decided to remove this as a bug simply because it appears to have been a fluke and cannot be recreated.

~~o 20170324: Newly-identified bug. Firmware 1.10.01. Sometimes, approximately seven seconds after pressing HOLD while on the~~ 

~~screen the cosφ value is changed to zero. This occurs even if no screen capturing is being performed. This test case, if it makes a difference, is a 40W compact fluorescent. This problem, which I had never noticed during in months of use, has now disappeared. The problem's appearance/disappearance is not caused by powering on/off or by performing a soft reset. Strange.~~

~~screen image immediately after HOLD is pressed~~	~~7 seconds after pressing HOLD~~
	

~~o FV2 always enables HOLD at the start of the capture and disables HOLD at the end of the capture (even if HOLD was enabled by the user). So if you are encountering the cosφ-is-zeroed-after-seven-seconds problem: to obtain a correct screen capture of the~~ 

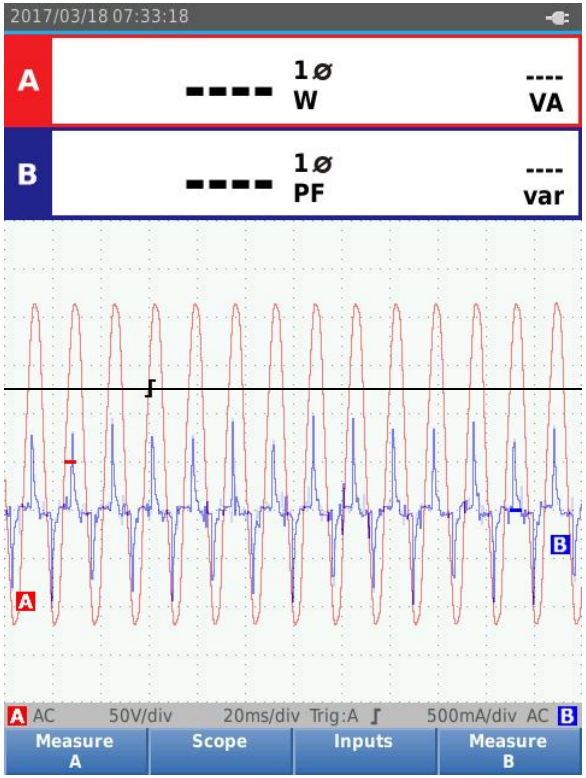
~~screen, you can either let FV2 do its thing (i.e., you don't enable HOLD prior to initiating the capture) or you must initiate the capture immediately after enabling HOLD.~~

~~*Bug: In SCOPEMETER mode VA, VAR, PF, and W will not concurrently measure*~~

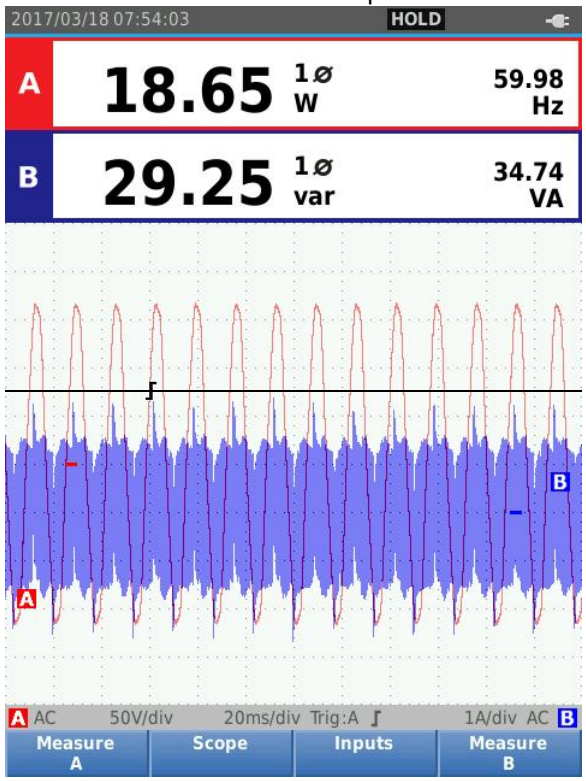
o 20170923: This bug was fixed with firmware 1.11.01.

