



Firmware 2.1 - Changelog

Contents

- **Bug Fixes and Enhancements – 2.1.8**
- **Bug Fixes and Enhancements – 2.1.7**
- **Bug Fixes and Enhancements – 2.1.6**
- **Bug Fixes and Enhancements – 2.1.4**
- **Bug Fixes and Enhancements – 2.1.2**
- **Bug Fixes and Enhancements – 2.1.0**
- **New features – 2.1**

Bug Fixes and Enhancements – 2.1.8

1. *Enhancement:* Improved the battery charge rate.
2. Fixed an issue with the daily trends when the ground point changes on the PQube.
3. Fixed an issue with sending a Test Email to the 'Outgoing Event Summary Email' recipients.
4. Fixed an issue with sending the beginning of an event notification email to the 'Outgoing Event Summary Email' recipients.
5. Fixed an issue with invalid Flicker values in the weekly PQDIF files for a split phase configuration.
6. Fixed an issue with the PF value lacking decimal digits on the display when using a high CT ratio.
7. Fixed an issue with the neutral current event triggers when using a high CT ratio.
8. Fixed an issue with the AN Swell graph displaying the units in volts when configured for amps.

Bug Fixes and Enhancements – 2.1.7

1. Fixed an issue with invalid L3 Flicker values in the daily trends.csv and PQDIF files in a Delta Configuration.
2. Fixed an issue with Daylight Savings Time off by 3 hours after disabling DST in the setup.ini.

Bug Fixes and Enhancements – 2.1.6

1. *Enhancement:* Automatic Daylight Savings Time (DST) now available!
2. Fixed an issue with the one hour gap in the PQDIF files.
3. Increased the battery charging rate.
4. Fixed an issue with the energy values in the trends.csv (off by a factor of 1000) when using a comma as the decimal separator in the setup.ini.

Bug Fixes and Enhancements – 2.1.4

1. Fixed an issue preventing to upload setup files, firmware updates, generating snapshots, etc. from the Commands Web page, when non-English language packs is set as primary language.
2. Fixed an issue where the PQube may reset on a daily basis. This may possibly lead the PQube to stop recording new data. Upgrade of firmware is highly recommended.
3. Fixed an issue with incorrect Flicker values with the daily trends.csv and PQDIF files in Split Phase Configuration.
4. Fixed an issue where the PQube resets if the Resistive Attenuator Correction Tag is enabled.
5. Fixed an issue with generating daily trends when CO2 Emissions = Avoided in the setup.ini.

Bug Fixes and Enhancements – 2.1.2

1. *Enhancement:* Added new listing index file for improved compatibility with PQView.
2. *Enhancement:* Separate HIGH and LOW analog ranges now available!
3. *Enhancement:* New charging method to prolong battery life and minimize swelling.
4. Added Modbus compatibility fix for coil reads
5. Fixed a compatibility issue with ATT1 module and analog LOW range.
6. Fixed an issue with summary emails not being sent under certain conditions.
7. Fixed an issue with an empty white space at the beginning of PQDIF filenames.

8. Test emails are now sent to summary email recipients.
9. Fixed an issue where the configuration log showed the wrong Major Dip setting.
10. Fixed an issue with popup event notifications for temperature/humidity events.

Bug Fixes and Enhancements – 2.1.0

1. Phase/neutral/earth current events AUTO threshold set to full-scale current.
2. Turned off HF Impulse and Waveshape Change events by default.
3. Turned on FTP by default.
4. Normalized email retry timer to 10 minutes.
5. Fixed an issue with a lingering directory handling when resetting Ethernet.
6. Fixed an issue that prevents outgoing email when summary events are on.
7. Fixed an issue with XML emails not being sent correctly.
8. Fixed an issue where current gain constants affected range of interest.

New features – 2.1

1. **Trigger Temperature and Humidity Events**
Your PQube now records temperature and humidity events with a TH1 probe. Each event recording is complete with magnitude, duration, and timestamp. You can set over-thresholds or under-thresholds.
2. **Choose what kind of emails to receive from your PQube**
You can now choose which types of emails are sent from your PQube. This is useful if you want to disable trend emails (which may contain large attachments) but still want event emails so you can react quickly to problems in the field.
3. **Set your own Major-Dip Ride-Through Curve**
Need to trigger an event based on voltage *and* time? Customize your own Major Dip ride through curve! Specify up to 4 depth/duration points.
4. **Support for Potential Transformers with Calibrated Ratios**
You can now apply a gain correction factor for the mains voltage terminals, with a range of 0.95 to 1.05. Use with calibrated potential transformers to improve the accuracy of your measurements!

