WT1800

PRECISION POWER ANALYZER

Product Tutorial

WT1800 PRODUCT TUTORIAL

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WT1800 POWER ANALYZER PRODUCT TUTORIAL

A.) OVERVIEW & OBJECTIVES

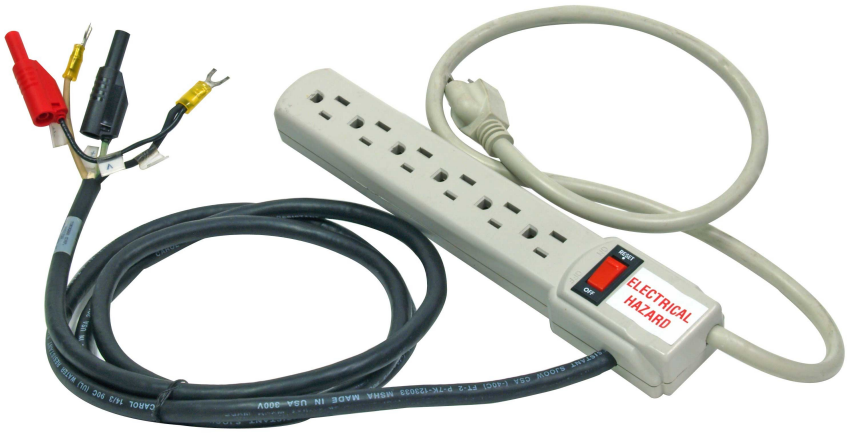
The following is a basic demo procedure for the WT1800 Power Analyzer. This demo uses the power meter's own power supply for the load. The demo can easily be done in a conference room or lab without having to hook up to the customer's load.

B.) POWER METER CONNECTION

Measuring consumption power of the WT1800 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. Plug in the load cord.
3. Turn on the power meter.

Connect to 120 V 60 Hz Power Source



Plug Power Cord from WT1800 Power Analyzer into Load Cord.

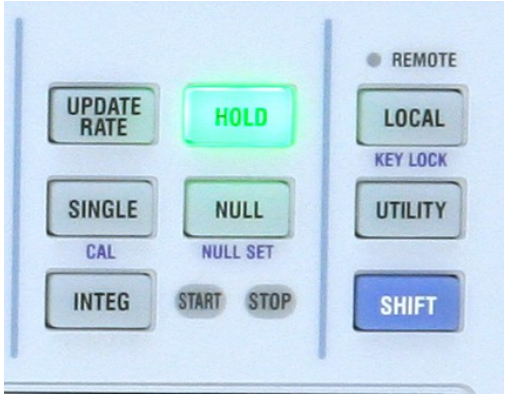
Plug the **Banana** plugs into the **Voltage** input terminals.
Connect the **Spade** lugs to the **Current** terminals.

Connect **Spade Lugs** to **CURRENT** Terminals

Connect **Banana Plug** to **VOLTAGE** Terminals

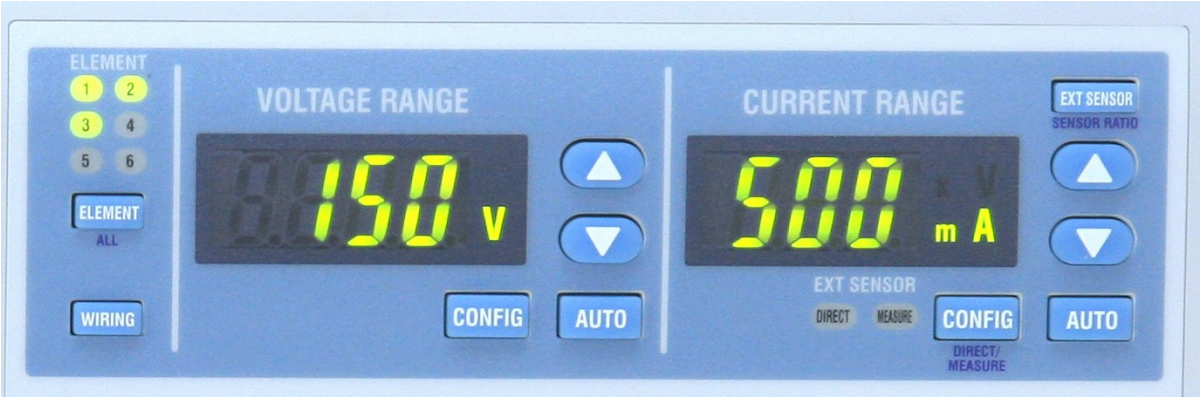
C.) BASIC SETUP FOR POWER MEASUREMENT

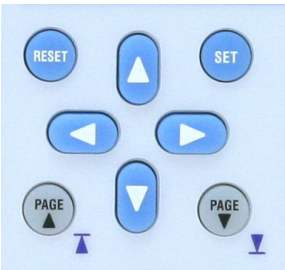
INITIALIZE SETTINGS (Manual Chapter 20.2)



1. Before you start your demo, you may want to Initialize the settings to make sure it was not left in an unknown mode or some functions left on that may interfere with your demo.
2. **Press [UTILITY]** button.
3. **Press Initialize Settings** Soft Key.
4. **Press** Left Arrow Key to select **OK.**
5. **Press [SET]** button.

