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APPLICATION NOTE - 013

Single Phase AC-DC Efficiency Measurements with the Newtons4th PPA1520 Power Analyzer

In light of industry demand for single phase power efficiency testing of AC – DC power supplies, Newtons4th have released new firmware that supports this application. The instrument is configured so that PH1 will monitor the power incoming from the mains supply (e.g. 230V @ 50Hz) and PH2 will monitor the DC output (e.g. 12V) Computation is then performed inside the instrument to display the efficiency of PH2/PH1, i.e. the total efficiency of the Power Supply, this can be output to data logging software if desired.

This application note will take you through the setup process and illustrate how simple the PPA1520 Power Analyzer is to setup and take accurate efficiency measurements.

Setup Process

To begin we will check the firmware revision of the unit to ensure the unit is ready,

Press [SYS +/-] then [◀]

This will take you to the instrument information screen below

```
                    PPA1520

serial number        00214
manufacturing code  KQ4610
main release         2.16
DSP release          2.16
FPGA release         2.06
boot release         2.01
phase 1              00043
last calibration     10 MAR 2011 1554 AMW
phase 2              00044
last calibration     10 MAR 2011 1554 AMW



                  return >
```
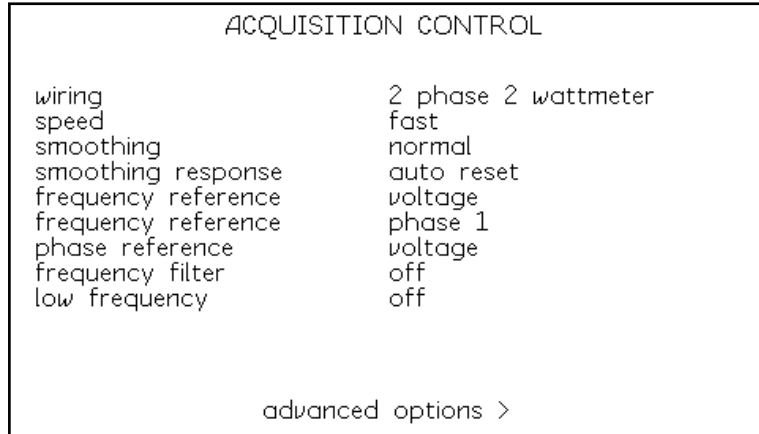
![N4L logo]

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Here we can see a main release of 2.16 and FPGA release of 2.06, this firmware level includes the efficiency functions required for the single phase AC – DC measurements. If you have an earlier firmware revision, please visit the support section on the Newtons4th website which provides free firmware upgrade files.

Now we press [ACQU 1]

Here you need to set up the following

Wiring: 2 Phase 2 Wattmeter

```
                  ACQUISITION CONTROL

   wiring                  2 phase 2 wattmeter
   speed                   fast
   smoothing               normal
   smoothing response      auto reset
   frequency reference     voltage
   frequency reference     phase 1
   phase reference         voltage
   frequency filter        off
   low frequency           off




                  advanced options >
```
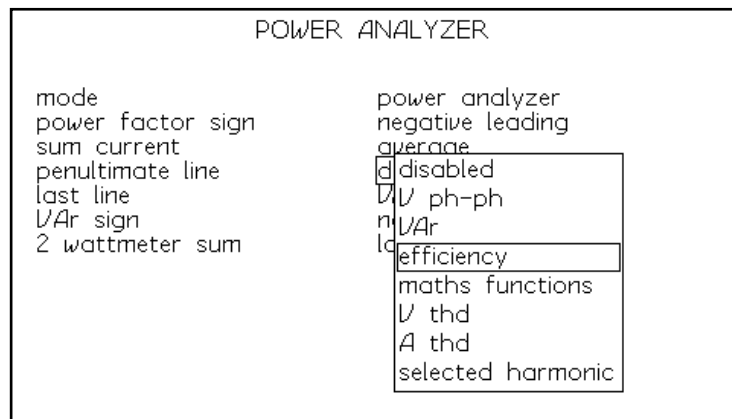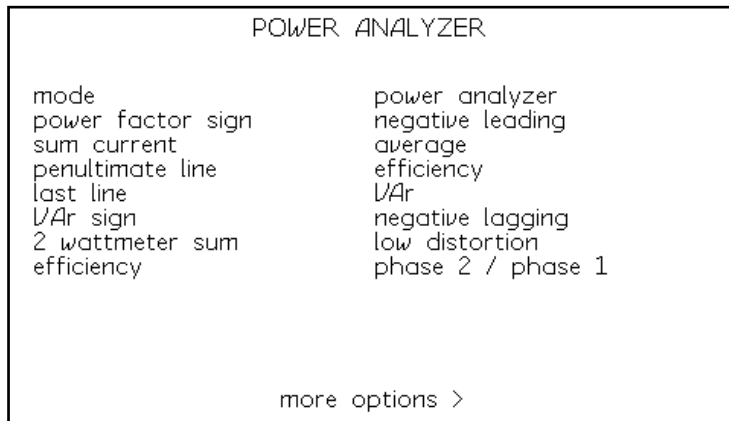
Now Press: [MODE 0]

Here you need to set the following

Penultimate Line: Efficiency

Efficiency: Phase 2 / Phase 1 (I.e. DC Output Phase 2 / AC Mains Phase 1)

```
                  POWER ANALYZER

   mode                power analyzer
   power factor sign   negative leading
   sum current         average
   penultimate line    │disabled
   last line           │V ph-ph
   VAr sign            │VAr
   2 wattmeter sum     │efficiency
                       │maths functions
                       │V thd
                       │A thd
                       │selected harmonic
```

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```
              POWER ANALYZER

  mode                    power analyzer
  power factor sign       negative leading
  sum current             average
  penultimate line        efficiency
  last line               VAr
  VAr sign                negative lagging
  2 wattmeter sum         low distortion
  efficiency              phase 2 / phase 1


                 more options >
```

The instrument is now set up to perform efficiency measurements on the power supply. In the below picture the instrument was connected up to a 5V 50W DC power supply, the power supply was loaded with only 3.2 Watts which is outside the operating parameters of the power supply. This results in an efficiency of around 40%, which illustrates the need for correct power supply selection to suit the load as 40% would be unacceptable to a consumer.

```
                   POWER ANALYZER

              phase 1      phase 2      SUM
  watts       7.7515       3.2425       10.994      W
  VA          14.843       3.2426       16.782      VA
  pf          0.5223       1.0000       0.6551
  Vrms        239.15       5.6917       244.84      V
  Arms        62.065m      569.70m      315.88m     Arms
  frequency          50.091Hz
  efficiency  41.83%       -0.000%
  VAr         12.658       21.351m      12.679      VAr
```

Please find more information on the Newtons4th Power Analyzer Range on our website
http://www.newtons4th.com/products/power-analyzers

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Newtons4th Ltd