PSL



Firmware 2.0 - Changelog

Contents

- **Bug Fixes and Enhancements – 2.0.2**
- **Bug Fixes and Enhancements – 2.0.1**
- **New features – 2.0**

Bug Fixes and Enhancements – 2.0.2

1. In Firmware 2.0.1, temperature graphs might not be displayed correctly. *Fixed.*
2. In Firmware 2.0.1, certain power channels (including total VARs) were sometimes displayed incorrectly. *Fixed.*
3. In Firmware 2.0.1, PQDIF file names occasionally became malformed. *Fixed.*
4. In Firmware 2.0.1, flicker channel names showed up incorrectly in the summary files. *Fixed.*
5. In Firmware 2.0.1, the Y-axis on the Analog channel graphs would sometimes show up incorrectly. *Fixed.*

Bug Fixes and Enhancements – 2.0.1

1. In Firmware 2.0.0, CSV files had some minor issues with quotations and separators. *Fixed.*
2. In Firmware 2.0.0, XML files were malformed. *Fixed.*
3. In Firmware 2.0.0, the Ethernet module might freeze under certain circumstances when using a command-line FTP client. *Fixed.*
4. In Firmware 2.0.0, certain language packs might not load properly. *Fixed.*

New features – 2.0

1. **FREE! PQube Report Writer Program.**

Automatically writes ready-for-customer reports, using data from your PQube! Use pass/fail thresholds from EN50160, IEEE519, or create your own. Reports are generated in Microsoft Word® format for easy editing. *PQube Report Writer requires Microsoft Office® 2007 or newer.*

2. **Improved flicker measurements.**

Your PQube now calculates “Incandescent” flicker according to IEC 61000-4-15. PST and PLT measurements are within specified accuracy for a wide range of modulation frequencies. Choose between 120V/60Hz or 230V/50Hz for your lamp voltage.

3. Split-single-phase power configuration now supported.

Your PQube supports split-single-phase power configuration (3-wire, single-phase, mid-point neutral). Useful in North American residential electrical systems: monitor the interaction of HVAC systems, appliances and home electronic devices.

4. Improved harmonics recording

Voltage – Record harmonics in absolute volts or as percentage of fundamental. Total distortion is calculated as THD.

Current – Record harmonics in absolute amps and total distortion as TDD, or as percent of fundamental and total distortion as THD.

5. More parameters available.

Record PF, THD, VA, VAR and Flicker for each individual phase.

6. Improved VARs recording

Fundamental VAR computation.

Your PQube now calculates Fundamental VARs, in addition to Budeanu VARs. Useful for selecting the appropriate power factor correction capacitor for your application.

VARh Accumulator.

Your PQube now records accumulated VAR-hours, to help you calculate the benefit of PF correction capacitors.

VARs included in event CSV recordings.

Your PQube now records fundamental and/or Budeanu VARs in event CSV files – useful for wind-turbine applications.

7. Double the recording period for RMS graphs.

Now you can double the recording period of the RMS graphs that are generated after an event. For 50Hz, the RMS event window doubles from 10 to 20 seconds worth of data. For 60Hz, the RMS window doubles from 8.5 to 17 seconds worth of data. NOTE: doubling the window reduces the resolution of your RMS graphs. When you choose this option, the RMS is updated every 1 cycle instead of every 1/2 cycle.

8. Double the recording period at the beginning of an event.

Record twice as much data at the beginning of an event, in exchange for discarding the end-of-event data. Useful for analyzing events that take a long time to unfold, but you're really only interested in the initial part of the event, such as FIDVR events.

9. Temperature reported in Celsius or Fahrenheit.

Your PQube now records temperature in your choice of °C or °F.

10. Brief summary emails.

Summary emails contain only essential information about the event, with no HTML. Up to three email addresses can be added to the summary email list. You might send summary

emails to managers, and send the detailed information to the field technicians must respond to the event.

11. Partial daily trends are automatically generated after a configuration change.

In previous firmware versions, your PQube discarded the previous measurement whenever you changed the power configuration, nominal voltage, PT and CT ratios, or the trend settings. Now, your PQube will automatically generate trends and statistics for the previous configuration to preserve the previously recorded data. If you're moving your PQube from site to site, this is very helpful!

12. Stop recording when SD card becomes full. By default, your PQube automatically performs maintenance on your SD card. It deletes the oldest data when the SD card becomes full in favor of new data. Now you can choose to stop recording when the SD card becomes full, giving you the opportunity to preserve your old data before your PQube deletes it.

13. Hide Neutral Current Channel and Earth Current Channel if necessary.

Neutral and earth current channels can now be hidden from event and trend files.

14. PQube serial number included in file names.

You can now manage files from different PQubes without risk of mixing up the data. Makes managing data from multiple PQubes easier.

15. Improved Modbus

More meters and more functions are available through Modbus.

These are useful for applications where Modbus is used almost exclusively—for example when you have another device pulling data from your PQube.

Peak values reset via Modbus.