~~o 20170324: Newly-identified bug. Firmware 1.10.01. In SCOPEMETER mode when VA, VAR, PF, and W are measured concurrently no values are displayed when the test load was a 40W compact fluorescent or a 100W incandescent. I tried tweaking settings (different time bases; different vertical scaling; smoothing on/off; measured parameters in different orders & channels). The solution was to exclude PF from the measurements and pay attention to which measurement is where.~~

~~Doesn't work if PF is measured:~~



~~Without PF. And VAR and VA in specific locations:~~



~~Note: If VAR and VA are reversed, their values will not display. So there might be other combinations which might work or might not work. Flakey.~~

~~o The easiest workaround is to use the Power Harmonics > WATTS screen.~~

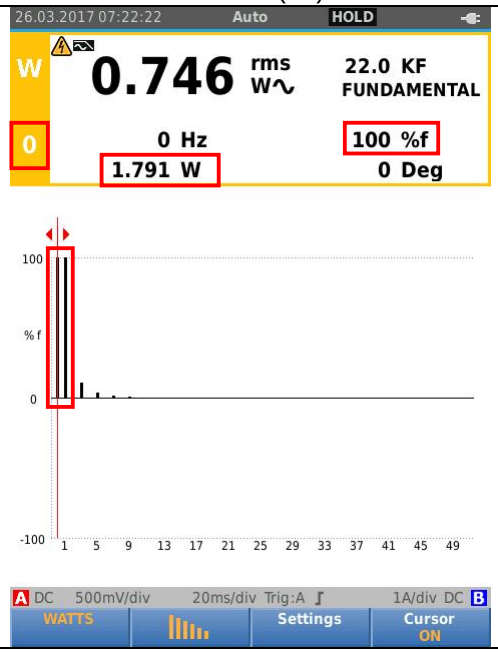
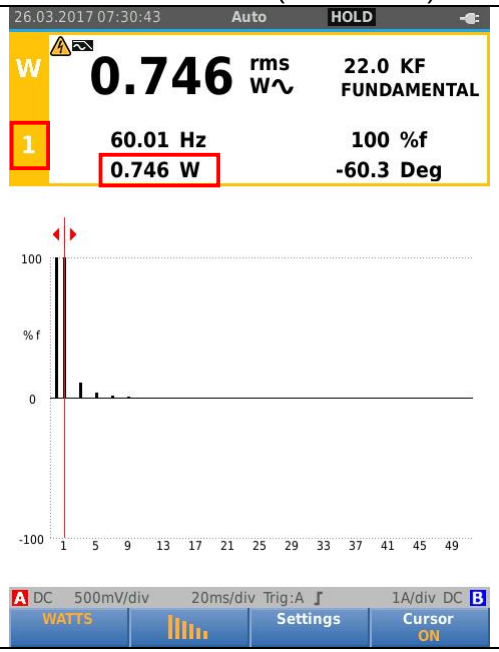
Bug: Harmonics graph is incorrect when a harmonic's amplitude is greater than the base amplitude

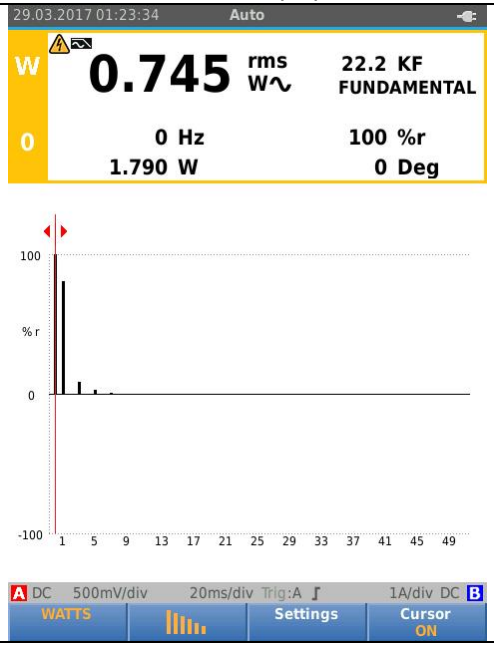
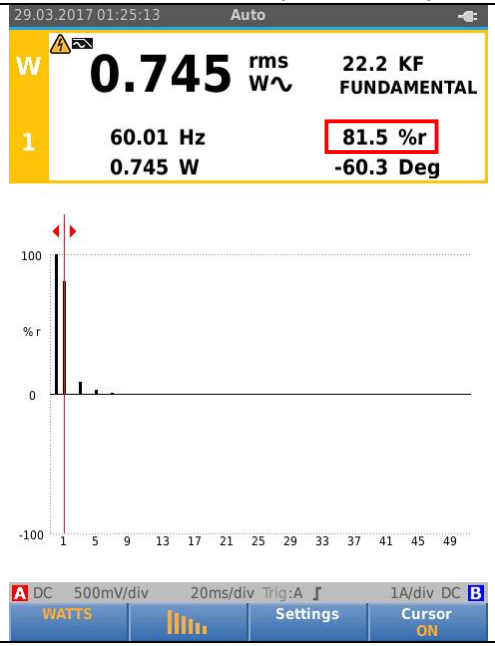
20170923: This bug remains, i.e., it was not fixed by 1.11.01 (Nor was it claimed to be fixed in the release notes. I was just checking.)
20170326: Newly-identified bug. Firmware 1.10.01. In the example below, the harmonics graph displays harmonics 0 and 1 with 100% amplitude but harmonic 0 is 1.791 W and harmonic 1 is 0.746 W. Also, the %f for harmonic 0 should be 240% (1.791 ÷ 0.746) rather than 100%. This problem occurs on the Watts, Volts, and Amps  screens.