SETTING WIRING (Manual Chapter 1)

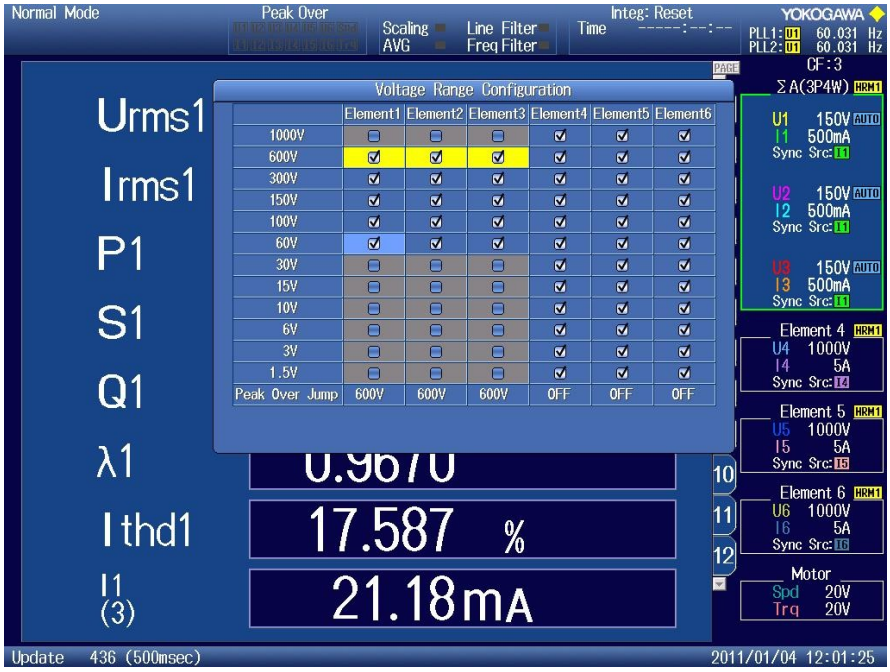




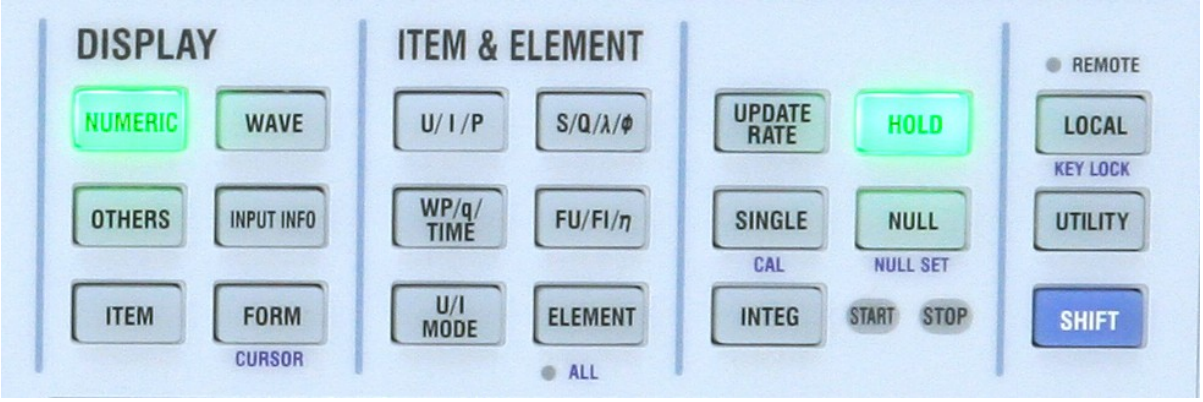
1. **Press** the **[WIRING]** button. **Press** the **Wiring** Soft Key
2. **Press Left/Right** arrow keys to highlight Element 1.
3. **Press** the Blue **[SET]** button. **Press** the Blue Down Arrow key to highlight **3P4W**.
4. **Press** the Blue **[SET]** button to select the **3P4W**-wiring configuration. Element lights 1,2 & 3 will turn ON.
5. **Press [ESC]** button to clear the menu.
6. **NOTE** for this Demo we will use the **3P4W** wiring even though we are only using single phase on Element #1. This will allow you to demo some of the other functions later on in the demo.

SETTING RANGES **(Manual Chapter 1)**

- **Press** Voltage Up/Down arrow key to select Voltage ranges of 15/30/60/100/150/300/600/1000 Volts. For this demo set Voltage Range to **150 V**.
- **Press** Current Up/Down arrow key to select Current ranges of 10/20/50/100/200/500mA/1/2/5 Amps for Elements 1, 2 and 3. For this demo use **500 mA** or **1 A** range.
- **External Current Sensor Range Setting: Press [EXT SENSOR]** button.
- **Press** Current Up/Down arrow key to select Sensor ranges of 50/100/200/mV 1/2/5/10 Volts.
- **Sensor Scaling: Press [SHIFT] [EXT SENSOR]** button, **Sensor Ratio.**
- Use the Cursor Arrow keys to set the numeric scaling factor in mV/A. Press **[EXT SENSOR]** button to exit back to Current Range settings.
- The WT1800 offers a new **Auto Range** feature to improve speed of range change.
- **Press [CONFIG]** button for either Voltage or Current. **Press** the Up/Down Arrow keys to select the Upper Limit of the Auto Range search. **Press [SET]** button.
- **Press** the Up/Down Arrow keys to select the Lower Limit of the Auto Range search. **Press [SET]** button. **Press [ESC]** button to exit the menu.
- **Press [AUTO]** button for Auto Range.



