PA900 Firmware Revisions

PERFORMING AN UPGRADE

NOTE – failure to correctly apply the upgrade files may result in the PA900 being inoperative and may require returning to the factory. If this occurs please contact the factory for support.

NOTE – a full upgrade of a PA900 requires upgrading 3 files. Do NOT power cycle the PA900 between upgrading files, only after upgrading all 3 files.

1. Copy the upgrade files to a USB Thumb Drive root directory. These files should be named PA900.S19, PA900.HEX and MLO (this last file must be with no extension, some email systems add an extension to this, if so it must be manually renamed without the extension).
2. Insert the USB Thumb Drive into the PA900 front-panel USB port and ensure it attaches correctly.
3. Press the USB Drive information area on the screen adjacent to the USB drive. This will open the file export/import screen.
4. Press the IMPORT FILE button on the right side of the screen. This will change the screen to the import file screen.
5. Press the UPDATE button in the IMPORT area of the screen. The SELECT FILE area will list the files available on the drive for updating the PA900. Check that the BOOT, FPGA and FIRMWARE file buttons are shown in the SELECT FILE area – if any of these buttons are not present or has the incorrect date then the files were not copied correctly onto the USB drive.
6. Press the BOOT button in the SELECT FILE area. The PA900 will now apply the boot update (the MLO file – this only takes a second or so). DO NOT REMOVE POWER FROM THE PA900 DURING THE FILE TRANSFER.
7. When completed successfully, press the UPDATE button in the IMPORT area of the screen. The SELECT FILE area will list the files available on the drive again for updating the PA900.
8. Press the FPGA button in the SELECT FILE area. The PA900 will now apply the FPGA update (the PA900.HEX file – this can take many seconds). DO NOT REMOVE POWER FROM THE PA900 DURING THE FILE TRANSFER.
9. When completed successfully, press the UPDATE button in the IMPORT area of the screen. The SELECT FILE area will list the files available on the drive again for updating the PA900.
10. Press the FIRMWARE button in the SELECT FILE area. The PA900 will now apply the firmware update (the PA900.S19 file – this can take many seconds). DO NOT REMOVE POWER FROM THE PA900 DURING THE FILE TRANSFER.
11. When completed successfully, press and hold the POWER button until the PA900 powers down.
12. Wait a few seconds and then turn on the PA900. The PA900 will now be using the updates just applied.
13. When a significant upgrade has been performed, sometimes there may be an error message shown regarding corrupted configuration files. The PA900 should be power cycled again by using the POWER button should this occur. In extreme circumstances you may need to re-configure the PA900.

UPGRADE HISTORY

v1.2.15, 3rd April, 2018

1. Fixed issue created in v1.2.13 where accumulated fundamental data was not cleared when restarting an integation.

v1.2.14, not released

1. In all prior versions the numerical listing of the individual harmonic levels on the HARMONICS screen were not always coloured correctly when limits were being applied and when some harmonics failed to meet the respective limit. This has been corrected in this version.

2. Added that a confirmation is required when using the front panel menu to save a user configuration into a store which had been previously defined.

v1.2.13, 26th June, 2017, not released

1. Added the ability to accumulate fundamental data for V, A, W, VA and VAR.
2. Extended the INTEGRATED and INTEGRATED AVG sub-screens of the POWER DATA screen to allow for selection whether the COUPLED or FUND data is being displayed.
3. Added the x:INTEG:CHn:H1 READ? data syntax, where 'x' is V, A, W, VA or VAR and 'n' is the required channel.

v1.2.12, not released

v1.2.11, 29th May, 2017, not released

1. Added 10 internally stored user configurations.
2. Added two additional buttons to the SYS CONFIG screen to allow for saving and recalling configurations from the new internal user configuration stores. The RECALL button also allows the user to select for a factory default configuration to be loaded.
3. Added a *RCL,n interface command which allows for a previously stored user configuration to be recalled (as defined by 'n' which is a NR1 between 1 and 10) or a factory default configuration (as defined by 'n' being 0).
4. Added a *SAV,n interface command which causes the present configuration to be stored in the respective store define by 'n' (as NR1 between 1 and 10).
5. The RETURN button is no longer shown on some multiple choice selection screens.

v1.2.10, released 19th March, 2017

1. The SCOPEINRUSH and SCOPEINRUSH? commands documented in the manual were actually implemented in prior versions as SCOPECAPTURE and SCOPECAPTURE? respectively (which were not included in the manual). This release changes these commands to use the keywords as documented in the manual.
2. In prior versions if a motor channel was fitted and enabled and/or efficiency was capable of being displayed, then on the CYCLE VIEW screen the available choices for the VPA from which to choose the signals were not correct and included invalid and incorrectly displayed choices as being available. This has been corrected in this version.

v1.2.9, released 26th February, 2017

1. Added support for V current PCBs.

v1.2.8, released 22nd August, 2016

1. Changed the default calibration data for the HI range of any type a D current PCB. This has no effect on calibrated units.

v1.2.7, released 8th August, 2016

1. Corrected issue where following a VPA reconfiguration command being received via an interface then rarely the PA900 could produce erroneous measurement results afterwards until the PA900 was power cycled. This has a very low probably (about 1 in 100000 reconfiguration commands) and is very rarely seen in practice.
2. Improved the initial default calibration data used in Vitrek production prior to calibration of channel. This has no effect on PA900 channels which have been calibrated; it only improves the time taken in production to perform the initial calibration.
3. Corrected issue in prior releases where the HISTORYDATA? and LOGDATA commands returned a data syntax error erroneously in most situations. These commands are now decoded correctly (see also below for the HISTORYDATA? command).

4. Corrected issue in prior releases where the HISTORYDATA? start and ending times were actually decoded with units of 1000's of seconds (e.g. 0.001 was decoded as 1 second). The start and ending times are now in seconds as documented.

v1.2.6, not released

v1.2.5, released 29th March, 2016

1. Added a PHASE setting to the PREFERENCES menu allowing the user to select the numerical range for phase results (+/-180 or 0-360°), which rotational direction the vectors screen chart is shown with (CW or CCW), and whether mathematical or delay related phase is returned. Added PHASEPREF and PHASEPREF? commands to set/query this setting.

2. Corrected issue where the FREQSPEED interface command was inoperative and always returned an error in all prior releases.

v1.2.4, released 27th January, 2016

1. Fixed issue created in v1.2.2 where a "runt" IP packet transmitted from the PA900 on the LAN interface incorrectly indicated that the IP data length was extended when actually only the Ethernet packet was extended to enforce the minimum 64 byte Ethernet frame length.

v1.2.3, released 25th January, 2016

1. Added support for option MU (see manual for details).

v1.2.2, released 22nd October, 2015

1. Added the ability to use Auto-IP (RFC3927) to configure the LAN interface IP details by extending the existing FIXED IP and DHCP selections for the LAN interface with a new AUTO-IP selection. Similar to DHCP, there is no other configuration needed if this is selected. Auto-IP has many other names in the industry, e.g. Link-Local, Zeroconf, IPv4LL, or APIPA. This is compatible with the protocol used since Windows 98 to automatically select an IP address when no DHCP server is present, without needing to use manual IP entry (the computer needs to be set to use DHCP, then it will actually use both DHCP and Auto-IP). Note that this can take up to 10 seconds to obtain a valid IP address after linking to the LAN at the PA900, possibly much longer at the computer. Also note that most versions of Windows support both DHCP and Auto-IP simultaneously on the same port allowing a single computer port to be used on a network but also allowing that same port to communicate with a PA900 configured for Auto-IP on that network (auto-IP addresses should not propagate traffic through a router so the PA900 must be local to the computer).