Peak values can now be reset via Modbus, in addition to Web interface and display.

Snapshot via Modbus.

Snapshots can now be triggered via Modbus, in addition to Web interface and display.

Firmware 1.4 - Changelog

Contents

- Bug Fixes and Enhancements – 1.4.14
- Bug Fixes and Enhancements – 1.4.12
- Bug Fixes and Enhancements – 1.4.10
- Bug Fixes and Enhancements – 1.4.8
- Bug Fixes and Enhancements – 1.4.7
- Bug Fixes and Enhancements – 1.4.6
- Bug Fixes and Enhancements – 1.4.5
- Bug Fixes and Enhancements – 1.4.4
- Bug Fixes and Enhancements – 1.4.3
- Bug Fixes and Enhancements – 1.4.2
- New features – 1.4

Bug Fixes and Enhancements – 1.4.14

1. *Enhancement:* Optimized firmware for more stable and reliable operation.
2. *Enhancement:* Improved formatting of MAC addresses in the log file.
3. Fixed an email compatibility issue in Firmware 1.4.12 and older.

Bug Fixes and Enhancements – 1.4.12

1. In Firmware 1.4.10, long event durations would sometimes be inaccurate under certain conditions. *Fixed.*

Bug Fixes and Enhancements – 1.4.10

1. *Enhancement:* Modified the digit printing requirement so that users will be much less likely to encounter values such as .200kA, and would instead get 200A.
2. In Firmware 1.4.8, Counter Event emails would occasionally stop emails from being sent. *Fixed.*
3. In Firmware 1.4.8, the PQube would occasionally not shut down properly to UPS timeout. *Fixed.*



Bug Fixes and Enhancements – 1.4.8

1. In Firmware 1.4.7, triggering multiple snapshots in fast sequence could cause the PQube to lock up. *Fixed.*
2. *Enhancement:* Relocated the ground symbol to the middle for center-grounded Delta configurations to eliminate any confusion.
3. *Enhancement:* Optimized PQDIF for smaller file sizes.
4. *Enhancement:* Increased the limits for Potential Transformer Ratio and Current Transformer Ratio. Please contact support@powerstandards.com for more details.

Bug Fixes and Enhancements – 1.4.7

1. *Enhancement:* Improved Vectors screen, it now indicates correct or incorrect phase rotation.

Bug Fixes and Enhancements – 1.4.6

1. *Enhancement:* Increased range of unbalance values to better reflect reversed rotation.
2. *Enhancement:* Improved compatibility with PQView.
3. In Firmware 1.4.5, sometimes the axis labels would not show up in the Trends and Statistics. *Fixed.*
4. In Firmware 1.4.5, “Events in progress” was not translated in the Web Server. *Fixed.*
5. In Firmware 1.4.5, phase current events were recorded improperly for multi-phase configurations. *Fixed.*
6. In Firmware 1.4.5, temperature-humidity probes would sometimes work incorrectly when a splash screen was loaded. *Fixed.*

Bug Fixes and Enhancements – 1.4.5

1. In Firmware 1.4.4, an issue prevented certain weekly and monthly trends to be generated. *Fixed.*
2. In Firmware 1.4.4, THD was being miscalculated in DELTA power configurations. *Fixed.*
3. In Firmware 1.4.4, Phase Current Events would only be able to trigger once for L1-N configuration until the PQube is reset. *Fixed.*

Bug Fixes and Enhancements – 1.4.4

1. In Firmware 1.4.3, certain triggering and recording functions did not work correctly in the Single_Phase_L1-L2 power configuration. *Fixed.*

Bug Fixes and Enhancements – 1.4.3

1. *Enhancement:* Weekly and Monthly trends are generated faster.
2. *Enhancement:* New language packs can be uploaded through email.
3. *Enhancement:* Usernames and passwords are now hidden in the Configuration Log file.
4. In Firmware 1.4.2, Weekly and Monthly trends would sometimes report an incorrect min/avg/max value. *Fixed.*
5. In Firmware 1.4.2, the individual phases would occasionally be displayed incorrectly in Delta configurations. *Fixed.*
6. In Firmware 1.4.2, the PQube would print the wrong Setup File Error if the Major Dips were configured incorrectly. *Fixed.*

Bug Fixes and Enhancements – 1.4.2

1. In Firmware 1.4.1, sometimes the Web Server and Emails would show blank meters before the PQube locked onto the Power Configuration. *Fixed.*
2. In Firmware 1.4.1, emails sent in Text or XML format would sometimes be corrupted. *Fixed.*
3. In Firmware 1.4.1, the Unbalance meters showed up incorrectly under certain power configurations. *Fixed.*
4. *Enhancement:* More reliable Web Server.