SETTING NUMERIC DISPLAY ITEMS **(Manual Chapter 6)**



- **Press [NUMERIC]** display button. The default is 4 numeric items. Continue Pressing **[NUMERIC]** will change from 4 items, to 8, to 16 etc.
- **Press [FORM]** button. This is another way to select the number of Numeric Items to be displayed. **Press** the **Soft Keys** to choose **4 items; 8 items; 16 items** etc.
- For this demo start by setting Numeric Form to **8 items. Press [ESC]** to clear Numeric Form menu.
- There are two ways to select the Numeric Display items.
- Using the **ITEM & ELEMENT** quick select function keys.
- Select From the **[ITEM]** menu.
- **Press** the **UP Arrow** button to highlight measurement item **Urms1**.
- **Press [U/I/P]** button to see how the measurement item is changed. Try the other Item Function keys and the **[ELEMENT]** key.
- **Press [U/I MODE]** button. This changes the Mode from RMS to Mean (mn), DC (dc), Real Mean (rmn) and AC (ac).
- **Press [ITEM]** button. First **Press Item No.** Soft Key. Use the Cursor Arrow keys to highlight the Item Number to be changed.
- **Press Function** Soft Key to display the complete Item List. Use the Cursor Arrow keys to highlight the measurement item. **Press [SET]** to select the item.
- **Press [ESC]** to clear menu.

SETTING CREST FACTOR **(Manual Chapter 1)**

- **Press [UTILITY]** button.
- **Press System Config** Soft Key. Select **CF3** or **CF6** with bottom Soft Key.
- **NOTE:** When selecting **CF6**, the Voltage and Current Ranges are one-half the standard ranges at **CF3.**

SETTING UPDATE RATE **(Manual Chapter 1)**

- **Press [UPDATE RATE]** button.
- **Press** Soft Keys to change Update Rate from 50 msec to 20 sec.
- **Press** the **Fast** Soft Key for a faster Update as displayed.
- **Press** the **Slow** Soft Key for a slower Update as displayed.
- **Press** the **Current Rate** Soft Key and with the Up/Down Arrow keys select the Update from the menu. Highlight the Value then **Press [SET].**

PAGE FUNCTION **(Manual Chapter 6)**

- **Press [PAGE Down]** key to select twelve pages of different Display configurations.
- Note the Default Display for the 3P 4W Wiring Configuration.
- Use the DISPLAY ITEM & ELEMENT keys to set up the display items for each page if you want something different than the default settings.

SETTING WAVE DISPLAY **(Manual Chapter 9)**

- **Press [WAVE]** display button.
- **Press [ITEM]** display button. **Press ALL OFF** Soft Key. Use Up/Down Arrow keys to select the waveform for display. Highlight the Waveform Number and **Press [SET].** The waveforms will be displayed for the checked items.
- For this demo select **U1** and **I1** for display.
- **Press [ESC]** key to clear menu.
- **Press [FORM]** display button. This lets you configure various waveform display functions using the menu and Soft Keys.
- **Format:** Single; Dual; Triad; Quad; Hexa
- **Time/div:** Use Up/Down Arrow keys to change time.
- **Trigger Settings:** Auto/Normal; Source; Slope; Level
- **Display Settings:** Interpolate; Graticule; Scale Value; Wave Label.
- **Wave Mapping:** Auto; Fixed; User
- **Press [ESC]** key to clear the menu.
- **NOTE:** There are some restrictions on Time/Div setting and Update Rate. This is all automatic.

SETTING OTHER TYPE OF DISPLAYS

- **Press [OTHER]** display button.
- Using the **Others Menu** and Soft Keys you can select various display configurations.

