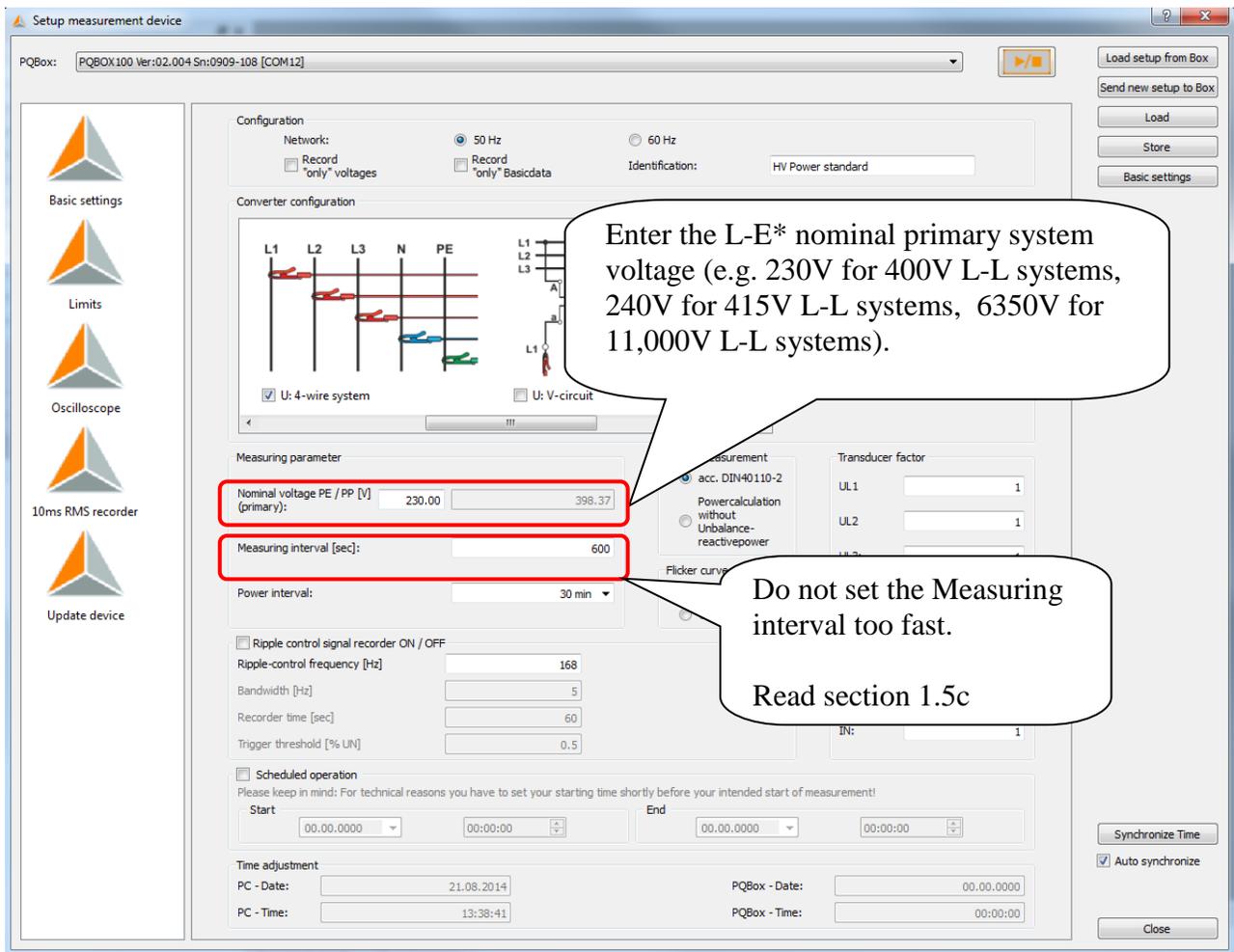


PQ-Box 150 – Quick Start Instructions

These instructions are provided for the purpose on providing a quick start to PQ-Box 150 installation and operation. Please refer to the user handbook for full details.

Please avoid these two errors:



The screenshot shows the 'Setup measurement device' window. The 'Measuring parameter' section has two fields highlighted with red boxes: 'Nominal voltage PE / PP [V] (primary):' with a value of 230.00 and 'Measuring interval [sec]:' with a value of 600. A callout box points to the first field with the text: 'Enter the L-E* nominal primary system voltage (e.g. 230V for 400V L-L systems, 240V for 415V L-L systems, 6350V for 11,000V L-L systems)'. Another callout box points to the second field with the text: 'Do not set the Measuring interval too fast.' A third callout box points to the 'Measuring interval' field with the text: 'Read section 1.5c'. The interface also shows a circuit diagram, various checkboxes, and input fields for other parameters like ripple control frequency and bandwidth.