2. Added the ability to provide either a factory or user set identity name for a PA900 on an interface. Via the LAN the name is verified as unique and advertised using mDNS (RFC6762), allowing hosts to communicate with the PA900 by name instead of IP address, and on other interfaces the name is available as the response to the newly added IDENT? command but uniqueness is not guaranteed. When DHCP is used for the LAN IP address then this name is also registered with the DHCP server, which allows the name to be resolved without mDNS in some situations (so the .local extension might not be needed but is always recommended). See the updated manual for full details regarding this.

3. Changed the LAN interface so that it is always active if it is installed, but if it is not configured as the controlling interface then it will not respond to command connections.

4. Added an IN REMOTE button to the interface screen visible while the PA900 is in remote. This makes this screen the same as most other screens in this regard.

5. Changed the method by which an attempted TCP connection via LAN was refused, e.g. if another connection was already established or an incorrect port number was used. Previously a TCP RST packet was returned by the PA900 (per the TCP RFCs) but some computer operating systems (e.g. Windows) do not correctly respond to a RST packet unless the packet sent from the computer was also acknowledged, so the response from the PA900 in these circumstances has been changed to a combination RST+ACK packet. For example, with most versions of Windows this means that if a user attempts to connect to the PA900 but the PA900 is already being controlled by a different computer now the user software is quickly (and correctly) informed that the connection was refused by the

PA900 whereas previously this could take tens of seconds and the user was told (incorrectly) that the PA900 failed to respond.

6. Changed the contents of the lower portion of the interface info area on the screen. See the latest manual for details.

7. Changed the displayed LSD of the local mains frequency when used as a fundamental to 1Hz.

8. Changed the colouring of the fundamental frequency on the VECTORS screen and the fundamental period on the CYCLE VIEW screen to be the same as that used on the HARMONICS screen starting with v1.2.1.

9. Corrected issue in all prior versions where an ASCII datalog file did not include the sub-data description for WATTS data from a VPA data source.

10. Corrected issue in all previous versions where the user could not configure an electrical VPA for efficiency/loss grouping if operating in a single VPA mode but a motor channel was fitted. In this release the user can set the efficiency/loss grouping for a single VPA if a motor channel is fitted. Previously the user would have to select the MULTI-VPA mode in order to achieve this, but that was not available if the unit only had a single electrical channel fitted, so in that case there was no work-around available to the user. This does not affect the ability to set efficiency/loss grouping from an interface.

11. Corrected issue in all previous versions where received LAN UDP and TCP protocol frames were not properly checked for checksum errors. All received TCP and received checksum enabled UDP protocol frames are now properly checked and silently disregarded if corrupted.

12. Corrected issue created in v1.2.1 where if FUND is set as MAINS and no fundamental was measurable then no harmonics were available; as documented and as in all versions other than v1.2.1 in this situation harmonics should be still available using the local nominal mains frequency as the fundamental.

13. Corrected issue created in v1.2.1 where if the fundamental frequency was higher than 1/10th of the maximum allowed fundamental frequency for the channel hardware then too much anti-aliasing filtering was employed giving minor errors in the harmonics measurements.

14. Corrected issue present in all prior revisions where the displayed resolution of frequency was sometimes incorrect if either if a VPA was configured to obtain its fundamental frequency from that of another VPA, or a VPA was configured with a fixed fundamental frequency.

15. Corrected issue present in all previous revisions where if the LAN interface was linked and configured for DHCP and IP details had been established using DHCP, but was then reconfigured for FIXED IP with the same IP address, gateway and subnet mask as were obtained by DHCP then the DHCP sub-system was not turned off.

16. Corrected issue present in all prior releases where in rare LAN topologies it was possible for the PA900 to receive its' own ARP transmissions resulting in abnormal operation of the LAN interface. All LAN frames received by a PA900 now only have an effect if the ARP source MAC address is not that of itself.

17. Corrected issue present in all prior releases where if a PING request was sent to a destination IP address other than that of the PA900 but the PA900 was connected via a hub (so it actually received the PING request) then the PA900 would respond to the PING request. The PA900 now only responds to PING requests actually addressed to it.

v1.2.1, released 5th October, 2015

1. Added support for option EN allowing EN61000-3-2 and -12 assessments if option H500 is also installed. See the updated manual for details regarding this.

2. Added support for the GPIB interface option and added the required IEEE488.2 registers for that interface. See the updated manual for details regarding this.

3. Harmonics measurements now have additional bandwidth limiting when the frequency of the highest desired harmonic is significantly below the frequency of the configured bandwidth restriction. In prior releases the user had to configure a low bandwidth setting (particularly for PWM signals) if it was desired to measure harmonics on a signal having significant high frequency content in order to obtain the best possible harmonics results. This enhancement means that the PA900 will

automatically include additional bandwidth limiting (just for the harmonics measurement) if only a small number of harmonics are configured but a wide general bandwidth restriction (or no restriction at all) is configured. This yields better harmonic performance when measuring harmonics of PWM generated signals but when set for unfiltered bandwidth as it improves the anti-aliasing filtering for the harmonics system in this situation.

4. Added the ability to view the harmonics, cycle view and scope results for inter-phase voltages when a channel is selected which is in a VPA configured for 3p3w(3ch) or 3p4w wiring. Extended the RDEF data field availability to allow for the additional harmonics data to be read via an interface. See the updated manual for details regarding this.

5. Added Y axis minor grid lines to all LOG type charts (HARMONICS and SPECTRUM screens) and 1/5th division minor gridlines on all LIN type charts (HARMONICS, HISTORY, SCOPE, ASSESS EUT and STBY POWER).

6. Added the THC, POHC and PWHC data types to the available RDEF definitions. See the updated manual for details regarding this.

7. Changed the display of fundamental frequency on the HARMONICS screen to colour the value according to if the data is not measurable (coloured red), unlocked (coloured orange) or properly locked (coloured white). Previously the data was always shown coloured white and the user had no method of determining the validity of the harmonics data shown.

8. Fixed an issue where the interface info area TX and RX indicators sometimes did not show when they should have for a very short time.

9. Fixed an issue where the standby power results could not be obtained with a READ? command in some circumstances.

10. If the user enters an invalid upgrade code in the SYS CONFIG – UPGRADE screen then there now is an error message temporarily shown, previously it was silently accepted with no error (and no action).