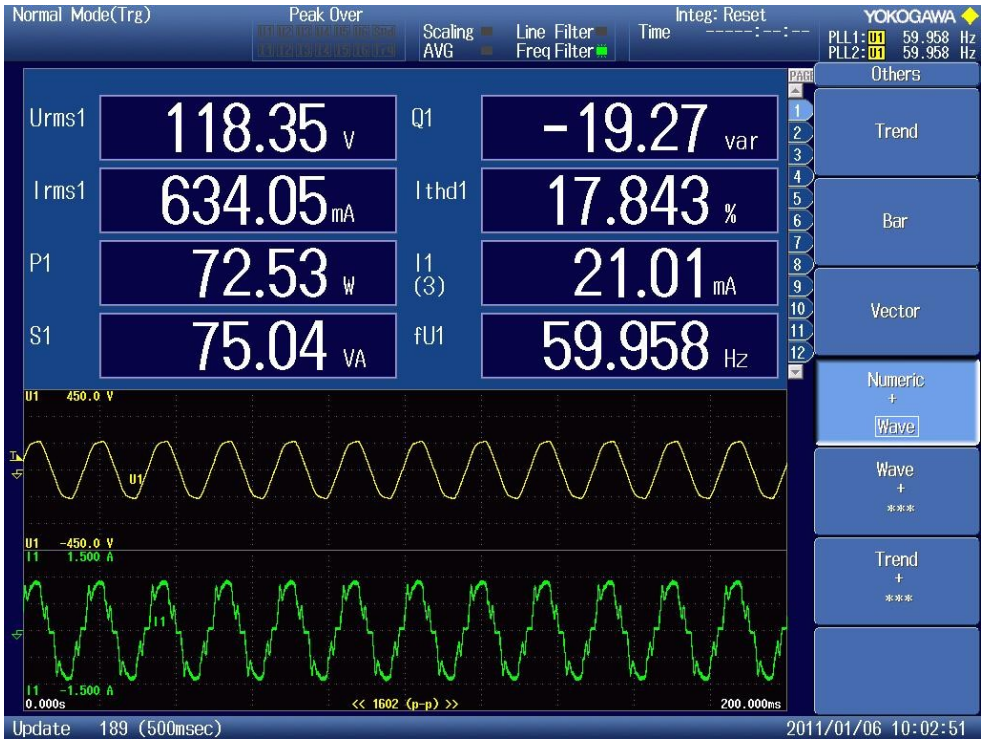
TREND DISPLAY: **(Manual Chapter 10)**

- **Press [OTHER]** display button, and **Trend** Soft Key.
- **Press [FORM]** button. Use the Soft Keys to select Form as **Single, Dual, Triad,** or **Quad.** Select Dual or Triad for this demo. Use Soft Key to select Time/Div. For this Demo set at 10 Sec.
- **Press [ITEM]** button. With the Arrow key, highlight T1 and **Press [SET].** Set up the menu as shown below to Trend Volts, Amps & Watts.

- **Press [ESC]** to clear menu and go back to Trend Display.

SPLIT DISPLAYS **(Manual Chapter 13)**

- **Press [OTHER]** button.
- **Press** the Soft Keys to select the different Split Screen Displays.
- **Pressing [ITEM]** in Split Screen mode will select the setup menu for top display function, such as Numeric.
- **Pressing [FORM]** button in split Screen mode will select the Form setup menu for the top display. You can select the number of items for the top display group.
- **Press [ESC]** to clear menu.



DISPLAY ON/OFF **(Manual Section ?)**

- This new function has been added to the WT1800. **Press [UTILITY]** button. **Press System Config** Soft Key, then **LCD** Soft Key. **Press LCD Turn OFF** Soft Key. **Press *ANY*** button on the front panel turn the LCD back ON.
- LCD **Auto OFF** is also available. **Press Auto OFF** Soft Key to select **OFF/ON.** Set **Auto OFF Time** from **1 min** to **60 min.**
- **Press [ESC]** to clear menus.

D.) HARMONIC MEASUREMENTS (Manual, Chapter 2)

- Harmonic measurements and Normal measurements are made simultaneously in the WT1800. There is not a Harmonic Mode and Normal Mode selection like in the WT1600, older WT and PZ Series Power Analyzers. Requires Option /G5 or /G6

HARMONIC SETUP:

- First setup the Harmonic measurement functions
- **Press [HRM SET]. Press Element Settings** Soft Key. Set each Element to either Hrm1 or Hrm2. **Press [ESC]** to clear this menu.
- Next set the **PLL Source; Min & Max Order; and THD Formula.**
- The **Max Order** sets the number of Harmonic Orders over which to calculate the THD. As an example a specification may call for calculating THD over 50 Orders.
- **Selecting THD Formula: Press THD Formula** Soft Key**.**
- **UL & CSA** applications typically use **1/Total** as the mathematical formula.
- **IEC** applications use **1/Fundamental** as the mathematical formula.

HARMONIC LIST DISPLAY:

- **Press [NUMERIC]** button for basic Numeric display. Display 8 Items
- **Press [FORM]** button then select **Hrm List Single** or **Dual** Soft Key. **Press [ESC]** to clear the Form menu. This is a quick and easy way to show all the harmonic data.
- **Press [PAGE Down]** to view all the harmonic data

BASIC NUMERIC DISPLAY:

- **Press [NUMERIC]** button for basic Numeric display.
- **Press [FORM]** button then select **4 Items, 8 Items,** or **16 Items** Numeric display.
- **Press [ITEM]** button. **Press Function** Soft Key. Select Harmonics (k), then press Left Arrow to select the measurement item. **Press [SET].**
- **Press Order** Soft Key. **Press** Up Arrow Cursor button to select Order 3.

BAR GRAPH DISPLAY **(Manual Chapter 11)**

- **Press [OTHERS]** button and **Select Bar** as the display type.
- **Press [FORM]** button. From the menu select type of display such as Single, Dual or Triad. Select number of Harmonic Orders to display by using the Start Order and End Order. Use this as a "Zoom" function for the Bar Display.
- **Press [ITEM]** button. From the menu select Function (U, I, P, etc) to display as a Bar Graph. Use the Bar Item No. to select where to display a selected Function. **Press [ESC]** to clear the menu.