- Obviously a base amplitude is needed to define what 100% means but that does not necessarily mean that the max on the graph scale should be 100%. If the design decision is to leave the graph max at 100% then harmonics exceeding 100% should be highlighted, perhaps by a unique color – and their % should be correct, not capped at 100%.

When Harmonics = %f, the "base" amplitude which defines 100% is the amplitude of the fundamental.

When Harmonics = %r, the "base" amplitude which defines 100% is the amplitude of the AC waveform components, i.e., H1 – H51. Details below.

Harmonics setting	Cursor is on harmonic 0 (DC)	Cursor is on harmonic 1 (fundamental)
%f		

Harmonics setting	Cursor is on harmonic 0 (DC)	Cursor is on harmonic 1 (fundamental)
%r		

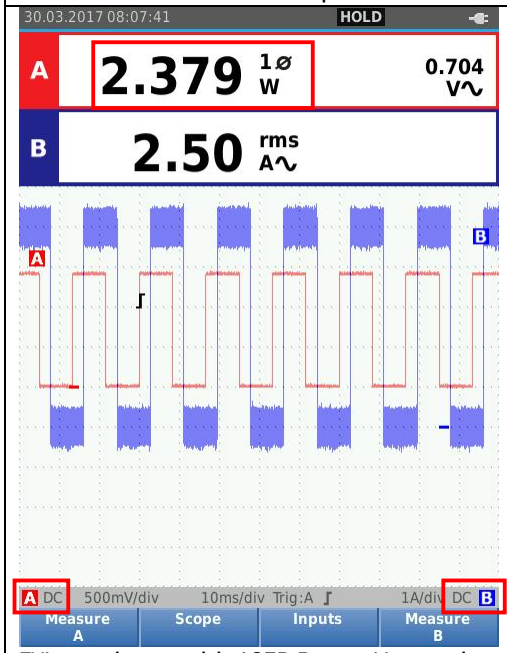
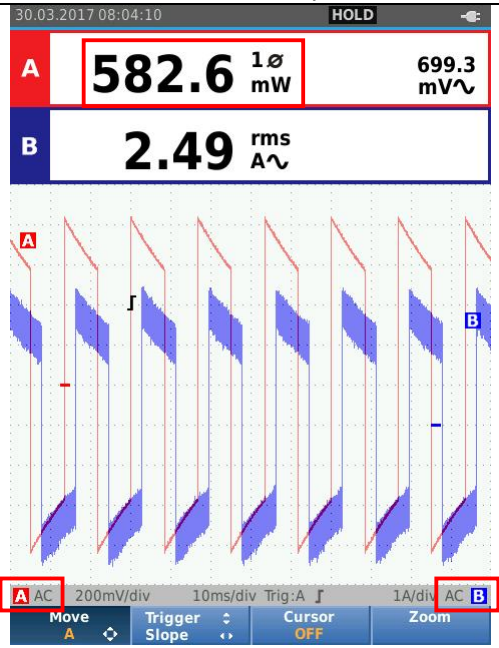
*Info: Nuances of the **r** value (of %r)*

(continued from the previous section)

In the example above when Harmonics = %r, what is the 81.5% for harmonic 1 based on? 0.745W ÷ 81.5% means that the r in %r should be 0.914W – but the 125B is saying that RealPower$_{fundamental}$ is 0.745W. It turns out that although the 125B is displaying RealPower$_{fundamental}$ as 0.745W (correct) it is:

(1) defining 100% on the graphs as the power in H1 – H51 (all AC power), i.e., 0.914W in this case.

o But the 0.914W is not available on any screen so the user might be left wondering what's going on. It cannot be determined in SCOPEMETER mode (below). The 125B should be defining r as 0.582W (which is the measured power in the AC components) rather than 0.914W (which is the harmonics power in the AC components (more explanation below)). In v09 of this pdf, I labeled this as a bug but I now believe it to be a necessary compromise due to hardware limitations (more explanation below).

SCOPEMETER mode DC coupled	SCOPEMETER mode AC coupled
	
FYI: consistent with 125B Power Harmonics mode and with my Tek and Keysight scopes.	FYI: consistent with my Tek and Keysight scopes.

20170420: Fluke states "The 100% is indeed the H1-H51 value. That is indeed used and not displayed. The statement that 125B should be defining r as 0.582W in this example seems incorrect. This is the measured Power with AC coupling on which gives different result as can also be seen by the changed waveform shape which is different than just subtracting the offset."

20170421: My thoughts: Even if my contention that using 0.582W (measured power of the AC components) is theoretically correct, there is probably no alternative to using H1-H51 (harmonics power of the AC components). The 

screen is DC coupled – if it were AC coupled H0 could not be analyzed and displayed. To do what I originally suggested, the 125B would have to be AC coupled to measure the 0.582W but DC coupled to measure H0. It's probably impossible from a hardware standpoint to be simultaneously in both states.