11. Improved the decimation of sampling when measuring low frequency signals and a bandwidth limit was imposed. Previously the PA900 could decimate the samples by up to 8:1 in this situation, this has now been limited to a maximum of 2:1 for A or S type channels and 4:1 for W type channels. This yields a slight improvement in the stability of frequency measurements and better harmonic performance when measuring harmonics of PWM generated signals.

12. Fixed a bug where the serial number of a MT channel could not be altered after it had been initially set.

13. Fixed an issue where if the user sent too many characters via an interface overrunning the receive buffer and then disconnected the interface without first clearing the full buffer then improper operation could occur.

14. Fixed a bug where the progress bar on the POWER DATA screens when configured for LF or VLF operation did not display correctly.

15. Fixed an issue which occurred if displaying limits on a %LOG HARMONICS screen and the limits were several orders of magnitude higher than the fundamental, in this situation the tick markers could be numerically overrun and display 999999% for most of the tick markers. This has been changed to allow the user of multiplier characters in this situation.

16. Extended the usable ratio between the Fresl and Fmax settings useable in SPECTRUM mode. As detailed in the manual the user should be able to use ratios up to 16384:1 but in some circumstances this could be as low as 8192:1. This has been improved so that the ratio is not as easily limited and when it is necessary to limit it that limitation is about 25% less severe.

17. Minor internal changes to the firmware which computes the synchronization of sampling to the measured fundamental in a VPA, there is no externally visible difference this is merely an improvement of code.

v1.1.9, released 12th August, 2015

1. Re-arranged the SYS CONFIG screen to allow for longer serial numbers.

v1.1.8, released 21st July, 2015 (with v1.5 FPGA)

1. Added support for an MT channel card in the CH4 position.

2. Added the ability to configure for 6 digits of displayed resolution in addition to the present selections for 3, 4 or 5 digits.

3. Improved all DC zero corrections to have 2:1 better resolution.

4. Previously when a user bandwidth limit was configured and the fundamental (or a harmonic or a spectrum point) was 'close' to the -3dB frequency the measurement would be in error because of the bandwidth limitation. This has been improved by about 10:1 by including a correction for the frequency response of the bandwidth filter in the final results.

5. Where possible, phase data is now shown on the screen with 0.001° resolution instead of the previous 0.01° resolution.

6. Added selections for the MT channel SPEED configuration to select that speed is not measured but is taken from an electrical frequency measurement.

7. Added the ability to return a result for motor slip percentage.

8. Previously integrated average PF measurement results were not available. This has been added and is now available for both channel and VPA sources and has been made available on the POWER DATA screen.

9. Previously VPA average Volts and Amps data was only available for 'as coupled' and 1st harmonic, this has been extended to allow DC, AC or ACDC coupling also.

10. Previously VPA total Watts and VA data was only available for 'as coupled' and 1st harmonic, this has been extended to allow DC, AC or ACDC coupling also.

11. Previously VPA total VAR and PF data was only available for 'as coupled' and 1st harmonic, this has been extended to allow AC or ACDC coupling also.

12. Previously channel load Z was only available for 'as coupled' and 1st harmonic, this has been extended to allow DC, AC or ACDC coupling also.

13. All cursors can now be used to scroll a zoomed screen to the left or right by dragging the cursor off the screen in that direction (for the scope and history screens).

14. In previous releases the maximum zoom level on the history screen was 64:1, this has now been increased to 1000:1 (since the zoom level increases 2:1 for each press, this is roughly 10 presses of the ZOOM+ button, previously it was 6).

15. Previously the trace on the chart on the standby power screen was not trimmed to the top and bottom edges of the chart area. This has been fixed, previously if the trace went too far off the chart it could cause a crash (this could really only happen if a large negative watts was encountered during the test).

16. In some previous releases many interface command data fields of the NR1 syntax were not checked against the valid range. In most cases, if it was outside of the valid range an incorrect error could be generated (in some cases it raised no error and could yield odd results). This has been fixed.

17. In previous releases the validity of mid:out loss and efficiency data was not correctly determined and may be shown as invalid when it should have been valid (or vice versa). This has been fixed.

18. In previous versions numerical data entry via the screen was limited to only the 'k' and 'm' multipliers and also has a limited number of digits available (5 or 6) which created the scenario where a value entered via an interface or by using the AUTOSCALE buttons could result in a setting value which could not be handled by the numerical entry screen if that was later attempted (it was not properly displayed when this occurred).

19. The Ue (watts error) shown for standby power has been revised to correctly implement the revised specifications. Previously there was a very small error in this calculation resulting in a slightly smaller Ue being reported than should have been, this has also been corrected.

20. In some circumstances the HISTORY and SCOPE screen AUTOSCALE function could produce a trace scaling which was below the minimum allowed which would result in the scaling being reset to the default value. This has been fixed; the minimum scale factor for traces is now always 1e-9/div and this also enforced for auto-scale action.

21. In previous releases it was possible to select a history trace for disallowed Watts, VA, VAR and PF data (e.g. peak PF was previously selectable). This has been fixed.

22. It was previously possible for a PF result to be very slightly over 1.0 due to mathematics rounding accumulated errors. All PF results returned are now limited at +/-1.0.

23. Previously if the user reconfigured a VPA while performing integration then the integrated results were not properly initialized. This has been fixed.

24. In previous releases all channels not assigned to a VPA were 'kept alive' by operating them at a fixed sampling rate, with a default range (e.g. for the D current input the HI range). This was not previously correctly implemented which resulted in channels which are not fitted also being kept alive. This has been fixed – only unused fitted channels are kept alive.

25. Previously hysteresis on the selection of the displayed LSD for Watts, VA, VAR and PF data was not applied correctly which could result in flickering of the displayed data format. This has been fixed.

26. In previous releases there was a memory leak when importing the configuration which could result in mis-operation if performed several thousand times without power cycling the unit. This has been fixed.

27. Previously the display resolution of power data (W, VA, VAR and PF) was not quite correctly calculated and under some circumstances (particularly at low PF) too much resolution was shown – this has been improved.

28. Previously if a configuration file was from a unit which had H500 installed and it included a data log data with over 100 harmonics being listed and it was imported into a unit which did not have H500 installed then the data log data would still retain the 500 harmonic listing. This is now silently limited to 100 harmonics in this situation.

29. In several places the previous versions used the 'as coupled' data for calculating other results but as documented they should have been calculated using explicitly AC only or AC+DC data independently of the COUPLING setting. These have all been changed to be as documented.

30. Previously the exported measurements data was in the same order as the internal measurement results arrays were indexed. This has been changed so that the order of the exported data and the order of the internal data may be different.

v1.1.7, not released

v1.1.6, not released

v1.1.5, released 28th May, 2015

1. Added a LF/PERIOD setting of 500Hz/2ms available for a VPA which is using W channels only. This means that you can now make up to 500 readings per second instead of the previous 100 readings per second.

2. The PA900 history file now does not stop until after 584.5 million years.

3. Allowed the user to set a zero data logging interval time, which actually sets a 2ms data logging interval (i.e. 500/sec data logging rate).