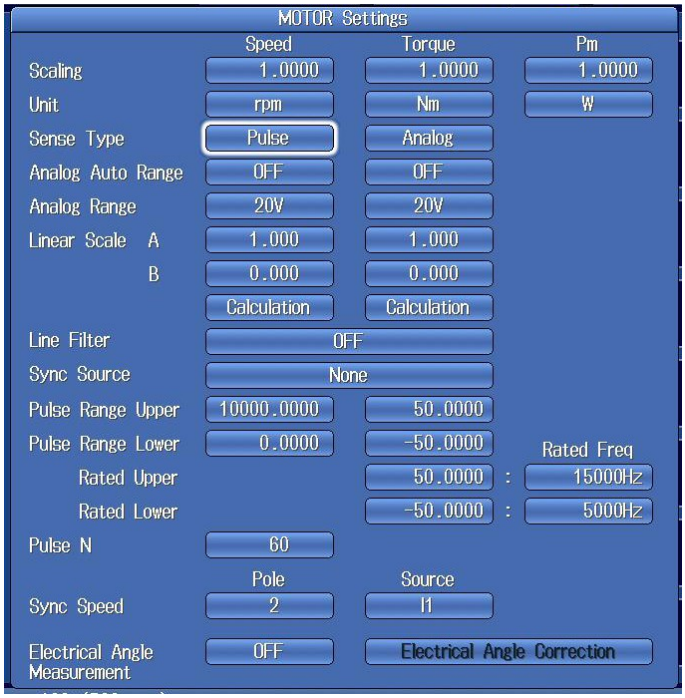
VECTOR DISPLAY: **(Manual Chapter 12)**

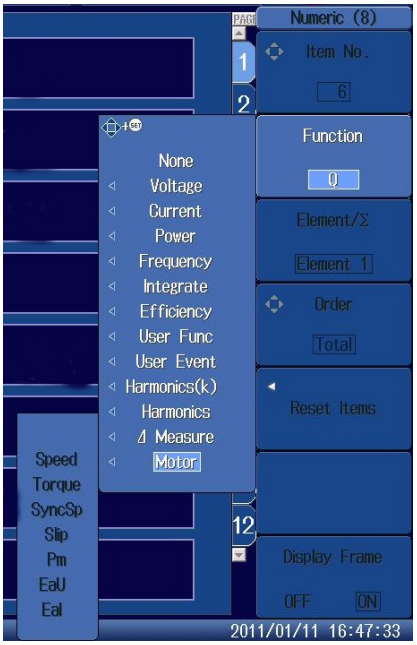
- **Press [OTHER]** button and **Vector** Soft Key.
- **Press [FORM]** button. **Press Object** Soft Key. In this demo example the Object can be set to Element 1 or "Sigma A."
- **Press [ITEM]** button.
- **Press Mag** Soft Key. Press Mag Soft Key twice to highlight both U Mag and I Mag. Press Left Arrow Cursor Key to highlight the most significant digit. Use UP Arrow Cursor Key to increase Mag to 2 for this demo.
- **Press [ESC]** to clear menu.
- **Press [FORM]** button. You can select a Single or Dual Vector Display with Dual Harmonics option, /G6.

E.) MOTOR SETTINGS **(Manual Section 3)**

Press Shift [SCALING] (Motor/AUX SET)

- This is where the various parameters are set to match the Speed and Torque sensors being used by the customer.





- In **Numeric** display mode, **Press [ITEM]**and select **Function** Soft Key.
- Select **Item No.** Soft Key and choose a display position for the measured item.
- **Press Function** Soft Key.
- In the Function menu use Down Arrow to select **Motor.** Press Left Arrow then highlight **Speed. Press [SET]**
- Repeat to display other items like **Torque, Pm (Mechanical Power),** etc.

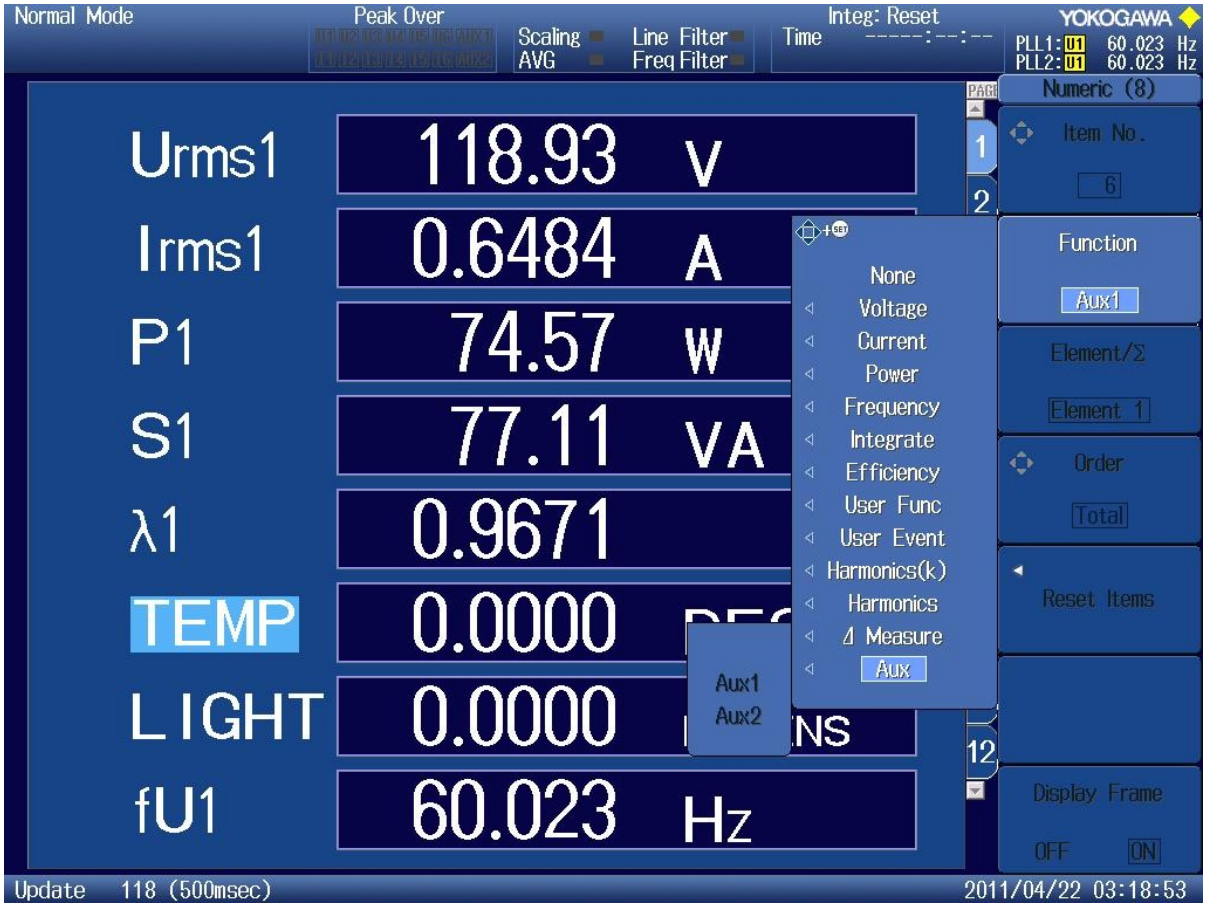
F.) AUXILIARY SETTINGS **(Manual Section 4)**