And my test case here is totally artificial, i.e., square waves with Vmin = 0V for both channels. Without delving too deeply, this might account for the wide disparity between the measured AC power (0.582W) and the harmonics AC power (0.914W). Perhaps with real world cases, the difference in measurements would not be significant.

Eliminating the DC offset (analysis below) from my test case did not eliminate the disparity so I suspect the issue is that the square waves are rich (i.e., have significant power) in non-harmonic components.

- o Rerunning my test case after removing the DC offset for V and the DC offset for I results in:
  - o From 

:
    - o H1 is 0.7457W and 81.7%r, which means that the r in %r is 0.913W (0.7457 ÷ 0.817).
  - o From my data capture: H1-H51 power = 0.911 W
  - o From SCOPEMETER mode DC coupled: 0.5876 W.
  - o From SCOPEMETER mode AC coupled: 0.5742 W.

  Conclusion: The presence or absence of the DC offset does not impact the 0.911W vs. 0.582W difference.

Re Fluke's contention that defining r as 0.582W is incorrect, I believe that 0.582W is theoretically correct but that a compromise was required because the scope cannot be simultaneously AC coupled and DC coupled. But Fluke has more education/experience/understanding of this subject – so maybe there is something I do not understand.

(2) incorrectly capping H0 at 100% when, if 0.914W is to be 100%, H0 should be 196% (1.790 ÷ 0.914).

20170420: Fluke states "Indeed incorrect."

Re the 0.914W, the calculation of power in H1 – H51 (all AC power) appears at the bottom of the next page. That power is the sum of the absolute values of the amplitudes of harmonics 1-51.

- The next page was produced by my capture program. That program always defines 100% based upon the amplitude of the fundamental because the 125B does not provide a way for the programming interface to ascertain the %f vs %r setting.