4. Added a new DATALOG - FORMAT selection setting to allow saving the data log to internal non-volatile memory, this is available in newly created units only; on older units this setting is not available (this is auto-detected and requires returning to the factory to activate this feature).

5. Previously the PA900 always used the lowest numbered channel in a VPA for frequency measurement. This has been changed so that it automatically selects from the configured channels in that VPA if not configured for Nx1p wiring.

6. Added two additional time format selections to the HISTORY screen. There were previously two selections (so the button toggled between them) of TIME -> and TIME <-, now settings of TIME and TIME/DATE have been added which show times as either time of day (with fraction) or time of day (without fraction) and date respectively.

7. When exporting to a file the previously used filename (if any) for that type of export is used as the 'starting' filename. Previously it always started with a blank filename. Also, during filename entry the BKSP button can now be used to delete the last character of the existing entry for the name (previously it could only delete the last character entered during this entry).

8. Previously it was not always obvious whether the ABORT button aborted an associated activity or cancelled a data entry, where it cancels a data entry then it has been labelled CANCEL, otherwise it

remains labelled ABORT. Also, on most screens the CANCEL button is now only visible if a change has been made.

9. In previous versions it was possible for a time/date update to occur during inserting data into the data log causing a mis-matched time and/or date to be recorded. This has been fixed.

10. In previous versions there was no history data for IN/MIDDLE/OUT total power, loss and efficiency data. This has been fixed.

11. In previous versions the neutral current when configured for 2p3w, or the pC current when configured for 3p3w(2ch), was inoperative (always returned a 0 result). This has been fixed.

12. In previous versions when running a standby power measurement if the load power started high but then dropped significantly during the first 1/3rd of the minimum time then this could cause the PA900 to crash. This has been fixed.

13. Under very unlikely circumstances it was possible for the PA900 to try to both write to the internal SDcard for a normal configuration file update (after a change) and to save a file to the internal SDcard because of file import – this would result in both files becoming corrupted. This has been fixed.

14. In previous versions if a VPA was configured for 3p3w(3ch) or 3p4w wiring, and the 1st channel had a scale factor <95% of the 2nd or 3rd channels, and the 2nd and 3rd channels had the exactly same scale factor, then the inter-channel voltage and/or current results for the VPA would not be correctly computed. This has been fixed.

15. In previous releases it was possible for the CYCLE VIEW or SCOPE VIEW screen to crash the PA900 if the leftmost point of the chart was vertically off the chart but the second one was on the chart. This has been fixed.

16. In previous versions the history chart was not quite shown correctly on the screen if a history data contained two consecutive points <8ms apart. This has been fixed.

17. In previous versions if the MEAS MODE was previously not a single VPA mode and it was changed to a single VPA mode via the interface and VPA1 was previously set to be in an efficiency group then an error would be raised. This has been fixed.

18. In previous releases if the data logging, scope or standby power configuration was changed on the screen while in local, and then the interface was placed into remote, then the interface measurement configuration data would not reflect those changes and the EDITCONFIG command had to be used. This has been corrected; the interface measurement configuration is now fully updated with any locally made changes.

19. In previous releases there was an error in the binary format for a data log file. This has been fixed.

20. In previous releases there could be anomalous HISTORY screen data shown after power on, or when starting the chart running, if making long period measurements (e.g. LF or VLF settings). This has been fixed along with a few other anomalies associated with the history screen when making long period measurements.

21. In previous releases the unit would rarely make an extra DFT harmonics measurement in each non-harmonic measurement period. This has been fixed.

22. In previous versions if configured for SPECTRUM mode and VPA1 was configured to be able to measure harmonics but HARMONICS was set to 0 then it would still measure 1 harmonic. This has been fixed.

23. In previous versions no error was raised if it failed to write a file during file export. This has been fixed.

24. In previous releases if the unit was in remote when defining a data log data and a HLIST type data was being defined then there was no request for the number of harmonics to be entered. This has been fixed.

25. In previous versions some of the progress bars could have an integer arithmetic overflow under unusual circumstances and cause the bar to be improperly drawn (actually this could cause a crash under some circumstances). This has been fixed.

26. In previous versions if a harmonic was checked against a limit and the bar was shown on the chart but the limit was below the chart then the bar would not be coloured red as it should have been. This has been fixed.

27. In previous versions if harmonic limits were defined for configured but unmeasured harmonics then no limit bars were shown for those harmonics. This has been fixed.

28. In previous releases if a channel scale screen was entered and changes to it were made while in LOCAL and then the interface entered REMOTE while still on this screen and then the user pressed the RETURN button, then the changes would be actioned when they should not be (because it is in remote). This has been fixed in this release – the RETURN button only saves changes on this screen if it is not in remote at that time.

29. In previous releases if set for 24hour time format then the seconds was not shown. This has been fixed.

30. In previous releases when performing 0.3sec measurement periods with W type channels the non-harmonics measurements were sub-sampled so the minimum guaranteed capture width of a pulse was greater than 1 sample, this has been changed so that full time resolution is possible in this situation.

31. In previous releases the scroll buttons on the data log data select screen did not auto-repeat. This has been changed so that they do.

32. Re-arranged the RETURN, START/STOP and CLEAR/CANCEL buttons on the data log screen. On all other screens the RETURN button is the topmost button; it was not on this screen, making it easy to accidentally start a data log when this was not intended.

33. Added the history starting time & date to the exported history file.

34. Changed the display update rate from a fixed rate of 20/sec to be variable between 25/sec and 4/sec. This speeds up harmonics and spectrum processing when displaying a complex display (primarily the history display).

35. Changed the repeat rate on repeat type buttons from 6/sec to 10/sec. The initial delay (500ms) is unchanged.

36. Increased the size of the polar chart on the VECTORS screen by approx. 10%.

37. In previous releases the hours portion of a time string was always displayed with 2 digits, this has been changed to displaying 1 or 2 digits as needed (the minutes and seconds are still always displayed with 2 digits).

38. All screen text is now horizontally trimmed at the left and right extents of the screen; all custom screen cell text is now horizontally trimmed at the edges of the data window.

39. In previous versions changing from the MEAS CONFIG screen to any of the main data screens would action any changes made, but changing to any of the Info window screens did not. This has been corrected.

40. In previous versions the response filters were 1-pole types, these have been changed to 2-pole filters to give better response filtering and faster settling time.

41. Improved the formatting of multi-unit time settings in buttons (e.g. delay times set in days:hours:minutes:seconds). Unused leading and trailing portions are no longer shown in the setting button.

42. If set for NORMAL or SLOW FREQ SPEEED preference settings then small changes in the frequency are now 'tracked' with filtering instead of immediately followed. This reduces the 'flicker' of frequency readings.

43. In previous releases it was valid to have no scaling for a X current option channel but if the SCALE screen was entered for one then current scaling was forced ON, so you could not ever operate one unscaled after entering this screen. This has been changed so the scaling ON/OFF for an X channel is the same as for any other channel type.