* For three wire systems, nominal voltage is entered in the L-L field



Check the LCD before leaving site:

- 1) Are the voltages and currents showing correct primary values (i.e. correct CT & VT ratios have been set)?
- 2) Are power values correct? Check for + vs - (correct VT/CT phasing and polarity)?
- 3) Is the device recording?

This quick start describes:

Section 1) Using WinPQ mobil software and laptop to set the PQ-Box 150 parameters (preferred)

Section 2) Setting unit up using LCD display only

Section 3) Decommissioning

1 Setup of PQ-Box 150 using USB connection to PC

This guide assumes that WinPQ mobil has been correctly installed on PC, and PQ-Box 150 has compatible firmware.

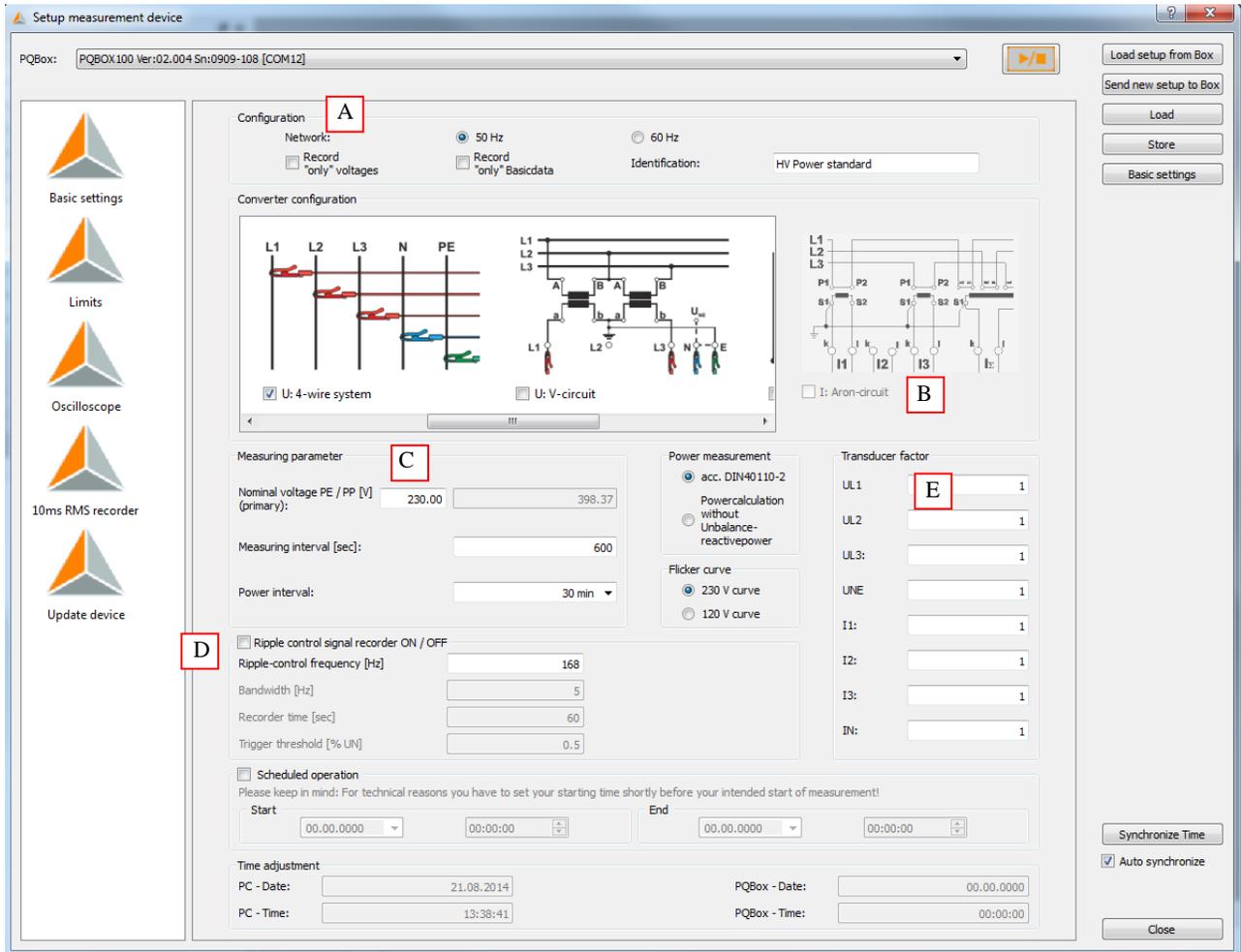
These instructions detail powering the PQ-Box 150 from external source, and using laptop to setup the PQ-Box 150 and to also display online measurements (phasor diagram) to confirm correct VT/CT connection.