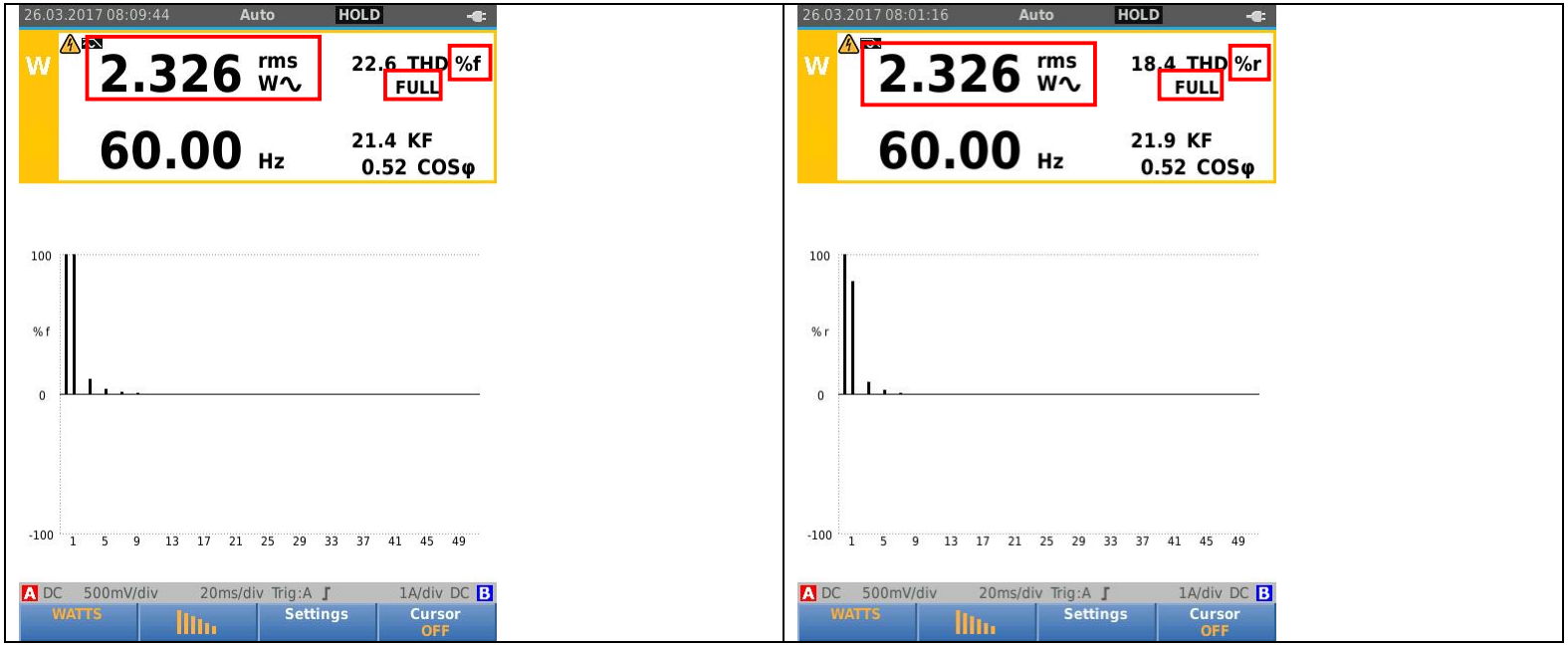
1.793616	W	Fluke 125B: Watt harmonics Channels A and B	0	0	0	DC	0.0°	240.5%		|————————————————————————————
0.7457327	W	Fluke 125B: Watt harmonics Channels A and B	1	1	+	Fund	-60.2°	100%		|————————————
-4.59195E-07	W	Fluke 125B: Watt harmonics Channels A and B	2	2	-	Even	91.1°	0%		|
0.08293062	W	Fluke 125B: Watt harmonics Channels A and B	3	3	0	Trip	-60.0°	11.1%		|—
-2.57149E-05	W	Fluke 125B: Watt harmonics Channels A and B	4	4	+	Even	158.8°	0%		|
0.03045534	W	Fluke 125B: Watt harmonics Channels A and B	5	5	-	Odd	-59.2°	4.1%		|–
3.82663E-06	W	Fluke 125B: Watt harmonics Channels A and B	6	6	0	Even	-71.1°	0%		|
0.01537385	W	Fluke 125B: Watt harmonics Channels A and B	7	7	+	Odd	-59.1°	2.1%		|
-6.1226E-07	W	Fluke 125B: Watt harmonics Channels A and B	8	8	-	Even	92.3°	0%		|
0.009098183	W	Fluke 125B: Watt harmonics Channels A and B	9	9	0	Trip	-59.6°	1.2%		|
-2.61741E-05	W	Fluke 125B: Watt harmonics Channels A and B	10	10	+	Even	139.9°	0%		|
0.00626342	W	Fluke 125B: Watt harmonics Channels A and B	11	11	-	Odd	-59.5°	0.8%		|
-1.57657E-05	W	Fluke 125B: Watt harmonics Channels A and B	12	12	0	Even	-163.1°	0%		|
0.004654554	W	Fluke 125B: Watt harmonics Channels A and B	13	13	+	Odd	-57.7°	0.6%		|
3.21437E-06	W	Fluke 125B: Watt harmonics Channels A and B	14	14	-	Even	-54.0°	0%		|
0.003606518	W	Fluke 125B: Watt harmonics Channels A and B	15	15	0	Trip	-56.3°	0.5%		|
4.13276E-06	W	Fluke 125B: Watt harmonics Channels A and B	16	16	+	Even	-15.4°	0%		|
0.002688281	W	Fluke 125B: Watt harmonics Channels A and B	17	17	-	Odd	-57.1°	0.4%		|
1.1786E-05	W	Fluke 125B: Watt harmonics Channels A and B	18	18	0	Even	-0.3°	0%		|
0.002036683	W	Fluke 125B: Watt harmonics Channels A and B	19	19	+	Odd	-58.6°	0.3%		|
-1.08676E-05	W	Fluke 125B: Watt harmonics Channels A and B	20	20	-	Even	122.9°	0%		|
0.001735604	W	Fluke 125B: Watt harmonics Channels A and B	21	21	0	Trip	-58.0°	0.2%		|
-1.31636E-05	W	Fluke 125B: Watt harmonics Channels A and B	22	22	+	Even	162.4°	0%		|
0.00150019	W	Fluke 125B: Watt harmonics Channels A and B	23	23	-	Odd	-56.5°	0.2%		|
7.19406E-06	W	Fluke 125B: Watt harmonics Channels A and B	24	24	0	Even	12.8°	0%		|
0.001278552	W	Fluke 125B: Watt harmonics Channels A and B	25	25	+	Odd	-56.3°	0.2%		|
-4.74502E-06	W	Fluke 125B: Watt harmonics Channels A and B	26	26	-	Even	101.8°	0%		|
0.001019566	W	Fluke 125B: Watt harmonics Channels A and B	27	27	0	Trip	-58.9°	0.1%		|
-1.92862E-05	W	Fluke 125B: Watt harmonics Channels A and B	28	28	+	Even	140.4°	0%		|
0.000918696	W	Fluke 125B: Watt harmonics Channels A and B	29	29	-	Odd	-59.4°	0.1%		|
-1.07146E-05	W	Fluke 125B: Watt harmonics Channels A and B	30	30	0	Even	-144.2°	0%		|
0.000917625	W	Fluke 125B: Watt harmonics Channels A and B	31	31	+	Odd	-54.4°	0.1%		|
2.44904E-06	W	Fluke 125B: Watt harmonics Channels A and B	32	32	-	Even	47.8°	0%		|
0.000776499	W	Fluke 125B: Watt harmonics Channels A and B	33	33	0	Trip	-52.7°	0.1%		|
5.51034E-06	W	Fluke 125B: Watt harmonics Channels A and B	34	34	+	Even	6.6°	0%		|
0.000622975	W	Fluke 125B: Watt harmonics Channels A and B	35	35	-	Odd	-55.3°	0.1%		|
1.01023E-05	W	Fluke 125B: Watt harmonics Channels A and B	36	36	0	Even	18.6°	0%		|
0.000527003	W	Fluke 125B: Watt harmonics Channels A and B	37	37	+	Odd	-57.7°	0.1%		|
-7.04099E-06	W	Fluke 125B: Watt harmonics Channels A and B	38	38	-	Even	115.2°	0%		|
0.000523635	W	Fluke 125B: Watt harmonics Channels A and B	39	39	0	Trip	-54.9°	0.1%		|
-1.19391E-05	W	Fluke 125B: Watt harmonics Channels A and B	40	40	+	Even	173.7°	0%		|
0.000490726	W	Fluke 125B: Watt harmonics Channels A and B	41	41	-	Odd	-53.0°	0.1%		|
8.41858E-06	W	Fluke 125B: Watt harmonics Channels A and B	42	42	0	Even	11.6°	0%		|
0.000417867	W	Fluke 125B: Watt harmonics Channels A and B	43	43	+	Odd	-53.7°	0.1%		|
3.82663E-06	W	Fluke 125B: Watt harmonics Channels A and B	44	44	-	Even	79.9°	0%		|
0.000349141	W	Fluke 125B: Watt harmonics Channels A and B	45	45	0	Trip	-57.7°	0%		|
-1.33167E-05	W	Fluke 125B: Watt harmonics Channels A and B	46	46	+	Even	154.5°	0%		|
0.000370264	W	Fluke 125B: Watt harmonics Channels A and B	47	47	-	Odd	-54.0°	0%		|
-1.23983E-05	W	Fluke 125B: Watt harmonics Channels A and B	48	48	0	Even	-159.0°	0%		|
0.000359244	W	Fluke 125B: Watt harmonics Channels A and B	49	49	+	Odd	-50.9°	0%		|
-2.90824E-06	W	Fluke 125B: Watt harmonics Channels A and B	50	50	-	Even	-155.2°	0%		|
0.000324498	W	Fluke 125B: Watt harmonics Channels A and B	51	51	0	Trip	-48.8°	0%		|
2.708473588	W	Total (not Σ(|amplitude|))								

