WT210 WT230

POWER ANALYZERS

Product Tutorial

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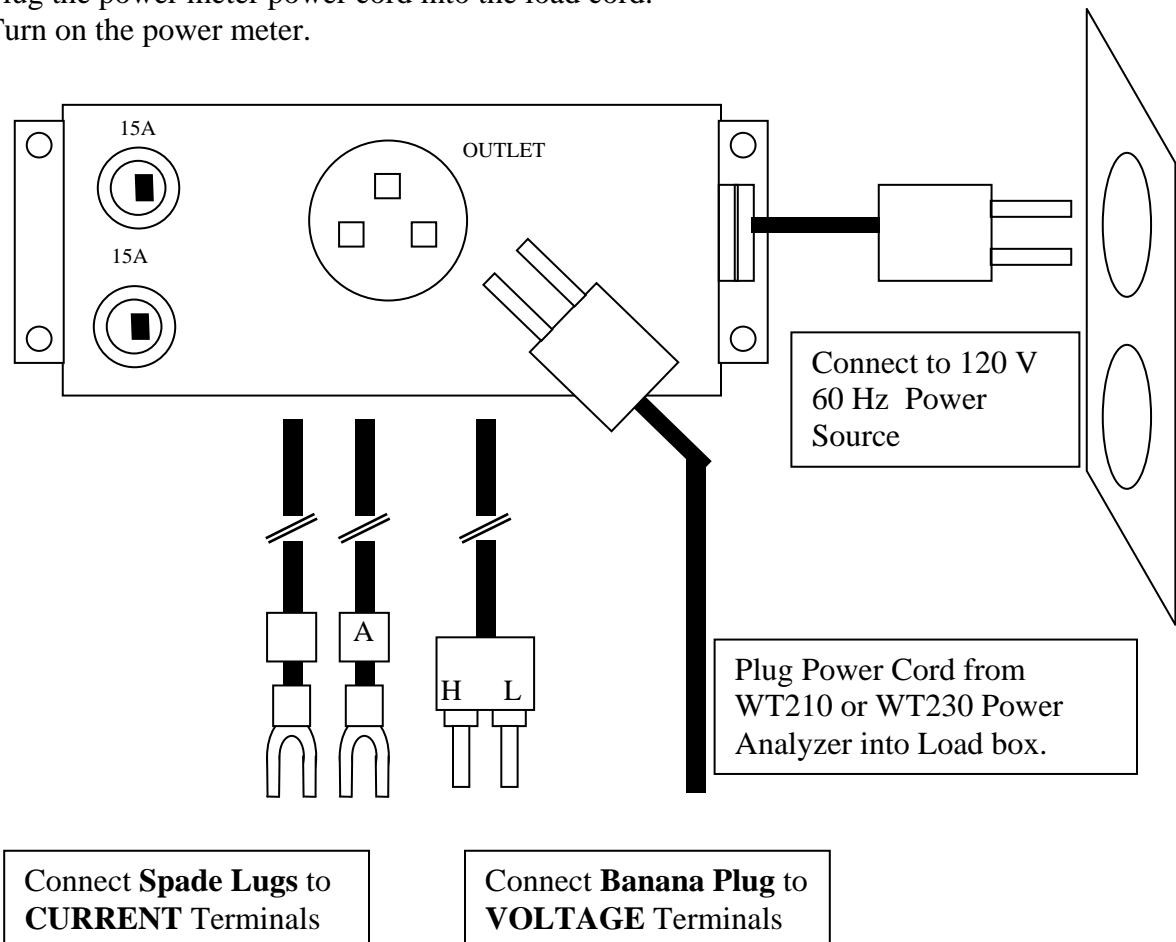
WT210 & WT230 Product Tutorial

A.) OVERVIEW & OBJECTIVES

The following is a basic demo procedure for the WT210 and WT230 Power Analyzers. This demo uses the power meter's own power supply for the load. This demo can easily be done in a conference room or lab without having to hook up to the customer's load.

B.) POWER METER CONNECTION
  Measuring consumption power of the WT210 or WT230 Power analyzer
1. Connect the Power Meter using the load cord. Plug the **Banana** plugs into the **Voltage** input terminals of Element # 1. Connect the **Spade** lugs to the **Current** terminals of element # 1. Make sure all connections are tight.
2. Plug the power meter power cord into the load cord.
3. Turn on the power meter.

15A

OUTLET

15A

A

H   L

Connect to 120 V
60 Hz Power
Source

Plug Power Cord from
WT210 or WT230 Power
Analyzer into Load box.