44. Improved the layout of the status information on the DATALOG Configuration & Status Screen.

45. In previous versions the lower text of the SELECT DATA button on the DATALOG configuration screen showed the number of data definitions which have been defined, starting with this release it shows the number of data (i.e. including harmonic listing data) which will be produced.

46. Added a REMOTE button to the channel scaling screen. Most other screens had a REMOTE button added in the previous release, this one was missed.

47. In previous releases if the screen was on the SYS CONFIG or MEAS CONFIG screens when powered down then it would not return to those screens when powered back on, this has been changed so that now all right-side screen buttons act in the same manner. This also fixes an issue where if the user used the USB Drive Info area to save an image of the SYS or MEAS CONFIG screens then when the USB Drive RETURN button was pressed it would not return to the original screen but to the last used non-configuration screen.

48. In previous versions when a numeric setting of 0 was displayed then it was displayed with the smallest multiplier character (e.g. 0uV or 0nA), now a 0 numeric setting is displayed with no multiplier character (e.g. 0V or 0A).

49. In previous versions if the AUTOSCALE button on the HISTORY screen was used when a trace was entirely below the screen but the trace was configured with a BOTTOM trace offset reference, or entirely above the screen but the trace was configured with a TOP trace offset reference, then the minimum scale factor was set. This has been changed, in both of these circumstances it is not possible to set a scale factor as there are no traces which can be brought onto the screen so now the scaling is left unchanged in these circumstances.

50. Added details regarding the drive and partition side in the right side of the FILE IMPORT/EXPORT and DATALOG screens.

v1.1.4, not released

v1.1.3, released 5th May, 2015

1. In previous versions in a certain circumstance the USB drive file structure could become corrupted when performing a data log. This has been fixed. This occurred if all of the following were true when a data log was run (this is independent of whether you were appending or not) –

   a. The data log file already existed

   b. The drive had 128 or more files in the root directory at some time in the past since it was last formatted.

   c. The data log file was not in the last 128 files of the root directory. This is not an obvious one – it depends on where deleted files were if any have been deleted since the drive had >128 files in the root directory.

2. In previous versions if an existing data log file was appended to and its starting file size was not an integer number of drive clusters then the last file cluster of the existing data log file could become corrupted. This has been fixed.

3. In previous versions if an existing data log file was appended to and it was a corrupted file (file size > number of clusters allocated to it) then this was not properly detected. This has been fixed, a corrupted data log cannot be appended to (it aborts with a file error).

4. In previous versions the uncertainty in the timing of data log updates was cumulative. This has been fixed; the timing uncertainty is now non-cumulative as it is documented and as it should have been.

v1.1.2, released 4th May, 2015

1. In all previous releases the interface ERR register held the last error found in a single set of commands and was cleared when a set of commands was received if it had no errors. This was not as documented, nor as intended. This has been corrected.

2. In previous releases if data log data was lost because of buffer overrun and a drive had not yet been inserted; when a drive was subsequently inserted the error message that data had been lost was erased. This has been corrected.

3. The addition of Valley data in the previous release made the exported MEASUREMENT data incorrect. This has been corrected in this release.

4. Changed the scroll buttons on all choice selection screens to be auto-repeating.

5. Considerably sped up writing to slower USB drives when writing data log files (20:1 or more with some drives). Previously the file size info and the FAT were updated on the drive for every cluster of data (typically 4 or 8Kbytes) written to the drive, in this manner the drive did not become too corrupted if removed during data logging (at most 1 cluster of data was lost and the drive integrity was usually OK). This has been changed to only updating the file size etc. for the first and last cluster

written and every 2 seconds in between – this is at the cost of the user losing up to 2 seconds of data written (could be up to 2Mbytes) + 1 cluster of data and the drive may end up with excess cluster usage (fixed with scandisk) if the drive is removed while data logging.

6. Previously a drive had to be inserted before data logging finished, otherwise the data log would be lost. This has been changed to being able to insert a drive after a data log is completed.

7. Changed the length of the data logging FIFO from 256k data to 8M data.

8. Starting with this release if the USB Drive Info area is pressed when no drive is attached then the Data Logging Screen is initiated. This now means that you can always access the data logging screen (and in a consistent manner), so it has been removed from the MEAS CONFIG screen.

9. Starting with this release if the Integration Info area is pressed when integration is being performed then the Integration Screen is initiated, rather than starting integration as previously (it can be started from the Integration Screen). This now means that you can access the Integration screen in a consistent manner without using the MEAS CONFIG screen, so it has been removed from the MEAS CONFIG screen. If integration is being performed when it is pressed then it still stops it as before. If integration is started from this screen then it now also returns to the previous screen.

10. If the MEAS MODE is set for a single VPA mode then starting with this release the CONFIG VPA button on the MEAS CONFIG screen is not shown (previously it was shown but was inactive).

11. Improved the text for several choice entry screens.

12. Added new selections for the FUND setting –
    a. MAINS. This selects a voltage frequency measurement with a fixed 45 to 65Hz frequency range. This also selects that if no frequency can be measured then the PA900 mains supply frequency is used (so harmonics continue to be available).
    b. AVIONICS. This selects a voltage frequency measurement with a fixed 300 to 900Hz frequency range. This also has a 'side-effect' of forcing the avionics harmonics measurement period requirement (if possible)
    c. These have been added so customers measuring mains power or avionics power will not have to decide on a maximum frequency setting – thus simplifying configuration for the majority of customers while retaining the full capabilities as previously allowed.

13. Changed the HF LIMIT setting to a BANDWIDTH setting with the following selections -
    a. AUTO-TRACK: as for the previous HF LIMIT setting
    b. UNFILTERED: as for the previous HF LIMIT setting
    c. USER: This allows the user to enter a frequency for the bandwidth (which is now a -3dB limit, so should be 2x the -1dB limit previously used).

14. Made changes to harmonic analysis as follows –
    a. Improved the speed of harmonic analysis.
    b. The number of harmonics measured is limited to half the -3dB bandwidth frequency limit.
    c. The harmonic bandwidth has been altered for better conformance to the Airbus standard when using harmonic analysis.
    d. Changed harmonic analysis to use a Hann (aka Hanning) window similarly to spectrum analysis (per the requirement of DO-357). Note –
        i. The Hann window slightly increases the bandwidth at each harmonic, but has a much sharper fall-off beyond that bandwidth. This results in inter-harmonics having less effect on the harmonic results.
        ii. This does result in a slightly lower harmonic floor (barely noticeable).
        iii. Although this affects all harmonics results not just those for avionics, the change is not really noticeable unless measuring a large number of harmonics and/or the load has unstable current demand.

v1.1.1, released 27th April, 2015

1. New BOOT (MLO file): Changed the core processor clock from 600MHz to 720MHz. This speeds up all processing operations by typically 10 to 15% (the memory speed is unchanged at 532MHz) resulting in faster updates when performing multi-channel, high harmonic (or spectrum) measurements.