Press Shift [SCALING] (Motor/AUX SET)

- This is where the various parameters are set for the Auxiliary inputs.

Use the Arrow Keys to move around the menu. Highlight the particular function, such as Range, and **Press [SET]** button to select. Use Arrow Key to highlight the desired Range and **Press [SET]** button to select.

You can assign a Name and Unit for each of the Aux Inputs. Use the Arroe Keys to move to the desired function and **Press [SET]** to display the keyboard.



To Display the AUX Measurements, Press [ITEM] **button. Then** Press [Function] **Soft Key and highlight** Aux **and** Press [SET] **button.** Then select Aux1 and or Aux2 to be displayed. The Name and Units will be displayed.

G.) DELTA MEASUREMENT (Manual Section 1.10)

- **NOTE:** This measurement requires 3P3W, 3V3A or 3P4W wiring method with three phases of Voltage and Current applied to the input terminals.
- **Press [WIRING]** button and **Δ Measure** Soft Key.
- **Press [SET]** button to select Delta Measure Mode. **Press [SET]** button to select from **rms; mean; dc; r-mean or ac** voltage mode.
- **Press [ESC]** to exit this menu.
- In **Numeric** display mode, **Press [ITEM]**and select **Function** Soft Key.
- Select **Item No.** Soft Key and choose a display position for the measured item.
- **Press Function** Soft Key.
- In the Function menu use Down Arrow to select **Δ Measure.** Press Left Arrow then **ΔU1. Press [SET]**
- Repeat to display **ΔU2, ΔU3** and **ΔI.**

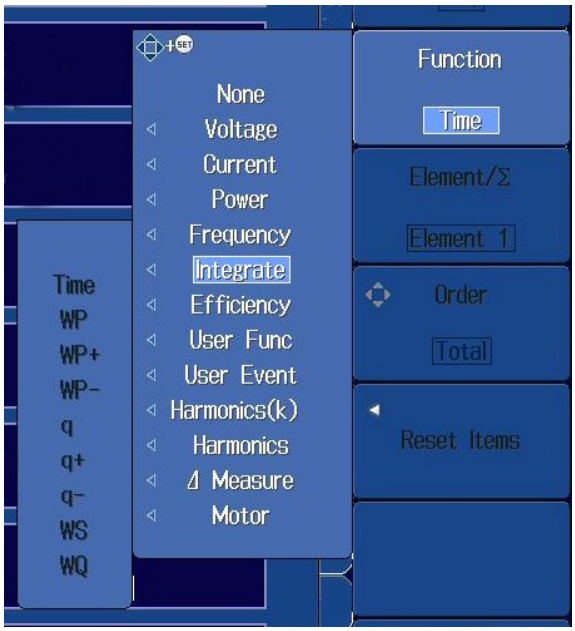
H.) LINE FILTER (Manual Section 1.13)

- **Press [LINE FILTER]** button.
- **Press Element** Soft Key to Select **OFF** or **ON.**
- Use the Arrow Keys to select the Cutoff frequency. The WT1600 uses a new Digital Filter with selectable filters of 0.1kHz to 100kHz in o.1 kHz steps.
- In addition there is a 300kHz and 1 MHz Analog Filter. These are selectable by Pressing Up Arrow after the 100.0kHz selection.

I.) FREQUENCY FILTER (Manual Section 1.14)

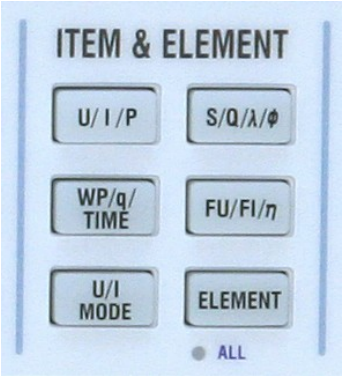
- **Press SHIFT [LINE FILTER] FREQ FILTER** button.
- **Press Element** Soft Key to Select **OFF, 100Hz** or **1kHz.**
- The 100Hz filter is typically used for 50/60 Hz Line Frequencies.
- The 1kHz filter is typically used for 400/800 Hz Aircraft applications.

J.) INTEGRATOR FUNCTIONS (Manual Section 8)



- Set Numeric Display as shown below.