New features – 1.4

- 1. DC Current/DC Power/DC Energy**

Individual ratios for each Analog channel.
New AN1xAN2 channel for measuring Watts.
Analog Energy accumulator.
Ability to swap AN1 and AN2 in setup file.
Specify new names and units for your Analog channels.
- 2. No AC voltage required to record data**

Now you can record DC channels, temperature, humidity, and more, without locking onto an AC power configuration.
- 3. Improved Language Selection**

You can specify your language(s) in your setup file. Setting languages remotely is now possible. Selected language(s) remain even after a firmware update.
- 4. Network Improvements**

Network information is now available on your PQube display and Web Server. This allows you to setup your PQube on a network more easily. A more powerful Web Server allows you to download your existing Setup file, upload a new Setup file, or upload a new firmware update.
- 5. PSL-calibrated Current Transformers**

Current Transformers with ultra-precise calibration are now available. Standard CTs are rated for $\pm 1\%$ of full scale. PSL-calibrated CTs are five times as accurate at 70% of full scale ($\pm 0.2\%$).
- 6. Separate Neutral Current Transformer Ratio**

You can now specify a separate CT ratio for Neutral current, just like you can for Earth current.
- 7. User Counter**

Counts the number of times your Digital Input or Analog Input channels are triggered.
New channel: Energy per count. Your PQube will automatically divide the accumulated energy by the number of counts, providing the energy usage per unit (energy used to fill each bottle in a beverage factory, for example).
- 8. Harmonic of Interest – Improved functionality**

Now you can change your Harmonic of Interest remotely via Web Server, Email, or Modbus. Your Harmonic of Interest remains, even after your PQube resets.
- 9. Improved Modbus Functionality**

A writable register has been added to the list of Modbus registers, for changing your Harmonic of Interest. And your PQube supports big-endian and little-endian byte orders.

10. **Support for Simple Network Management Protocol (SNMP)**

New for 1.4 (beta). This is a common protocol in data centers worldwide. A PQube MIB file is also available!

Firmware 1.3 - Changelog

Contents

- Bug Fixes and Enhancements – 1.3.17
- Bug Fixes and Enhancements – 1.3.15
- Bug Fixes and Enhancements – 1.3.14
- Bug Fixes and Enhancements – 1.3.13
- Bug Fixes and Enhancements – 1.3.12
- Bug Fixes and Enhancements – 1.3.9
- Bug Fixes and Enhancements – 1.3.8
- Bug Fixes and Enhancements – 1.3.6
- Bug Fixes and Enhancements – 1.3.4
- Bug Fixes and Enhancements – 1.3.3
- Bug Fixes and Enhancements – 1.3.2
- New features – 1.3

Bug Fixes and Enhancements – 1.3.17

1. *Enhancement:* Optimized firmware for more stable and reliable operation.

Bug Fixes and Enhancements – 1.3.15

1. In Firmware 1.3.14, the PQube would sometimes reset while generating Weekly or Monthly Trends. *Fixed.*

Bug Fixes and Enhancements – 1.3.14

1. In Firmware 1.3.13, the Individual Power Trends were mislabeled RMS ½ instead of RMS 10/12. *Fixed.*
2. In Firmware 1.3.13, there was an issue with the harmonic outputs on L1-L2 power configuration. *Fixed.*
3. In Firmware 1.3.13, the nominal voltage would sometimes be incorrect in Modbus. *Fixed.*
4. In Firmware 1.3.13, sometimes the Phase Current triggers would not be initialized properly. *Fixed.*

Bug Fixes and Enhancements – 1.3.13

1. In Firmware 1.3.12, setting the Decimal Separator to a comma in your setup file would alter the formatting In the Web Server. *Fixed.*



2. In Firmware 1.3.12, the PQube would occasionally hang while trying to release the SD card. *Fixed.*

Bug Fixes and Enhancements – 1.3.12

1. In Firmware 1.3.9, load duration statistics would occasionally be displayed incorrectly. *Fixed.*
2. In Firmware 1.3.9, AN1-AN2 events were sometimes mixed up with AN2-E events, causing issues with emails. *Fixed.*

Bug Fixes and Enhancements – 1.3.9

1. In Firmware 1.3.8, Weekly and Monthly trends might not be generated, depending on your configuration. *Fixed.*

Bug Fixes and Enhancements – 1.3.8

1. *Enhancement:* Added support for 10V range and 100V range for the Analog channels on all PQubes sold since late May 2010.
2. In Firmware 1.3.6, the offset from UTC was occasionally applied to the outgoing email timestamps twice, depending on your email server. *Fixed.*