2. Added the ability to export CYCLE VIEW data as a .CSV format file. This was overlooked in previous versions.

3. Changed the SCOPE DATA capture to allow operation more like that of a digital oscilloscope and also to allow a longer capture for inrush measurements (e.g. DO-160 requires a 2 second capture of a 800Hz waveform) and also to allow for inrush measurements without the need for reconfiguration of measurements.

4. Added an AUTOSCALE button to the HISTORY, CYCLE VIEW and SCOPE VIEW screens just above the listing of the trace scaling and offsets. This button is only shown if the screen chart contains any drawn traces and when pressed adjusts the scaling set for each trace such that the trace data as presently shown has the best fit to the screen using 1/2/5 scale factors. It does NOT adjust the offsets.

5. Removed the EXPORT – MEAS CONFIG and SCREEN CONFIG buttons from the file export screen. These data are included in the previously labelled ALL CONFIGS button file (now relabelled CONFIGURATION), so there was really no use for the individual export capability.

6. Added an EXPORT – HARMONICS button to the file export screen. This exports the harmonics results as a .CSV file.

7. Removed the IMPORT – MEAS CONFIG and SCREEN CONFIG buttons from the file import screen. Since these cannot be exported or otherwise generated there is no longer any point in being able to import them.

8. Added WATTS:%n and WATTS:%Sn data for a single channel to the available RDEF results (which includes custom screen etc.), also WATTS:Hn and WATTS:Hn:n are also now available for a single channel (previously it was only available for H1).

9. Added the ability to display Watts data on the HARMONICS screen. Although available in other ways (e.g. via the interface) it was not previously available in the HARMONICS screen itself.

10. Removed the LIMITS button from the HARMONICS screen if there are no limits defined for the selected harmonics data. It is now only shown if limits have been defined. Note that limits cannot be defined for Watts harmonics – only for voltage and/or current.

11. Previously cursors drawn on charts were inconsistent between screens - not all screens used the same colour and most screens drew the cursor beneath the traces but others on top of the traces. These have all been made consistent, all cursors are now GOLD colour (and their associated text) and all cursors are drawn beneath the traces.

12. Several customers have commented that the BLUE colour used to draw the harmonics bars and the spectrum and standby power chart traces is not bright enough and is difficult to see from a distance. The colour used was the brightest blue available, so the colour for these have been changed to CYAN which has two primary colours and so appears brighter but still gives good contrast to the RED of over limit harmonics bars and the GOLD of a cursor line (although it does not give good contrast to the chart axis).

13. Previously the decision point for using scaling multipliers (e.g. 'm', 'u', 'k' etc.) was inconsistent throughout the PA900. A central function has now been created and used throughout.

14. Previously when the COUPLED data was selected on the POWER DATA screen the button displayed the coupled setting (e.g. AC+DC, DC or AC). This has been changed to COUPLED followed by (AC+DC), (DC) or (AC) to make it more obvious that this is the configured coupled data when viewing the screen.

15. If no harmonics are available to be shown on a HARMONICS screen bar chart then a message is now displayed centred in chart. Previously the chart was just blank.

16. If no harmonics are available to be shown on a VECTOR screen then a message is now displayed centred in chart. Similarly if no traces are defined then NO TRACES SELECTED is displayed. Previously in both these cases the chart was just blank.

17. If no traces are defined on the HISTORY screen then NO TRACES SELECTED is displayed within the chart area. Previously in the chart was just blank.

18. If no traces are defined on the CYCLE VIEW screen then NO TRACES SELECTED is displayed otherwise if no fundamental is available then NO FUNDAMENTAL is displayed within the chart area. Previously in the chart was just blank in these cases.

19. If no data has been captured in the SCOPE VIEW screen then NO DATA CAPTURED is displayed otherwise if no traces are defined then NO TRACES SELECTED is displayed within the chart area. Previously in the chart was just blank in these cases.

20. Improved the method of calculating and tracking the primary sampling parameters. This results in the following significant improvements/changes in performance –

    a. Speed of harmonics analysis is improved by up to 20% (better optimization of the DFT sample collection resulting in smaller DFT sample counts in many circumstances).

    b. Maximum harmonic frequency is now 435kHz for the W channel type and 115kHz for other channel types (used to be 305kHz and 80kHz resp.) but the maximum measurable fundamental frequency is unchanged at 305kHz and 80kHz resp. (better computation of the DFT sample size etc. results in the ability to fully utilize the entire DFT sample buffer).

    c. The accuracy of the frequency lock is improved by about 5:1 (only barely noticeable to the user and there's no specification change).

    d. In previous versions the harmonic bandwidth was 'fixed' as was specified in the manual. For avionics standards it is required that the harmonic analysis time window be 0.05sec (so a 20Hz harmonic bandwidth), but previous versions measured harmonics over 1 or 2 cycles at these frequencies so the time window was 0.005s or perhaps less. The harmonic analysis bandwidth has been changed to accommodate this requirement resulting in a smaller harmonic bandwidth for most applications (see change to the harmonic analysis specifications in the manual).

21. As requested by customers the frequency portion of the POWER DATA screens has been changed as follows –

    a. Except for the FUNDAMENTAL data screens, the frequency is not shown if the channel/VPA is configured for DC ONLY data (and as previously if FUND is set to NONE).

    b. If a fundamental frequency cannot be measured then instead of showing the frequency as 0 as previously, now the text NO FUNDAMENTAL is shown.

    c. The rationale behind this is that customers wish to be 'warned' if no frequency is present and they are expecting it to be present.

22. Customers have stated that it would be "nice" to have the channel type listed with each channel on the MEAS CONFIG screen. Each channel button on the MEAS CONFIG screen has been changed to include the two letter code for that channel under the channel number. Since you cannot combine W channels with non-W channels in the same VPA, and also the scaling and range selections vary with channel current option, it is good to have this information available on this screen rather than having to remember it. Note, many customers configure the unit then wire it up to their application – not the other way around which was really what I'd assumed.

23. Removed the AUTOZERO, VAR POL and VA/VAR buttons from their respective areas on the MEAS CONFIG screen and collected them together on a new screen accessed by a new PREFERENCES button from the SYS CONFIG screen which replaces the previous POWER CTRL button on that screen.

24. Added a preference setting for system response time to frequency changes. Previously this was fixed and was a compromise between several applications.

25. Added support for LH, LD and LX channel cards.

26. Added the ability to adjust the sampled signals for the effect of either the voltage drop across the A terminals or the current drain in the V terminals – this is only performed on channel signals which are not scaled. Note – this adjustment is performed on each individual sample essentially in real-time, but it is not applied prior to the scope mode trigger (this will not be noticeable by the vast majority of users). Note, this is recommended only for applications which are at low voltage and high current, or at high voltage and low current, and will reduce the overall system inaccuracy when the PA900 is used in those applications. As an example, if the voltage is 5V and the current is 0.5A measured in a D

current channel on the LO range, then the drop across the A terminals is 285mV, i.e. a 5.7% error potentially (using the ADJUST setting will reduce this to 0.057%). Note that PLA-1 has the V@SRCE connection.