Connect **Spade Lugs** to
CURRENT Terminals

Connect **Banana Plug** to
VOLTAGE Terminals

QUALITY ▪ INNOVATION ▪ FORESIGHT

C.) BASIC SETUP FOR POWER MEASUREMENT

SETTING RANGES
1. **Press <VOLTAGE> RANGE** Button.
2. **Press** UP or DOWN Arrow Key to display the Voltage Ranges of 15/30/60/150/300/600/Auto. Display the desired Range and **Press <ENTER>.**
3. **Press <CURRENT> RANGE** Button.
4. **Press** UP or DOWN Arrow Key to display the Current Ranges. WT210 Ranges:5/10/20/50/100/200 mA, 0.5/1/2/5/10/20 A , Auto. Display the desired Range and **Press <ENTER>.**   If the unit has External Current Sensor Option, these ranges will be displayed as E 2.5/E 5/E 10 V (EX1 Option), or E 50/E 100/E 200 mV (EX2 Option).
5. Setting **VOLTAGE MODE. Press <SHIFT> <VOLTAGE>** (*MODE*). Mode will change from RMS to VOLTAGE MEAN, and will be indicated by the Green LED under the MODE Display at the top. **Press <SHIFT> <VOLTAGE>** (*MODE*) again. Mode will change from VOLTAGE MEAN to DC. **Press <SHIFT> <VOLTAGE>** (*MODE*) again and MODE will change back to RMS.
6. Note that the Current Mode is either RMS or DC.
7. CHECK RANGE: This is a new function added to the WT210 and WT230. If the Red LED is ON for VOLTAGE and/or CURRENT, it is an indication that the range is set either too high or too low. Check and adjust the range so the LED is OFF.

WIRING (WT230 Only)
1. **Press <WIRING>** Button.
2. Wiring configuration will change from **1P3W** to **3P3W**. The Green LED indicates wiring configuration selection. Each Time the Wiring button is pressed , it will advance to the next configuration.
3. For measurement of a Single-Phase Two-Wire circuit, selecting any of the Wiring methods will result in correct measurements. The ELEMENT function Σ does not have any meaning in Single-Phase Two-Wire measurements.

SETTING DISPLAY ITEMS
1. **Press <FUNCTION>** Button next to the display to change the display item.
2. On WT230, also **Press <ELEMENT>** Button to display selected Display Item on Element 1, 2, 3, or Σ. Σ for Voltage or Current will be the Mathematical Average of the two or three elements as determined from the Wiring selection. Σ for Watts will be the Total Power.
3. **Press <SETUP>.** Press DOWN Arrow key to display **rESo** (Resolution). **Press <ENTER>.** Press DOWN Arrow key to select **Hi** (5 Digits) or **Lo** (4 Digits). Select desired resolution and **Press <ENTER>.**

SETTING FILTERS
1. The WT210 and WT230 now have a LINE Filter (Low-Pass Filter) and a FREQUENCY Filter. The LINE Filter is selectable to 500 Hz or Off. This Low-Pass filter will filter all the measurement functions. The Frequency Filter is set to 500 Hz or Off and is used to measure the fundamental frequency WITHOUT filtering the measurements.
2. <u>LINE FILTER</u>: **Press <SETUP>** Button. Press the UP or DOWN Arrow keys to display **L.FiLt** (Line Filter). **Press <ENTER>.**
3. **Press** DOWN Arrow key to display **on. Press <ENTER>.**
4. The Green LED for LINE FILTER will be ON.
5. <u>FREQUENCY FILTER</u>: **Press <SETUP>** Button. Press UP Arrow key to display **F.FiLt** (Frequency Filter). **Press <ENTER>.**
6. **Press** Down Arrow key to display **on. Press <ENTER>.**
7. The Green LED for FREQ FILTER will be ON.

SETTING UPDATE RATE
1. **Press <SETUP>** Button. Press UP or DOWN Arrow key to display **u.rAtE** (Update Rate.). **Press <ENTER>.**
2. Press UP Arrow key to display Update Rates of 0.1/0.25/0.5/1/2/5 Sec. Display the desired Update Rate and **Press <ENTER>.**

SETTING AVERAGING
1. **Press <SETUP>** Button. Press UP or DOWN Arrow key to display **AVG. Press <ENTER>.**
2. **Press DOWN** Arrow key to display **tyPE. Press <ENTER>.**
3. **Press DOWN** Arrow key to select Linear, **Lin**, or Exponential, **EP. Press <ENTER>.**
4. **Press UP** Arrow key to display Averaging Count of 8/16/32/64. Display the desired Averaging Count and **Press <ENTER>.**
5. **Press <SETUP>** again and **Press <ENTER>. Press UP** Arrow key to display **on. Press <ENTER>.**
6. The Green LED for AVG will be ON.