Bug Fixes and Enhancements – 1.3.6

1. *Enhancement:* Modified the configuration logs to display more reasonable values.
2. In Firmware 1.3.4, the PQube sometimes had issues locking onto 400Hz nominal frequency. *Fixed.*
3. In Firmware 1.3.4, if data was missing for an entire week or month, the PQube would sometimes generate a Weekly or Monthly trend anyway, with invalid data. *Fixed.*
4. In Firmware 1.3.4, negative power values would sometimes be displayed incorrectly in the Individual Phase power graphs. *Fixed.*
5. In Firmware 1.3.4, the PQube would occasionally freeze if the monthly folders became too large. *Fixed.*
6. In Firmware 1.3.4, setting CO2_Emissions to Avoided would prevent the trends from being generated. *Fixed.*
7. In Firmware 1.3.4, the PQube would occasionally send duplicate emails, especially when used with a cellular modem. *Fixed.*
8. In Firmware 1.3.4, on rare occasions the flicker readings could be invalid. *Fixed.*
9. In Firmware 1.3.4, null characters might appear in the harmonic trend CSV files. *Fixed.*

10. In Firmware 1.3.4, sometimes the incorrect XCT4 or CT4 version number would be recorded in the log file. *Fixed.*
11. In Firmware 1.3.4, the PQube would occasionally record an incorrect average value when the data transitioned between positive and negative readings. *Fixed.*

Bug Fixes and Enhancements – 1.3.4

1. In Firmware 1.3.3, the PQube could get stuck while generating Weekly and Monthly trends if your SD card was formatted at the beginning of a new week or month. *Fixed.*
2. In Firmware 1.3.3, if the event was long enough to be split into 2 sets of files, the end waveform CSV file might not be generated properly. *Fixed.*
3. In Firmware 1.3.3, full monthly PQDIFs could reset the PQube. *Fixed.*

Bug Fixes and Enhancements – 1.3.3

1. *Enhancement:* Improved error handling during firmware updates.
2. In Firmware 1.3.2, some GIF files would show incorrect RMS_{1/2} values on weekly and monthly trends. *Fixed.*

Bug Fixes and Enhancements – 1.3.2

1. In Firmware 1.3.1, internal error logs were occasionally being corrupted due to flash not being erased before reburning. *Fixed.*
2. In Firmware 1.3.1, XCT4 module numbers and assembly numbers were recorded in the logs incorrectly. *Fixed.*
3. In Firmware 1.3.1, the PQube would reset at 10:30pm every night due to a bug in the monthly folders. *Fixed.*
4. In Firmware 1.3.1, PQubes sold in early 2008 would not work properly with the latest firmware due to display drivers. *Fixed.*
5. In Firmware 1.3.1, folder names and file names might occasionally become corrupted due to a DSP buffer overrun. *Fixed.*
6. In Firmware 1.3.1, Trend Harmonics would sometimes corrupt the directory handles and cause the PQube to stop generating output files. *Fixed.*
7. *Enhancement:* Improved SD card removal image on display to minimize confusion.
8. In Firmware 1.3.1, the PQube sometimes reported incorrect magnitudes for long events. *Fixed.*

9. In Firmware 1.3.1, events without magnitudes would not contribute to the number of Counter events. *Fixed.*
10. In Firmware 1.3.1, some Modbus registers would display incorrect values. *Fixed.*
11. In Firmware 1.3.1, the event web pages would not load properly if GIFs and PQDIF files were disabled. *Fixed.*

New features – 1.3

1. **Individual phases now available**
Your PQube now records daily, weekly, and monthly trends for individual phases. Files are available in GIF, CSV, and PQDIF format.
2. **Harmonics – up to the 63rd order**
Your PQube now generates CSV files with the magnitude, angle, and interharmonic for every harmonic order up to the 63rd. Snapshots now include a harmonic spectrum GIF, up to the 50th.
3. **PQ1 Emulation (requires factory-installed RLY option)**
Your PQube now emulates up to three PQ1 Power Quality Sensors. Select from a variety of international standards, such as SEMI F47, and trigger a “Major Dip” when the thresholds have been exceeded.
4. **Faster, more secure web server**
5. **Counter events**
Last resort to keep track of events that occur in succession quickly.
6. **User-triggered Daily Trend and Snapshot**
Generate reports at your own convenience. Now you can view trends and snapshots without waiting until midnight.
7. **Current triggers - level and inrush thresholds (phase/neutral/earth)**
Your PQube can now trigger events based on current.
Level Events are triggered when the measured current exceeds a certain value.
Inrush Events are triggered when the measured current increases by more than a certain value during a specified duration.
8. **Earth current – measure earth leakage current**
Your PQube can now trigger events and generate trends for current on the earth conductor, or the net current on all the power conductors.
9. **Waveshape fault trigger**
Perfect for Power Factor Correction capacitor switching events. The PQube now triggers events on a waveshape change.

10. Individual dip/swell thresholds for each analog channel

The PQube now supports separate thresholds for each analog channel.

11. DIG1 high/low trigger

The PQube now triggers on the digital input channel.