- 1.1 On site connect the PQ-Box 150 external power supply to the PQ-Box 150. Connect the two black fused input leads to a suitable voltage source (100-4400 Vac or 100-300 Vdc). The supply leads do not have any polarity.

The supply leads can be connected to the measuring circuit (if voltage range is suitable).

- 1.2 The PQ-Box 150 will now boot up. Wait approx 20 seconds until the main LCD measurement screen shows before connecting USB cable to PQ-Box 150. Also ensure computer is fully booted up before connecting USB cable. *Do not rush making USB connections, otherwise connection problems may occur.* Follow the PC instructions if Windows USB drivers need to be installed.
- 1.3 Check free memory reported on the PQ-Box 150 LCD screen. For PQ-Box 150 with no data stored, approx. 3800 MB should be reported. Download data from the PQ-Box 150 or delete as required. Confirm sufficient memory will be available for intended recording period (Refer 1.5c).
- 1.4 Using the PC software, open the Setup PQ-Box 150 screen (Main menu: Data/Measurement device configuration).

Select "Load setup from Box" if you want to see and update existing PQ-Box 150 settings. Alternatively click on "Basic settings" to select default values (this will set default parameters for advanced Limit, Oscilloscope and 10ms RMS recorder)- note that the new values will need to be uploaded back to the PQ-Box 150 (i.e. "Send new setup to Box").



1.5 Enter correct settings for:

A) Configuration:

Select appropriate frequency and do not check the other two boxes. A setup text description can be entered into the Identification field (Site information can be applied when the data is downloaded from the PQ-Box).

B) Converter configuration:

Select the appropriate system type. Scroll to see more selections. Normally “U:1-wire system” for single phase monitoring and “U:4-wire system” for three phase systems (with neutral)

C) Measuring parameter:

Nominal Voltage:

The Nominal Voltage setting should be the nominal (target) **primary** system voltage. *For example 11,000 or 33,000. For single phase (1- wire) and 4-wire systems the L-N value must be entered, i.e. 6350 or 19052 respectively. For 3-wire systems the L-L value is set*

Normally you would not enter secondary VT values (63.5/110V).

If a single phase voltage is being measured (e.g. 230 Vac), set Nominal Voltage to the 230 Vac and ignore the displayed L-L value.

Measuring Interval:

*The measuring interval is the number of seconds over which permanent recording data (long term line graphs) is averaged. This setting does not influence the high speed oscilloscope or high speed RMS recorder functions. The PQ-Box 150 measures most “permanent recording” measurements each ½ cycle, and the average of each of these values is recorded at the end of each measurement interval. The maximum and minimum ½ cycle values (of voltage and current) are also recorded at the end of **each** measurement interval, therefore there is little advantage in selecting a shorter measuring interval. A shorter duration creates larger data files.*

Normally a 600 second setting is used (10 minutes) to conform with EN 50160 reporting.

HV Power recommended measuring interval:	
Monitoring duration	Measuring Cycle
Less than 12 hours	1 second*
Less than 2 days	120 seconds
Less than 1 week	600 seconds
*Flicker measurements will be recorded as zero data values if the measuring interval is set to less than 60 seconds.	

For very short tests, to obtain easy to view graphs, make sure the PQ-Box 150 records for at least 10 measuring intervals.

As a guide to the memory requirements for permanent recorded data (only):

Measuring interval	Time to generate 1 MB data (approx)	Time to generate 100 MB data (approx)
1 sec	2 minutes	3.3 hours
10 sec	20 minutes	1 day 9 hours
30 sec	60 minutes	4 days
60 sec	2 hours	8 days
300 sec (5 minutes)	24 hours	40 days
600 sec (10 minutes)	11 hours	80 days

Oscilloscope 'event' recordings each require up to approx. 2.8 Mb of memory (assuming 4000 ms of recorder time) and RMS 'event' recordings each require approx. 20 kb (assuming 3 seconds of recorder time).

D) Ripple Control Signal

Enter the frequency of the ripple control signal. The other settings only apply to PQ-Box 150's with additional Ripple Control Monitoring functionality enable, and default values should generally be used.