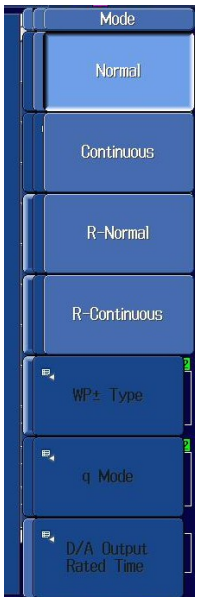
WP = Watt Hours **q = Ampere Hours**
WS = Volt-Amp Hours **WQ = VAR Hours**
Time = Integration Run Time



- First set up the Integration Measurement items to be displayed.
  - Quick set method: In the **Numeric** Display Mode, use the Arrow key to select the position on the screen to display the measurement item. In the **ITEM & ELEMENT** section, **Press [WP/q/TIME]** button.
  - **Press [ELEMENT]** button to select the appropriate element.
  - Example Select **WP1** and **TIME1.**
  - For other items select from the Item menu. In the **Numeric** Display Mode, **Press [ITEM]** button and **Function** Soft Key. Press Down Arrow key to highlight **Integrate. Press** Left Arrow key and highlight a measurement item. Example **WP** for Watt Hours. **Press [SET].**

STARTING INTEGRATION **(Manual Section 8)**

- There are Four different Integration Modes. **Press [INTG]** button. **Press Intg Set** Soft Key. Select the Mode using the Soft Key. **Normal; Continuous; R-Normal; R-Continuous.** Select **Normal**.



- With **Mode [Normal], Press Integ Timer** Soft Key. Set an integration time. Press Left Arrow key to highlight Minute field. **Press [SET]** button. Use **Up/Down** Arrow Key to set an integration time. Example set for 5 Min. **Press [ESC].**
- **Press [INTEG]** button.
- **Press Start** Soft Key to start Integration function. Once Integration is started, you cannot change any of the settings. Try changing Range or any of the other functions**.** The front panel is locked up!
- **Press Stop** Soft Key to stop Integration function. Note that Timer and Integration functions stop updating. **Press Start** Soft Key again and note the Timer and Integration functions start again. This is more like a **Pause** condition. Settings cannot be changed.
- To **Quit or End** Integration function, **Press Stop then Press Reset** Soft Keys. This stops the Timer, and now settings can be changed. **Quit Integration before continuing.**

K.) STORE FUNCTION (Manual Section 15)

- **Press [SHIFT] [STORE START] (Store Set).**
- **Press Control Settings** Soft Key. **Press Store Mode** Soft Key to select the different Store functions:
    - **Manual: Select Manual** for the demo exercise
    - **Real Time:**
    - **Integ Sync:**
    - **Event:**
    - **Single Shot:**
- Set the **Store Count** by using the UP/DOWN Arrow Keys to set the number.
- **Press Interval** Soft Key. With the Interval time set to all zeros, the data will be stored at the Update Rate setting of the unit. Otherwise you can set the storage interval for Hour/Minute/Second.
- **Press Item Settings** Soft Key. Next **Press** Soft Key for **Displayed Numeric Items OR Selected Items.** For Selected Items, **Press Items** Soft Key. Use the Arrow Keys to navigate around the Item Settings Menu. To select an item to store, move the cursor to highlight the item and **Press [SET].**
- **Press [ESC]** to return to the Store Set Menu.
- **Press File Settings** Soft Key. Here you can set up file names and other store functions.
- **Press [STORE START]** button to start the store function.
- The store memory must be reset before another Store function can be performed. **Press SHIFT [STORE STOP] (STORE RESET)** to reset memory.

L.) USER DEFINED FUNCTIONS (Manual Section 7.1)