12. Events in Progress notification

The PQube notifies you about events when the event ends. Now, for long events, your PQube also provides an Event in Progress notification after an event has continued for 1 minute. This new feature is useful, for example, during extended power interruptions.

13. Improved Modbus-TCP, faster with more meters

14. Remote commands from the web server

Generate Snapshot, Generate Daily Trends, Send Test Email, Reset Energy Accumulators, Reset Peak Measurements, and Reset PQube.

15. Phase-swapping available in your setup file

Accidentally connected the phases to the wrong inputs on your PQube or reversed the polarity of your Current Transformers? No problem, you can now correct your hardware connections using your setup file.

16. Unbalance – zero and negative sequence

The PQube now calculates unbalance based on either the ANSI, IEC, or GB methods.

17. Large energy digits on display

Easier to see from a distance, useful for ANSI certification

Firmware 1.2.2 – Changelog

Contents

- Bug Fixes and Enhancements – 1.2.2d
- Bug Fixes and Enhancements – 1.2.2c
- Bug Fixes and Enhancements – 1.2.2b
- Bug Fixes and Enhancements – 1.2.2a
- Bug Fixes and Enhancements – 1.2.2
- New features – 1.2.2

Bug fixes and enhancements – 1.2.2d

1. In Firmware 1.2.2c, the accumulator could not be cleared correctly on certain days of the month. *Fixed*
2. *Enhancement:* The N-E channel is now available in GIF and CSV format.

Bug fixes and enhancements – 1.2.2c

1. In Firmware 1.2.2b, an incorrect scalar caused flicker readings to be off by a fraction of 10 in PQDIF. *Fixed*
2. In Firmware 1.2.2b, energy was calculated incorrectly for systems with high voltage inputs. *Fixed*
3. In Firmware 1.2.2b, an intermittent bug involving time caused the PQube to reset. *Fixed*
4. In Firmware 1.2.2b, problems with multi-packet response transmissions and handling of APOP servers resulted in failed emails. *Fixed*
5. In Firmware 1.2.2b, there were missing/incorrect translations with the web server. *Fixed*
6. In Firmware 1.2.2b, PQDIF did not work correctly with PQWeb. *Fixed*
 - a. In Firmware 1.2.2b, an incorrect scalar caused flicker readings to be off by a fraction of 10 in PQDIF. *Fixed*
7. In Firmware 1.2.2b, energy was calculated incorrectly for systems with high voltage inputs. *Fixed*
8. In Firmware 1.2.2b, an intermittent bug involving time caused the PQube to reset. *Fixed*
9. In Firmware 1.2.2b, problems with multi-packet response transmissions and handling of APOP servers resulted in failed emails. *Fixed*
10. In Firmware 1.2.2b, there were missing/incorrect translations with the web server. *Fixed*.

11. In Firmware 1.2.2b, PQDIF did not work correctly with PQWeb. *Fixed.*

Bug fixes and enhancements – 1.2.2b

1. In Firmware 1.2.2a, PQDIF files had compatibility problems with PQView and DranView. *Fixed.*
2. In Firmware 1.2.2a, PQDIF scalars had problems when the exponent was non-zero. 2,000A would scale to 2A instead of 2,000A. *Fixed.*
3. In Firmware 1.2.2a, if the PQube was interrupted while making a PQDIF trend, it would leave it unfinished. *Fixed.*
4. In Firmware 1.2.2a, trends would use the incorrect axis when a nominal value for the axis has not been specified. *Fixed.*
5. In Firmware 1.2.2a, the display would freeze at the screen saver during rapid event pop-ups. *Fixed.*
6. In Firmware 1.2.2a, the PQube would lock up during start up if the word "AUTO" was not entered in all upper case in the setup.ini file. *Fixed.*
7. In Firmware 1.2.2a, the PQube would lose communication with the PC while directly connected via Ethernet cable. *Fixed.*
8. In Firmware 1.2.2a, if one of the Email_To fields in the setup.ini file were blank, the PQube would not send emails to any recipients below the blank field. *Fixed.*
9. In Firmware 1.2.2a, fractional numbers in the CT ratio were not permitted. For example, 300:1 had to be used instead of 100:0.333. Fractional numbers are now permitted. *Fixed.*

Bug fixes and enhancements – 1.2.2a

10. In Firmware 1.2.2, Weekly Trends that span across months would sometimes show incorrect date. *Fixed.*
11. In Firmware 1.2.2, energy readings on the PQube were incorrect when PT/CT ratios were applied on the PQube. *Fixed.*
12. In Firmware 1.2.2, the display had minor glitches including the word "Current" clipping the directional guide on the Phasor screen. *Fixed.*

Bug fixes and enhancements – 1.2.2

1. In Firmware 1.2, potential transformer (PT) ratios did not always display properly, could create unreasonable nominal voltages, and could occasionally crash your PQube. *Fixed.*