CAL
1. This function is used to create a Zero Input condition using the internal circuit of the instrument. Zero Level Compensation must be performed to meet the specifications of the instrument. This is done automatically after changing Range.
2. **Press <SHIFT> <ENTER> (*CAL*).** This performs a Manual Zero Level. This should be done after the instrument has warmed up for at least 30 minutes, OR if the Measurement MODE, RANGE, or FILTERS are not changed over a long period of time.

SETTING SCALING

1. **Press <SETUP>** Button. Press UP or DOWN Arrow key to display **SCALE. Press <ENTER>.**
2. **Press DOWN** Arrow key to display **dAtA. Press <ENTER>.** On the WT230 you can set different Scaling Data for each element, or the same Scale Data for ALL the elements in one easy step.
3. Display **ALL** and **Press <ENTER>** to set the same Scaling for ALL the Elements. To set different Scaling Data for each element, **Press UP** Arrow to select **EL 1, EL 2,** and **EL 3. Press <ENTER>.**
4. **P** = PT Ratio. **C** = CT Ratio. **F** = Power Scale Factor. Use this to convert Watts to some other Power Unit, such as KW to Horsepower; F = 1.341
5. PT and CT Scale Data are always set as a ratio to one (1). Example a 2400:120 PT would be set as 20. A 500:5 CT would be set as 100.
6. With **"1"** blinking in display A, **Press UP** Arrow to display **"2"**. **Press <SHIFT> UP** Arrow, (Decimal Point) once to move one place to the right. **Press <ENTER>.** Display should be set to 20.00.
7. With **"1"** blinking in display B, **Press <SHIFT> UP** Arrow, (Decimal Point) twice to move two places to the right. **Press <ENTER>.** Display should be set to 100.
8. Leave **F = 1.000. Press <ENTER>.**
9. Once the Scaling Data is set, you must turn **SCALING ON. Press <SETUP>** Button. Press UP or DOWN Arrow key to display **SCALE. Press <ENTER>.**
10. **Press UP** Arrow to display **on. Press <ENTER>.**
11. Green SCALING LED will be ON.

KEY LOCK

1. A new Key Lock feature has been added to the WT210 and WT230.
2. **Press <SHIFT> <LOCAL> (*KEY LOCK*).**
3. Key Lock LED will be ON. All front panel keys will now be locked out.
4. To disable, **Press <SHIFT> <LOCAL> (*KEY LOCK*).** Key Lock LED will be OFF.

D.) INRUSH MEASUREMENTS

1. **1. Press** Display **FUNCTION** Button to set Display A to **V**, Display B to **A**, and Display C to **P   A** (Peak Amps).
2. **Press <SHIFT> <CURRENT> (*MAX HOLD*).** *MAX HOLD* LED will be ON.
3. With *MAX HOLD* ON, the maximum of all measured values, both RMS and Peak, will be held. You can press the **FUNCTION** button for each display to scroll through all the measured items.
4. With *MAX HOLD* OFF, measured RMS and Peak values will be displayed for each display update.

E.) HARMONIC MEASUREMENTS

HARMONIC SETUP
1. **Press <SHIFT> <START> (*HARMONICS*) Button.**
2. **Press DOWN** Arrow key to display **SYnC. Press <ENTER>.** This selects the PLL (Phase Lock Loop) source. For a Power Supply application, select a Voltage source. For a Variable Speed Motor Drive application, select a Current source. For this demo, select **V1**, and **Press <ENTER>.**
3. **Press <SHIFT> <START> (*HARMONICS*) Button.**
4. **Press DOWN** Arrow key to display **tHd. Press <ENTER>. Press DOWN** Arrow key to display **CSA**, or **iEC** method. **Press <ENTER>.**
5. **Press <SHIFT> <START> (*HARMONICS*) Button.**
6. **Press DOWN** Arrow key to display **on. Press <ENTER>.**

HARMONIC DISPLAY FUNCTIONS
1. Display A will always show the Harmonic Order, **or. 01** is the Fundamental. **Press** UP or DOWN Arrow key to change the Order Number.
2. Display B will always show the RMS Value of the displayed measurement item for the displayed Harmonic Order.
3. **Press** Display B **Function** key to display "**t _ _ _ _   V %**" This is the Total Harmonic Distortion, THD, for Voltage.
4. **Press** Display B **FUNCTION** key again to display "**t _ _ _ _   A%**" This is Current THD. If you selected "**iEC**" method, it is possible for the current THD to exceed 100%.
5. **Press** Display B **FUNCTION** key again to display "** V %**". This is the Voltage Percent of Fundamental. If Order is set to "**or. 01**", display B will show "**- - - - - -**". **Press** UP Arrow key to select second order or higher.
6. **Press** Display B **FUNCTION** key again to display "** A %**". This is Current Percent of Fundamental.
7. **Press** Display C **FUNCTION** key to display "** V Hz**". This is the PLL Source Frequency, or the Fundamental Frequency. **Press FUNCTION** key again to display "**AHz**". Display should be blank since you selected Voltage 1 as the PLL Source.
8. Turn HARMONICS function **OFF.**