=======Harmonics Subset=========		======Magnitude=======		========Weighted========		
		MPWR	HD%	WPWR	WHD%	
		Σ(|pwr|)	PWR/pwrH1	Σ(n*|pwr|)	WPWR/pwrH1	where weighting factor, n, is the harmonic number
Distortion +	H4-H49	160.2642mW	21.49083 %	569.9486mW	76.42800 %	
Distortion -	H3-H50	208.1970mW	27.91845 %	623.2168mW	83.57107 %	
Distortion 0	H3-H51	316.9297mW	42.49910 %	727.5211mW	97.55789 %	
Distortion Even	H2-H50	15.34819mW	2.058136 %	76.28785mW	10.22992 %	
Distortion Odd	H3-H51	411.3873mW	55.16552 %	1.112073 W	149.1249 %	
Distortion Triplens	H3-H51	316.8031mW	42.48213 %	725.9863mW	97.35209 %	
All Distortion Harmonics	H2-H51	169.4751mW	22.72598 %	1.242527 W	166.6183 %	HD% is THD %f (THD %r = 18.5%)
All AC	H1-H51	915.2078mW	122.7259 %	1.988260 W	266.6183 %	
All	H0-H51	2.708823 W	363.2432 %	1.988260 W	266.6183 %	MPWR is not RealPower_FULL

Info: Real Power when Power = FULL

(continued from the previous section)

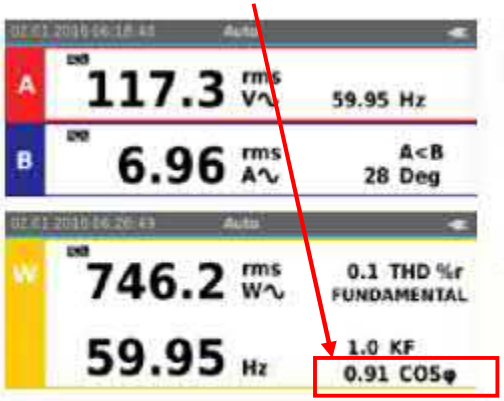
Note the "All" total above (very bottom of page) for H0 – H51 is 2.709W. But when Power = FULL the 125B says that Real Power is 2.326W. That's a difference of 0.383W. Why is there a difference? My theory is that the 125B is calculating Real Power from V * I many thousands of times per second. Whereas my "All" is based upon the W for each harmonic, which is computed as $V_{harmonic} * I_{harmonic} * \cos(\varphi_{harmonic})$. And there are signal components which are not harmonics.



o FYI: the test case for the above was a dual-channel waveform generator creating two square waves with a DC offset (waveform minimum = 0V) and a 30° phase shift. The signals are stable so there's not significant variation of the measured values.