E) Transducer factor

Assuming VT/PT/CVTs are in circuit and the PQ-Box 150 is connected to the secondary circuits, the transducer conversion factor (knu) is the ratio of primary to secondary voltage, e.g. $33 \text{ kV} / 110 \text{ V} = 300$.

In most cases the "UNE" setting will be 1, as Neutral to Ground VT's are not normally used.

Assuming intermediate CTs are being used, the current conversion factor (kni) is the ratio of primary to secondary current, e.g. $600 \text{ A} / 5\text{A} = 120$.

Note that if

- 20/200A Switchable clamps (111.7004) are being used on 200A setting, the CT factor should be set to 10
- 5300A Rogowski clamps are being used, a correction factor of X2 must be applied to the current conversion factor.

1.6 Check the Limits, Oscilloscope, 10ms RMS recorder screens for desired setup, and then "Send new setup to box". Default "Basic settings" are fine.

1.7 Assuming PC time is correct, press "Synchronize time".

Note that reported PQ-Box 150 time on the PC Setup screen, is that of when a setting file is uploaded or downloaded, it does not otherwise update.



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1.8 Connect the PQ-Box 150 voltage leads to the measurement source using appropriate care and precautions, connect in order, the green earth lead, neutral (blue) and then the 3 red leads to the circuit to be measured. (Do not connect to measuring circuit if it is greater than 850 V L-L, 600 V L-N/E).

If neutral connection does not exist, then connect the PQ-Box 150 (blue) neutral lead to the PQ-Box 100 (green) earth lead. (or vice versa)

Confirm all voltages displayed on the PQ-Box 150 LCD are the correct primary values.

Connect the supplied clamp CT's to the "I" terminal on the PQ-Box 150 and then connect one-by-one to the measuring circuit.

Ensure the current readings on the PQ-Box 150 LCD are correct primary values. To confirm correct polarity/phasing either:

- A) Use the PC online measurement functions (Main menu Data/Online) to display "Details" tab, and confirm correct primary voltage, current and power values are being measured. Use the phasor diagram "U/I/Phase" to confirm correct direction of CT clamps etc.
- B) Use the PQ-Box 150 left/right arrow keys to toggle through the LCD screen measurements. Play close attention to +/- signs on power readings, as these can be used to identify if a CT connection is reversed.

1.9 Disconnect USB cable from PQ-Box 150.

1.10 Press the PQ-Box 150 [PLAY/STOP] button to start recording.

1.11 Check that:

Rec. = ON (top left screen icon flashes red).

The recorder elapse timer at the top of the LCD screen starts.

The LCD voltages and currents on the LCD keep refreshing every few seconds.

1.12 Use the left/right button to scroll to LCD screen showing number of events (Recorder Count). Press the Manual trigger button (camera icon) for 1 second. The "Oscilloscope Rec" and "RMS Recorder" count should increment to 1 (this may take 2-3 seconds to update). This "manual trigger" takes an oscillograph snap shot of the "as connected" condition. If the number of events increases rapidly, it is recommended to check connections and settings (especially nominal voltage setting), as a very large file size will result. You may need to download data to PC, review and upload more appropriate trigger settings.

1.13 The PQ-Box 150 front panel keys may be locked by pressing Setup key [spanner icon] for 5 seconds. Repeat to unlock.

2 Setup of PQ-Box 150 without PC

The PQ-Box 150 LCD and front panel keys can be used to alter Network Type, VT and CT ratios and Measurement Interval settings. If the other settings of the PQ-Box 150 are known to be acceptable, then the front panel controls can be used to adapt the PQ-Box 150 to a given application.

By using the LCD only, you do not have ability to view advanced trigger and limit settings as last set by PC upload. If you are not aware of the last settings, then the PQ-Box should be connected to a PC to determine these, and potentially download new or default settings if required.

- 2.1 Refer and follow instructions 1.1 to 1.3 to power up PQ-Box 150.
- 2.2 Using the setup button (spanner icon) to enter the setup menu.
- 2.3 Select “Parameterisation” by pressing the enter key.
- 2.4 Select “Measurement Cycle”. Press enter key to ‘highlight’ the value. Enter the measuring interval using the “up” and “down” keys to alter individual digits, left/right to select the digit to be changed. Select “enter” when satisfactory. Refer section 1.5c for recommended values.
- 2.5 Press the down arrow key to select the next line. If required adjust “Net type” to match the connection type [‘1 conductor’ = single phase, ‘4 conductor’ = three phase 4 wire, ‘3 conductors’ = three phase 3 wire (e.g. Delta)] by pressing enter, then up/down keys, and enter to select.
- 2.6 Press the down arrow to select the next line “Nominal Voltage PE” (‘Nominal Voltage PP’ will be skipped. Adjust if needed, using enter to select, left/right arrow to select digit, up/down to alter selected digit. Press enter when satisfactory. Note if Net type is 3-wire or delta etc, then Nominal Voltage PP value is set and PE value is skipped.
- 2.7 Press the down arrow to select the next line “Voltage Converter L”. Adjust using enter/up/down/left/right keys as required. The transducer conversion factor (knu) is the ratio of primary to secondary voltage, e.g. $33 \text{ kV} / 110 \text{ V} = 300$. Set the Line voltage ratio, and then select “OK”.