F.) INTEGRATOR FUNCTIONS

INTEGRATOR MODES & MEASUREMENT FUNCTIONS

1. Press **<SHIFT>** then **<RESET>** *(INTEG SET)* Buttons. **"node"** (mode) should be flashing. **Press <ENTER>.**
2. The WT210 and WT230 have only two Integrator Operation Modes. Other WT Series Power Analyzers have four modes.
   - **nor, Normal:** This is the Default Mode and the simplest and easiest to demonstrate. In this mode Integration starts when the **START** button is pressed, and continues until the integration time reaches the maximum, or when the **STOP** button is pressed. If the Timer is set, the integration will stop at the preset time.
   - **Cont, Continuous:** Integration starts when the **START** button is pressed. When the timer-preset time is reached, the integrated value and integration time are reset automatically and restarted immediately.
3. The following is a definition of the Integrator Measurement Functions:
   - **Wh: Total** Watt-Hours for the Element selected or Three Phase total when Σ is selected by Display C Element key.
   - **Wh+/-: Positive** Watt-Hours.
   - **-Wp+/-: Negative** Watt-Hours. In an AC Circuit, this is the Reactive Power component. In a DC Circuit this is the Reverse Power Flow.
   - **Ah: Total** Amp-Hours for the Element selected or Three Phase total when Σ is selected by Display C Element key.
   - **Ah+/-: Positive** Amp-Hours. This is the Positive Flow of Current, AC or DC.
   - **-Ah+/-: Negative** Amp-Hours. This is the Total Negative Flow of Current, AC or DC

   Normal Mode Integration
   1. The following is a simple demo of the Integration Function using the **Normal** Integration Mode.
   2. **Press <SETUP>.** Press DOWN Arrow key to display **"PnLrSt"** Panel Reset. **Press <ENTER>.** Integrator will not work with Averaging ON or Harmonics ON.
   3. Set the display function to **Wh** or **Ah** on Display C.
   4. **Press <START>** key (integration start). Let the integrator run and note the increasing value of Wh or Ah.
   5. **Press <FUNCTION>** key on Display A until **TIME** is displayed. This is the Integrator Time in Hours:Minutes:Seconds.
   6. **Press <STOP>** key (integration stop or pause).
   7. The **STOP** Function is like a Pause. You can **Press <START>** again and the integrator will continue.

8. **Press <STOP>** and **<RESET>**. This operation Resets the Integrator Timer to Zero and is **_REQUIRED_** to fully **STOP** the Integration function.
9. *NOTE:* During Integration, you CANNOT change the Voltage or Current input ranges, or other functions like filters. The front panel will be locked out during integration.

G.) AVERAGE ACTIVE POWER

1. **Press <SETUP>** key and DOWN Arrow key to display $\overline{n}$ **AtH (MATH). Press <ENTER>** key.
2. Set the MATH function to **AV $\underline{u}$ 1** and **Press <ENTER>** key. For the WT230 you can select **AV $\underline{u}$ 1, AV $\underline{u}$ 2,** or **AV $\underline{u}$ 3**. That is the Average Active Power for Element 1, 2 or 3.
3. **Press** Display C **FUNCTION** key to display **"$\overline{n}$ W". $\overline{n}$**   indicates the Math function. This will be the Average Active Power reading.
4. Start the INTEGRATION Mode.
5. Display wattage (W) on Display B. This is the Active Power, and will show fluctuations from one reading to the next.
6. To end this measurement **Press** INTEGRATOR **<STOP> <RESET>. FACTOR**

H.) CREST FACTOR SETUP
1. WT210's and WT230's with Firmware Version 1.11 or higher have a Setup function for selecting Full Scale Crest Factor of 3 or 6.
2. **Press <SETUP>** key and DOWN Arrow key to display **CF. Press <ENTER>** key.
3. **Press** DOWN Arrow key to display **3** or **6. Press <ENTER>** key.

RANGE SELECTION					
CF3 Setting			CF6 Setting		
V Range	I Range	EXT Range	V Range	I Range	EXT Range
Auto	Auto	10V / 200mV	Auto	Auto	5V / 100mV
600	20	5V / 100mV	300	10	2.5V / 50mV
300	10	2.5V / 50mV	150	5	1.25V / 25mV
150	5		60	2	
60	2		30	1	
30	1		15	0.5	
15	0.5		7.5	0.25	