27. Added a new capability enabled by option H500: the MODE setting is extended to add a SPECTRUM selection which enables the use of the PA900 as a spectrum analyzer (although primarily for the avionics marketplace this might have a wider application).

28. Added detection of voltage and current 'valleys'. A 'valley' is the peak value of the lowest half cycle during a measurement period. Note that the difference between the PK and VALLEY data can be used as a measure of LF signal modulation.

29. Improved the accuracy of logarithmic charts.

30. Improved the resolution of the sine/cosine tables for harmonics. This results in a slight improvement in the floor for high harmonics and was needed anyway to add the spectrum capability.

31. Added the actual HF LIMIT (in kHz) in the HF LIMIT button on the MEAS CONFIG screen if set for AUTO-TRACK. Previously the user had no idea what the HF LIMIT actually was if set for AUTO-TRACK. Note, since the limit shown is that actually being used, correct data is not shown until at least one actual measurement is made using the new setting(s).

32. In previous releases when a button was pressed on the SCOPE VIEW screen then occasionally it might also be seen as a cursor movement press. This has been corrected.

33. In previous versions if it was required to both change to a multi-VPA mode and also configure VPA2 and/or 3 via an interface then the MODE command had to be performed prior to any other configuration commands for VPA2 and/or 3 if the existing mode was a single-VPA mode. This has been corrected.

34. In previous versions it was theoretically possible that pending changes to the system, screen and/or measurement configurations might not be saved when the POWER button is pressed to power down the unit. This has been corrected. Note – this had a very low probability and was only if the POWER button was pressed within 2 seconds of making a change.

35. In previous versions the LOSS and EFFICIENCY data on the efficiency POWER DATA screen was shown with one less digit than they should have been. This has been corrected in this version.

36. In previous versions the Ue (measurement error) reported on the STBY POWER screen was slightly inaccurate if a channel had V or A scaling applied and/or if a channel V or A had significant DC content. This has been corrected in this version.

37. In previous versions all displayed data on the STBY POWER screen was rounded to closest when displayed (as on all other screens). For the STBY POWER screen this has been changed so that all minimum data is rounded down and all maximum data is rounded up, in this manner the reported minimum and maximum cannot be exceeded by the reported average data (which has more resolution than the min/max figures so previously could have been perceived as being outside of the reported min/max figures).

38. Under certain circumstances (never actually seen or reported) the SCOPE data might not include valid data for the last 128 points. This has been corrected in this version.

39. Previously the actual maximum time between auto-zero operations (when enabled) was actually about 4 times that documented in the manual, this has been changed to match that stated in the manual.

40. In previous revisions if the user performed an export of scope view data then all measurements were held while the data file was created (not while saved, just while created) which could disrupt measurement results. This has been corrected in this release – only further scope view data updates are delayed.

41. In previous releases the PA900 would almost immediately start a new scope capture after completion of the prior scope capture if performing continuous triggering, this could use considerable time and reduce the time available for other activities if using a fast timebase and capturing several channels. In this release the maximum rate of performing scope captures is limited to a maximum of about 50/second to mitigate this.

42. Previously the bars for a chart configured as LOG%sig could yield a chart which had bars extending beyond the top of the chart and in extreme cases could crash the PA900. This has been corrected.

43. Added a REMOTE button to the STBY POWER configuration, PREFERENCES, and SCOPE trigger/timebase configuration screens. These screens are read only when in remote, but the user could not return to LOCAL from them previously.

44. Previously if a history, scope view or cycle view trace was shown which was more than about 100x off the chart then it could crash the PA900 in some circumstances. This has been corrected.

45. Previously if the user modified the scope configuration but pressed ABORT then any changes were not used (as they should not be) but if the user re-entered the scope configure screen those discarded changes were still there. This has been corrected.

46. Improved the front panel USB drive system. Improved the enumeration on some unusual drives.

47. Re-labelled the HARMS button on the MEAS CONFIG screen to HARMONICS.

48. Previously if the number of available harmonics changed due to a change in the fundamental frequency and the RESPONSE filter was set then there were problems regarding the response averaging on the new/old harmonics. This has been resolved in this release, if the number of available harmonics changes then the response filtering for harmonics is reset – filtering does not extend over such a change.

49. In previous versions the DATALOG button in the STBY POWER configuration was not operative. It now allows the user to select whether or not starting/stopping STBY POWER will also start/stop data logging.

50. Improved the anti-alias filtering when harmonics or spectrum analysis is performed at low frequencies but the user configured for UNFILTERED HF LIMIT, this is visible as a slightly lower floor on the harmonics and spectrum screens in this situation.

51. In previous releases all configured harmonics were included as long as they could be measured as determined by the sampling parameters even if they had actually been made totally inaccurate by a lower HF LIMIT setting with a fixed frequency. In this release the number of available harmonics is restricted to those having a frequency at or below the HF LIMIT setting. This includes restricting the number of computed harmonics – so this also results in faster updates when the number of harmonics is restricted by the HF LIMIT setting as previously time was wasted computing harmonics which were actually inaccurate.

52. In previous releases the VPA shown when starting the MEAS CONFIG screen was always VPA1. This has been changed so that the initial VPA shown when the MEAS CONFIG screen is started is the last one viewed (except if configured in a single VPA mode when it is always VPA1).

v1.0.20, released 30th March, 2015

1. Changed the maximum number of characters in a single interface set of commands from 2047 to 4095.

2. Removed the limitation on a READ? command regarding the 50 RDEF field limit. A READ? command can now have an unlimited number of RDEF fields, in practice the limit is the maximum number of characters in the command set (now 4095 characters) and the 65535 character limit to the response.

v1.0.19, released 30th March, 2015

1. Included the average measurement period (aka sampling period) to the STBY POWER – TIME area. This is required to be reported by EN50564:2011 para. 6.3.

v1.0.18, released 23rd March, 2015

1. Improved the stability of the measurement of fundamental frequency. In previous releases the frequency result sometimes tended to 'hunt' between two values surrounding the actual value, in rare cases this could be as much as 0.1% but typically it was around 0.02%. This has been improved such that any hunting is now less than 0.005%. This is particularly noticeable when using the 0.1sec measurement period with an integer multiple of 10Hz input frequency or when using the LF or VLF periods at any frequency below 1Hz. Since the stability and accuracy of the frequency results are now >10:1 better than previously, starting with this revision there is one more digit displayed for frequency results (previously it was capped at one less digit than other non-peak results).

2. In previous releases the frequency measurement was too sensitive to small signals; the minimum input level was actually about 3x less than that specified. This has been corrected; the actual

minimum input level for frequency measurement is now nominally 30% lower than specified in most circumstances.

3. In previous releases if a HARMLIST? command is issued for the voltage or current harmonics and the start harmonic was less than the number of harmonics available – then all measured harmonics measurements were listed as valid which usually includes more valid harmonics than was configured for. This was only for voltage and current harmonics; power harmonics were correctly listed as documented. This has been corrected in this release and was introduced when the change to allowing HARMLIST? for watts harmonics was added.