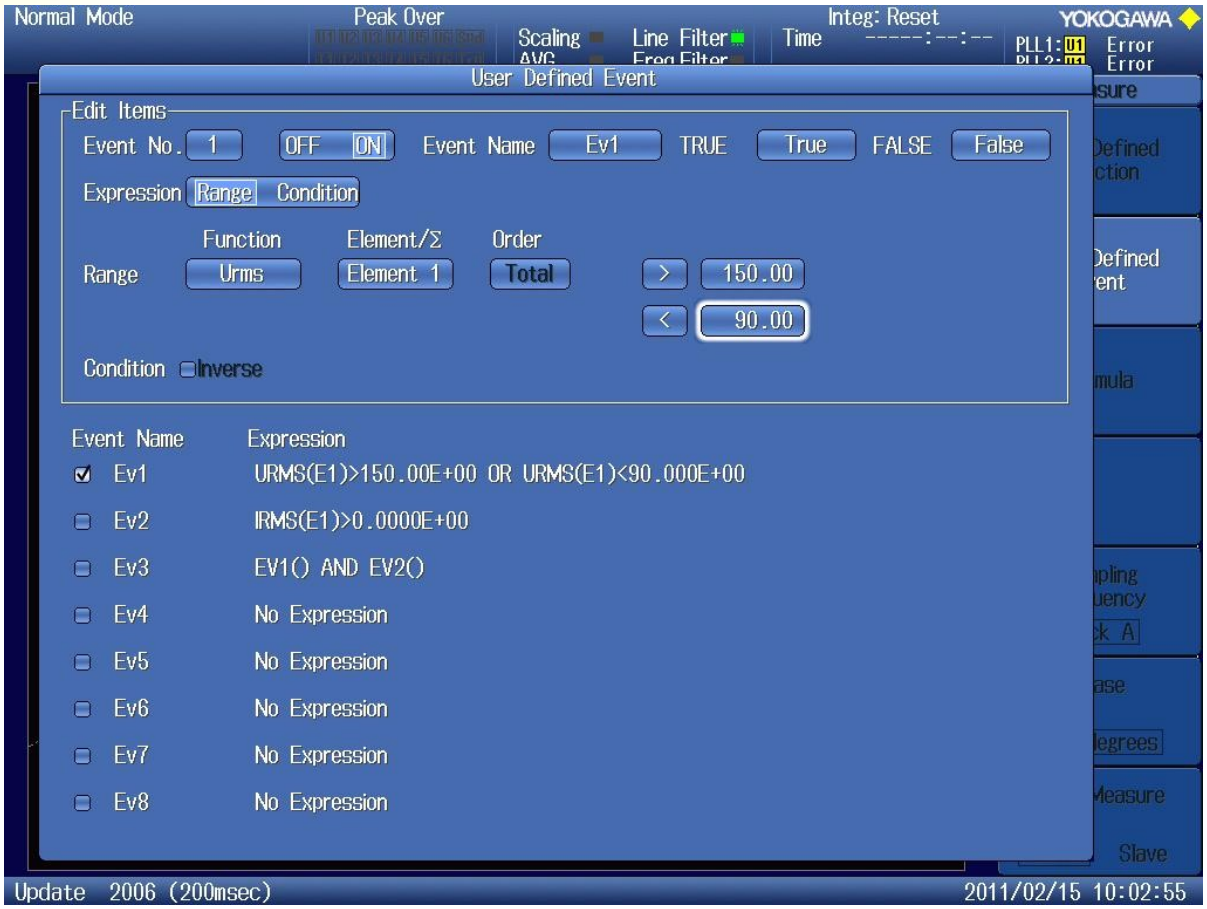
- The WT1800 includes a powerful **User Defined Math Function** as standard. Twenty Math Functions can be assigned for special analysis and computation.
- **Press [MEASURE]** button. **Press User Defined** Soft Key.
- Select **User Defined F1 – F5.** There are many useful Preset, Default Math functions already installed
- Function 1 is **Average Active Power**. **Press [SET]** to turn the function **ON.** Note there is now a Name Field.
- **Press [ITEM]** button. Select an **Item No.** for a position to display the data**. Press Function** Soft Key. Select **User Func** and **F1.**
- **Press [INTG]** and **Start** Soft Key. The Average Active Power uses the Integrator to make the calculations.

M.) USER DEFINED EVENT FUNCTION (Manual Section 7.2)

- The WT1800 includes a New **User Defined Event Function** as standard. Eight Event Trigger Functions can be set for TRUE/FALSE conditions.
- **Press [MEASURE]** button. **Press User Event** Soft Key.
- Use the Arrow keys to step through the Menu settings. Highlight the **Function** and **Press [SET]**.
- You can select *Any* of the Measured Items to use as one of the Event functions.
- Highlight a measurement function and **Press [Set].**
- Set the other functions such as **Element** and **Limits.**
- **Press [ESC]** to exit the menu.

Saving the Event Data

- **Press [SHIFT] [STORE START] (Store Set).**
- **Press Control Settings** Soft Key. Press **Store Mode** Soft Key then **Event** Soft Key.
- Set up the Store conditions as covered in Section K.
- **Press [STORE START]** button. This will Arm the Store function. The Store Light will blink until an event condition is met. Only Data that is outside the Event Conditions will be saved.


Normal Mode
Peak Over
Scaling
Line Filter
Time
Integ: Reset
YOKOGAWA
PLL1:
Error
Error
User Defined Event
Edit Items
Event No. 1
OFF ON
Event Name Ev1
TRUE True
FALSE False
Expression Range Condition
Function Element/Σ Order
Range Urms Element 1 Total
> 150.00
< 90.00
Condition Inverse
Event Name Expression
Ev1 URMS(E1)>150.00E+00 OR URMS(E1)<90.000E+00
Ev2 IRMS(E1)>0.0000E+00
Ev3 EV1() AND EV2()
Ev4 No Expression
Ev5 No Expression
Ev6 No Expression
Ev7 No Expression
Ev8 No Expression
Update 2006 (200msec)
2011/02/15 10:02:55

N.) D/A OUTPUT FUNCTION (Manual Chapter 9)

- **Press [UTILITY]** button. **Press D/A Output Items** Soft Key.
- From the D/A Output Items menu, set up the Function and Element for each D/A Channel.
- Example, use the Left Arrow key to highlight the Function for Channel 4. **Press [SET].**
    - Down Arrow to **Power. Press [SET].**
    - Down Arrow to **S. Press [SET].**
    - Use Right Arrow to Highlight **Element**. **Press [SET].**
    - Select an Element number. In this case select Element 1. **Press [SET].**
    - **Press [ESC]** to clear menu.

- **Setting the D/A Zoom Function**
    - Use Right Arrow to Highlight **Range Mode. Press [SET].**
    - Select **Manual.**
    - Use Right Arrow to Highlight **Max** and **Press [SET].**
    - Set the Max value for the measured signal. Example 75. **Press [SET].**
    - Use Right Arrow to Highlight **Min** and **Press [SET].**
    - Set the Min value for the measured signal. Exmple 0. **Press [SET].**
    - **Press [ESC]** to clear menu.