Info: Where is DPF (Displacement Power Factor)?

o 20170121: DPF is cosφ.



Easily obtain key power characteristics to validate a system power.

Industrial equipment needs a reliable power supply to operate properly, use the dual input to obtain key power measurements.

For single phase or 3-phase balanced systems, the dual inputs of the Industrial ScopeMeter® 120B Series can measure ac+dc rms voltage on channel A and ac+dc rms current on channel B. The Fluke 125B can then calculate; frequency, phase angle, active power (kW), reactive power (VA or var), power factor (PF) or displacement power factor (DPF) and can also calculate the power values for a 3-phase system where all phases have equal voltage and currents. This applies to both balanced system and resistive loads.

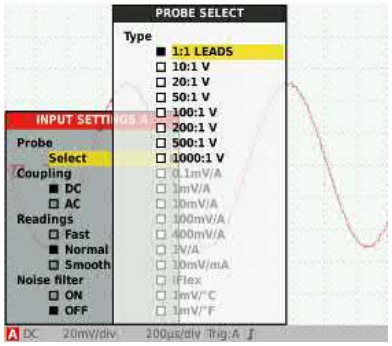
Info: Probe Select

The probe selections are shown in the screen capture below.

o The non-voltage selections are grayed only because Channel A is currently set to measure voltage.

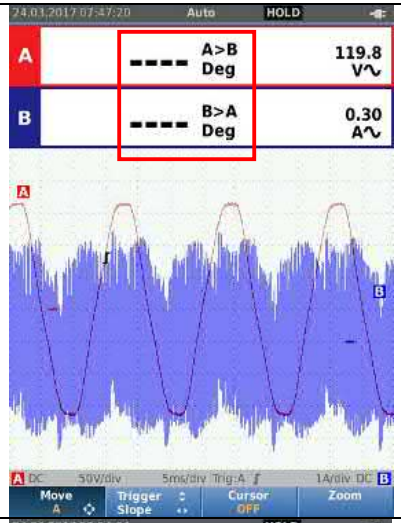
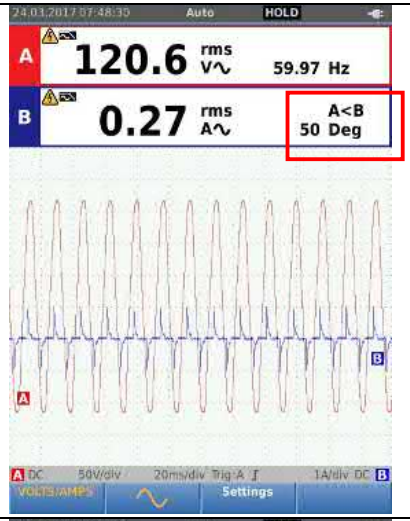
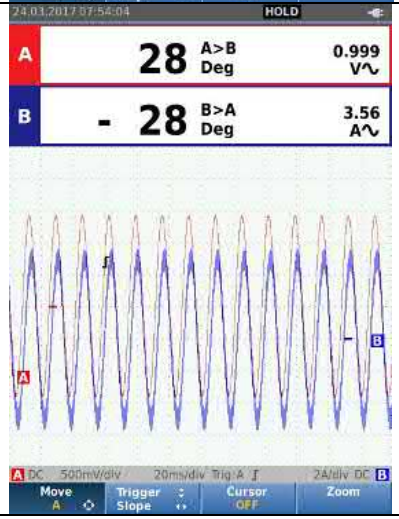
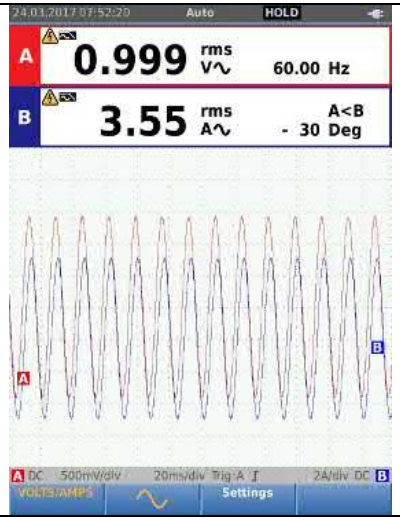
o Note the absence of a "10000:1 V" selection. Such a selection might be unnecessary because the 125B can handle 600 V at its input connectors. Tek, on the other hand, recently (2017) issued a firmware update which added the "10000:1 V" selection for its MDO series. This will be useful when using an ignition probe such as the AESwave 01-12 (1000:1) in series with Tek's 10:1 probe. Including Tek's 10:1 probe is necessary in some scenarios because my MDO3014 is limited to 30 V at the scope's BNC connector and some engines generate 60 kV to the spark plug – which, if the Tek 10:1 probe was omitted, would put 60 V at the scope's BNC connector.

o Saying that the "10000:1 V" selection might be unnecessary on the 125B is not the same as saying that it's safe to directly connect an unfamiliar ignition probe and/or unfamiliar engine (at various speeds/loads) to the 125B. It's probably safer to include a 10:1 probe until you are comfortable that the voltage levels will not fry the 125B's inputs. But the included Fluke VP41 10:1 probe does not support using a BNC adapter (to interface with the scope end of my BNC version of the AESwave 01-12) so I use an old aftermarket 10:1 probe which supports a BNC adapter at its probe tip.