4. In previous versions the user could configure the lead/lag detection method (or turn it off) using the front panel LEAD/LAG setting in a VPA, or by the interface LEADLAG command. This setting also configured the polarity for the VAR results. Starting with this release this setting now only affects the polarity of the VAR results; the lead/lag detection method is internally automatically selected by the PA900 in real time depending on whether the fundamental harmonic phase is available or not.

5. In previous versions if the user changed the configured number of harmonics to a number smaller than previously then the HARMONICS screen could sometimes be improperly drawn. This was because for a short period of time (a few hundred usec) there was a mismatch between the number of available harmonics (used to draw the bars and the highlight bar) and the number of configured harmonics (used to determine the horizontal scaling of the chart). This has been corrected in this revision.

6. For all of the interface commands which have a 'v' field defining a VPA the previous limitation that the field was of NR1 format in the range 1 to 3 has been changed to allow either 1, 2 or 3 (as previous, defining VPA1 to 3), or A1, A2 or A3 (defining VPA1 to 3), or VPA1, VPA2 or VPA3 (defining VPA1 to 3) or CH1, CH2, CH3 or CH4 (defining VPA1 to 3 as applicable for the presently configured CHANNEL settings). This is described as a VDEF format in the manual. This allows users to obtain results for queries or for certain commands when they know which channel they wish but the command is only available for a specific VPA (i.e. they don't know how or even if the PA900 is configured for measurements but they want the measurements anyway). NOTE – all commands listed in the Measurement Configuration Edit Commands section of the manual cannot use the CH1 to CH4 variant as the channel content of a VPA may not have been defined when the respective configuration command is issued (the A1…3 and VPA1…3 variants are allowed though).

7. For all of the interface commands which have a 'c' field defining a channel the previous limitation that the field was of NR1 format in the range 1 to 4 has been changed to allow either 1, 2, 3 or 4 (as previous), or CH1, CH2, CH3 or CH4. This is described as a CDEF format in the manual. This provides a consistent method for defining a specific channel via an interface, and with the above change to the v field also provides a consistent method of defining a VPA via an interface, with both maintaining backwards compatibility with the presently documented methods.

8. Added a LEADING?,*srce* command (where *srce* indicates a VPA as A1, VPA1, A2, VPA2, A3 or VPA3 or as a channel as CH1, CH2, CH3 or CH4) which responds with either '1' (PF is leading) or '0' (PF is lagging) for the requested VPA or channel.

9. Added RDEF field interface definitions which allows the user to obtain any of the data reported for standby power.

10. Added interface commands which allows the user to configure, control and obtain the status of standby measurements.

11. Added interface commands which allows the user to obtain historical data for standby power measurements.

v1.0.17, released 23rd March, 2015

1. In previous versions if a USB drive had a file in the root directory whose length exactly matched the expected length of any valid configuration file but was not actually a valid configuration file, then it could possibly crash the PA900. This has been fixed (the bug has never been noticed to my knowledge; it was discovered when reading the code). Similarly, if the root directory contained a file with zero length then it could possibly crash the PA900.

2. Added a 50KHz HF Filter choice. NOTE – this changes the codes for the interface configuration command and the query response (see manual).

3. In previous versions under some circumstances the history file could lose the first data point (1/4096th of the history timespan). This has been corrected.

4. In previous versions when displaying the POWER DATA – INRUSH screen for a VPA, the 'details' data (the white, smaller font size data) was not displayed if the DETAILS button on a non-inrush screen was set to BASIC. The details data for the INRUSH screen should always be shown. This has been corrected.

5. In previous versions when viewing the POWER DATA – INRUSH data for an individual channel, the primary (larger sized gold coloured) data was the highest recorded RMS data while the highest peak data was shown as a 'detail' (i.e. in the smaller, white coloured text). In practice, the majority of users wish to view the peak data as the primary data and the RMS data as a supplemental data (as is shown when displaying POWER DATA – INRUSH data for a VPA) so these have been reversed, starting with this revision the peak data is now the primary data when viewing the POWER DATA – INRUSH data for an individual channel (as it always was for VPA data).

6. Added a STBY POWER button to the right side buttons (and slightly reduced the height/spacing of the right side buttons to make room). This allows the user to make standby power measurements according to the requirements of EN50564:2011.

v1.0.16, released 25th February, 2015

1. Internal changes only.

v1.0.15, released 23rd February, 2015

1. Previously harmonics for a W type channel were only available up to approx. 297KHz, this has been raised to approx. 307KHz as it should have been.

2. In all prior versions any channels which were not used were held dormant, i.e. they were not actually sampling. In this version all unused channels sample at a fixed rate of 240KSPS, independent of their type.

3. In prior releases the imported ASCII format custom screen file had to have a C character as the first character in the first line (i.e. the first character of the file), but the C character did not have to be the first character of succeeding lines. Although the documentation states that the C must always be the first character of all lines, the firmware has been changed such that now the C does not have to be the first character on any line – all characters prior to the first C on any line are ignored.

4. In prior releases the imported ASCII format harmonic limits file had to have an H character as the first character in the first line (i.e. the first character of the file), but the H character did not have to be the first character of succeeding lines. Although the documentation states that the H must always be the first character of all lines, the firmware has been changed such that now the H does not have to be the first character on any line – all characters prior to the first H on any line are ignored.

5. In prior releases there was a very slim possibility that channel calibration data could be corrupted when written. This was caused by there being a possibility that the peripheral handling writing to the FPGA may be delayed by other activities, thus causing a delay in the command to select a different channel card to be written to. It has now been discovered that the processor instruction to ensure that all prior data written has been physically written does not actually include this peripheral, so there was the possibility that calibration data might start to be written to the previously written channel data before the correct channel is selected, resulting in both channels calibration data being corrupted.

6. Reversed the prior change eliminating the ability to set the calibrated DC zeroes from the SYS CONFIG screen. The DC zeroes are not stable enough with changes in configuration or environment to enable totally removing the capability of the user to set DC zeroes.

7. Added an interface command (EXTDCZERO) to allow performing the same action as using the SYS CONFIG - EXTERNAL DC ZERO button from the front panel.

v1.0.14, released 19th February, 2015

1. In previous releases the unit could corrupt it's calibration data if a hidden zero adjustment (20ms every few minutes typically) happened at the same time as certain other activities. Also, previously the hidden zero could interfere with scope collection. This has been fixed.

2. In previous releases if the user changed a channel from a VPA other than VPA1 to a lower numbered VPA while changing from multi-VPA mode to single-VPA mode at the same time then the unit raised an error and discarded the changes. This has been fixed.

3. Previously the user could perform an external DC zero on any configured channel from the front panel SYS CONFIG screen. If the channel was not scaled then the calibrated DC zero was set. This meant that there was no traceability on the calibrated DC zero in the future since it would be unknown if the user had adjusted it. This facility has been removed; the user can now only use the EXTERNAL DC ZERO to adjust the scaled offsets (which are not part of the traceable verified calibration).

4. Includes various wording changes in screen text.

v1.0.13, not released

v1.0.12, released for 1st production