- a. Note: if you are using PT's, we now recommend that you avoid the AUTO setting in your setup.ini file for Nominal_Phase_To_Phase_Voltage and Nominal_Phase_To_Neutral_Voltage and Power_Configuration. Instead, set your nominal voltage and power configuration manually to the correct values. (There are no standard world-wide power configurations for PT secondaries, so in its AUTO mode your PQube will simply choose the most reasonable nominal and power configuration, which may not be what you want.)
2. In Firmware 1.2, the AUTO feature for MAX_CURRENT_OF_INTEREST did not work properly. *Fixed.*
3. In Firmware 1.2, weekly trend graph that spans across the end of a month, or touches the end of a month, may be missing Sunday's data, although that day's data will show up properly in daily and monthly trend graphs. This bug also affects trend graphs that were recorded with two different power configurations, for example part of the week as three-phase delta, and part of the week as single-phase. *Fixed.*
4. *Enhancement:* trend graphs now show flags, even if there is no valid data at the time of the flag.
5. In Firmware 1.2, if you set the date exactly one month forward, you would trigger a weekly/monthly trends for the previous day, but you wouldn't trigger a daily trend for that day. If you set the date exactly one year forward, you would trigger a weekly trend, but no daily or monthly trend. *Fixed.*
6. An updated English-American language pack was released shortly after firmware version 1.2. But if you used the non-updated English-American language pack in your PQube's first language slot, it corrupted some images on the PQube (instruction screen, test email screen), and could reset your PQube when trend graphs were generated. *Fixed with updated English-American language pack, previously released.*
7. In Firmware 1.2, the tags in your setup.ini file that turned off spreadsheet files (CSV) and turned off picture files (GIF) did not work properly – those files were always generated. *Fixed.*
8. In Firmware 1.2, if your PQube was configured for all channels (voltage, current, analog, temperature, humidity, flicker, etc.), and recorded data for a full month, the monthly trend graphs could cause your PQube to get stuck in a continuing time out/reset cycle. *Fixed.*
9. In Firmware 1.2, there was somewhere between a 1-in-a-thousand and 1-in-ten-thousand chance that the PQube would stop recording data after an event takes place (meters keep updating, infinite spinner on recent events screen, no events e-mails, no additional data on trend graphs). *Fixed.*
10. In Firmware 1.2, the PQube created empty folders even if the output files were not generated, for example because you turned off those files in your setup.ini file. *Fixed.*

11. In Firmware 1.2, if the PQube happened to detect an event while it was generating a trend GIF file at midnight, the file writing system for the SD card would hang. *Fixed.*
12. *Enhancement:* If your PQube loses frequency lock during an event (for example, during an interruption it is impossible to measure the frequency), your PQube now shows “no data” for the frequency, instead of using the previous frequency.
13. *Enhancement:* If the PQube is connected to a single-phase system, but with L1 and Neutral reversed, you now see an error screen on your PQube’s display. Correct the connection, and the error screen goes away.
14. *Enhancement:* If the PQube cannot respond to a Modbus request immediately because it is too busy, it responds with an exception, instead of failing to responding to a request.
15. In Firmware 1.2, the PQube would sometimes accumulate energy and VAh at the same rate. This was a bug with polyphase VAh specifically. *Fixed.*
16. *Enhancement:* When the energy and demand accumulators in your PQube are cleared for any reason, your PQube records their values before clearing in its log file.
17. In Firmware 1.2, when there were no-data values for flicker and frequency, PQDIF would show a wrong value. *Fixed.*
18. *Enhancement:* PQube trend drawing algorithm improved, less overlapping, no random gaps, especially on weekly/monthly.
19. In Firmware 1.2, the nominal voltage on the top right corner of Trends and Statistics picture files (GIF) would sometimes display incorrectly. *Fixed.*
20. In Firmware 1.2, the proper separators (variable, decimal, time, date) were not being used in the spreadsheet files (CSV). *Fixed.*

New features – 1.2.2

(All of these features are firmware-only upgrades – they do not require any hardware changes to your PQube.)

1. 400 Hz nominal frequency – for aircraft and other applications (beta)

Your PQube now fully supports 50 Hz, 60 Hz, and 400 Hz nominal (and, of course, DC on the AN1 and AN2 screw terminals).

- At 400 Hz nominal, the frequency range for your PQube is 320Hz – 560Hz.
- Nominal 50Hz, 60Hz, and 400 Hz frequencies are automatically detected. 320Hz – 560Hz can be manually detected.
- At 400 Hz nominal, the frequency is measured through an analog 5-pole low-pass 3kHz filter, plus an analog 2-pole at 1kHz.