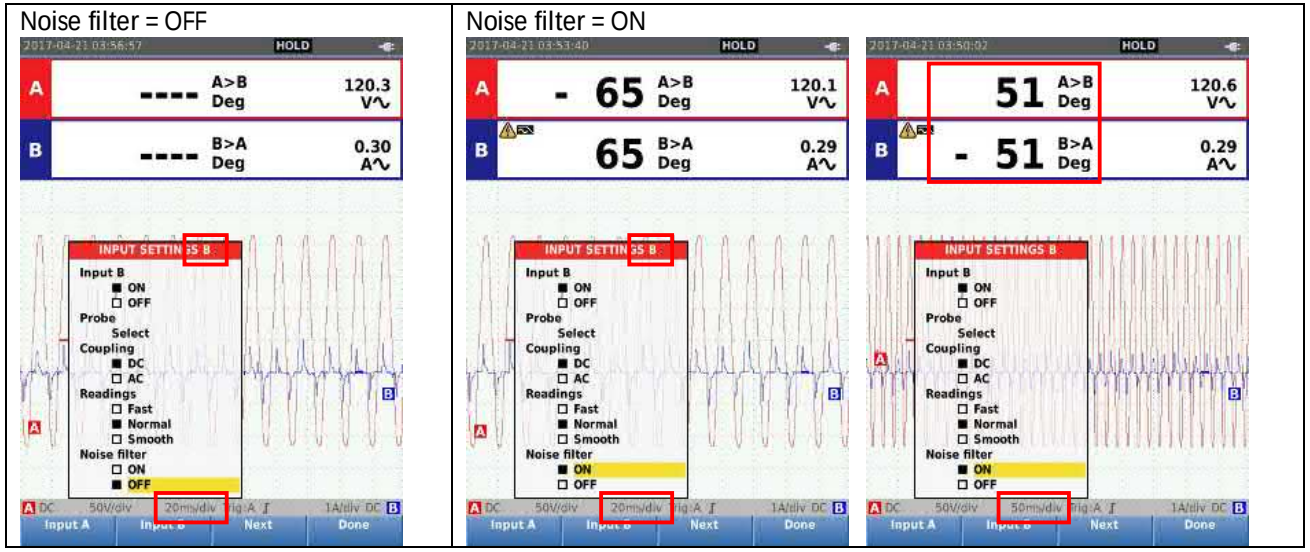
Info: Sometimes SCOPEMETER mode cannot measure Phase

o 20170324: Newly-identified issue. Firmware 1.10.01. Sometimes SCOPEMETER mode will not display a value for the Phase Angle measurement.
o 20170421: As discussed below, the solution is to set the timebase and noise filter properly. The settings to obtain a measurement will vary with the particular waveforms. The following describes what worked in my particular test case. YMMV.

Test case↓	SCOPEMETER mode	Power Harmonics mode
40W compact fluorescent (No Phase values are displayed in SCOPEMETER mode)		
Dual-channel waveform generator (Phase values are displayed in both modes)		

20170420: Fluke states “This does not seem to be a bug. In the situation where there is no phase measurement this is caused by the fact that with the given signal, the channel A timebase is autoset to 5 ms/div. With that timebase the phase algorithm cannot determine the phase because it does (sic: not) have a good signal on B to reference to. In power harmonics mode, the timebase automatically goes to 20ms/div and shows good channel A and B waveforms. This is the same when going to 20ms/div timebase manually in ScopeMeter mode.”

20170421: Ed replies: Ah ha! In this particular test case, timebase is only part of the solution. Just changing the timebase to 20ms/div did not solve the problem. However, enabling the noise filter on CH B gave a (varying) Phase value at 20ms/div. Timebases less than 20ms/div (i.e., 10ms/div, 5 ms/div) produced wildly unstable readings while a timebase of 50ms/div produced a much more stable reading – which better matched the measurement from Power/Harmonics mode. And AC coupling produced, for 20ms/div, a more stable reading than DC coupling.



o Just FYI: Settings which did not solve the problem: Readings (Fast, Normal, Smooth).

o Another lesson learned: Quite understandably (because its timebase is also 20ms/div), the measurement in Power Harmonics mode would sometimes jump around from its most common value of around -50 Deg. So the lesson is that if there is ambiguity of the Power Harmonics measurement, you have the option of switching to SCOPEMETER mode to experiment with other timebases and settings.