In most cases the “Voltage Converter N” setting will be 1, as Neutral to Ground VT's are not normally used.

- 2.8 The “Current Converter L” setting can be accessed and adjust in similar fashion. The conversion factor (kni) is the ratio of primary to secondary current, e.g. $600 \text{ A} / 5\text{A} = 120$. Set the ratio, and then select “OK”.

Select “Current Converter N”. The conversion factor (kni) is the ratio of primary to secondary current, e.g. $600 \text{ A} / 5\text{A} = 120$. Set the ratio, and then select “OK”.



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2.9 Select “setup” (spanner key) to return to the main menu.

2.10 Connecting the instrument to live source following instructions 1.8 to 1.13

3 Decommissioning

3.1 Press the Manual trigger button (camera icon) for 1 second to trigger an Oscillograph snapshot of the end of recording condition. Wait approx. 60 seconds before next step. *[If it is critical that the last event must be retained, then access the recorder count screen (right arrow button from main screen) and wait till the x/x count for each line is equal. That is Oscilloscope Rec = 4/5 informs that 5 events have been captured, but only 4 have yet been transferred to permanent memory - wait a minute for the count to show 5/5, then stop recording]*

3.2 Press the [START / STOP] key to stop recording.

3.3 Wait and check that : a) Rec. = OFF (Top left icon stops flashing red).

Do not immediately disconnect supply power, as the PQ-Box 150 should be left on till the “closing measurement” screen disappears.

3.4 Disconnect the PQ-Box 100 voltage leads from the measuring source.

3.5 Disconnect the PQ-Box 100 CT clamps from measuring circuit.

3.6 Disconnect the CT clamps from the PQ-Box 100 connector.

3.7 Disconnect the PQ-Box 100 supply leads.

3.8 Connect laptop and download data if required. Do not delete data from PQ-Box 100, till downloaded data has first been opened with WinPQ mobil software and verified.

Powering the PQ-Box 150.

Unlike the PQ-Box 100, the PQ-Box 150 cannot be powered via the USB to change settings or download data. The PQ-Box 150 must be powered to operate, change settings or download data.

Powering via the AUX Supply:

Connect the external power supply to the PQ-Box 150 for it to automatically start up.

To turn off the PQ-Box 150, stop any recording and the PQ-Box 150 will shut down approximately 10 seconds after external power source is removed.

If the PQ-Box 150 is recording and the AUX power source is removed, the PQ-Box 150 will continue to operate on internal battery (approx. 6 hours capacity). Full functionality is still provided in this mode (e.g. online measurements and USB connection remain). If the recording is stopped while operating on battery, the device will shut down after approx. 10 seconds.

Continuous mode (Battery Operation):

Via front panel keypad, the PQ-Box 150 Operating Mode “Setup/Setup/Continuous mode” can be changed from default “off” to “active”. This stops the PQ-Box 150 from automatically shutting down if not recording while running on battery. This essentially allows the PQ-Box 150 to be used like a multimeter, or record when AUX supply is not available.

To shut the PQ-Box 150 down when in this mode (‘active’), you must stop the PQ-Box 150 from recording (to allow access to the Setup menu), remove AUX supply and via Setup menu change the ‘Continuous mode’ back to ‘off’.

1. **Spanner** – to enter Setup menu
2. **Down arrow** – to highlight second level Setup menu
3. **Enter** – to enter second level Setup menu
4. **3 x down arrow** – to highlight Continuous mode menu
5. **Enter** – ‘active’ setting now shown in yellow
6. **Up arrow** – change setting from ‘active’ to ‘off’
7. **Enter** - to confirm change

The ‘Continuous mode’ control is only available via the front panel controls. It is not accessible/settable via WinPQ mobil software.

Start up without Aux Supply:

Unique to the PQ-Box 150 is the ability to start up the PQ-Box via battery. Hold the Start/Stop key for 15 seconds and the PQ-Box 150 will power up. This method automatically sets ‘Continuous mode = active’ (refer above).