- Dips, swells, interruptions, 1-microsecond impulses, frequency variations, daily/weekly/monthly min/avg/max trends and statistics, power calculations, etc. are all supported at 400 Hz. In general, your PQube treats 400 Hz as a 50 Hz signal with 8 cycles per interval, so single-cycle 50 Hz values are 8-cycle values at 400 Hz.

2. Improved Translations – web pages and e-mails

Your PQube can now translate its web pages and outgoing e-mails into Chinese, Japanese, Korean, etc., using UTF-8 encoded characters. To use this new feature, PSL must add your web/email translations to the Language Pack for 1.2.2. PSL will provide you with a list of phrases to be translated, and will provide new Language Packs as soon as you complete the translations.

3. Improved e-mail support

- Every PQube now has its own temporary e-mail account at pqube.com, making it easier to setup and test your PQube. The address and user name for your PQube's setup.ini file are both [PQube serial number]@PQube.com, and the password is [PQube serial number]. Everything is in lower case. This information may already have been entered in your PQube's setup.ini file.
- The PQube is now easier to use with a variety of e-mail servers, because it now supports the following email authentication methods:
 - [for POP] - PLAIN, LOGIN, DIGEST-MD5, CRAM-MD5, APOP, and USER-PASS commands
 - [for SMTP] No Authentication, PLAIN, LOGIN, DIGEST-MD5, CRAM-MD5
- In 1.2.2, your PQube does not support the following more difficult or unusual authentication protocols: SSL/TLS, NTLM, RPA, SPA, LDAP, SASL, GSSAPI. There may be others.

4. Improved accuracy at low voltages for 61000-4-30 Class A Certificate

The PQube's range switch for nominal voltages below 250Vrms is now fully implemented, giving you accuracy that exceeds IEC 61000-4-30 Class A requirements at all nominal voltages. Note: All PQubes have always been fully calibrated for this range switch, so no recalibration is necessary.

5. Improved and extended display

- The PQube now displays voltage and current phasors, to make it easier to connect properly.
- Meters are updated more quickly now during events.

- If you are connected on a single-phase L1-to-Neutral configuration but have L1 and N connected backwards, you will get a new warning screen on your display.
6. The PQube's Lithium-Ion battery charging algorithm is now temperature-aware, for improved battery reliability. (Below 60°C, your PQube charges its Li-Ion battery using standard voltage/current/time algorithms. At an internal temperature of 60°C, your PQube now limits itself to a 50% charging duty cycle; at 70°C, your PQube now switches to a 10% charging duty cycle.)
 7. The PQube now supports PSL's new voltage-input XCT4 modules, which are used with current transformers with built-in burden resistors, or for other types of voltage-output current sensors. Voltage-input XCT4 modules are available in $\pm 0.333V$, $\pm 1V$, $\pm 5V$, and $\pm 10V$ versions. Use the $\pm 0.333V$ version for the split-core CT's that are now offered by PSL.
 8. The PQube now fully implements the "keep most recent data" algorithm for its SD card. The PQube will delete the oldest month's file when the SD card is 75% full.
 9. The PQube's SETUP.ini file now accepts several new optional controls:
 - a) `Offset_From_UTC_In_Hours` lets you set the difference between your local time and UTC universal time, which is the time served to your PQube by SNTP servers during Ethernet time synchronization. You can set fractional hours if necessary. For example, `IST = +5.5`, not `5:30`. The range is ± 24 hours. Default=0 .
 - b) `Enable_10_Second_Frequency` lets you change the averaging period for your PQube's frequency measurements from 1 second to 10 seconds. This longer interval is not particularly useful, but it does allow your PQube comply with IEC 61000-4-30 Class A frequency measurements. Acceptable values= ON or OFF. Default value=OFF
 - c) `TDD_Available_Current_In_Amps` now lets you set the current used for TDD harmonic current calculations. (In Firmware Version 1.2, the `Max_Current_of_Interest` was used for this parameter.) Acceptable values = 0 to full scale current multiplied by CT ratio, if any. Default=AUTO, which is largest acceptable value.
 - d) `Nominal_Frequency` lets you force a nominal frequency. If you set this to AUTO, your PQube will determine the frequency. Acceptable values = 50, 60, 400, or AUTO. Default = AUTO
 - e) `SMTP_Auth_Method` lets you force an e-mail SMTP server authentication method. The acceptable values are AUTO, NONE, PLAIN, LOGIN, DIGEST-MD5, CRAM-MD5. Default = AUTO [PQube chooses authentication based on the SMTP server's response to PQube's EHLO command]
 - f) `POP_Auth_Method` lets you force an e-mail POP server authentication method. The acceptable values are AUTO, USER-PASS, PLAIN, LOGIN, DIGEST-MD5, CRAM-MD5,

APOP. Default = AUTO [PQube chooses authentication based on POP server's greeting, and/or the POP server's response to PQube's CAPA command]