

Total Power in Three-Phase AC Circuits
Program Note No. 3

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Total Power Formulas for Three-Phase AC Circuits

As written in Program Note No. 2 (*Power Calculations in AC Circuits*) there are two components of power: active and reactive.

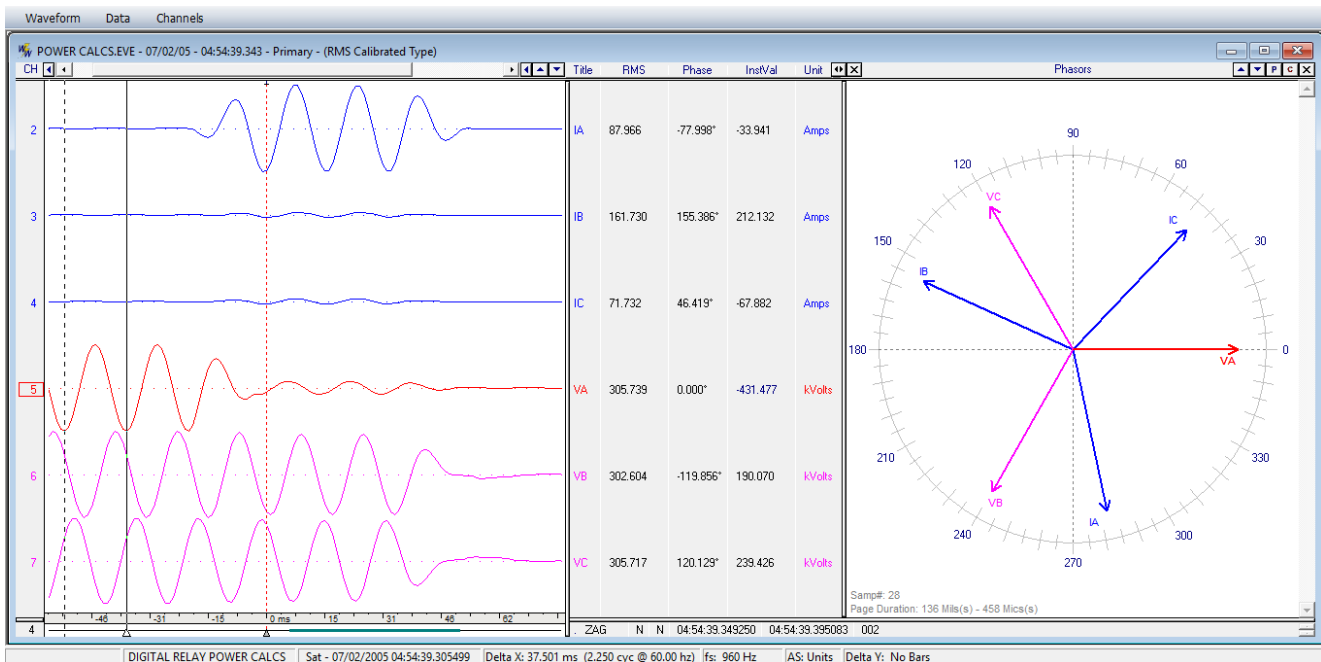
$$\begin{aligned} \text{Active Power} &= V_{RMS} I_{RMS} \cos(\theta_V - \theta_I) \\ \text{Reactive Power} &= V_{RMS} I_{RMS} \sin(\theta_V - \theta_I) \end{aligned}$$

In a three-phase circuit the total power is the equal to the sum of the components of each phase.

$$\begin{aligned} \text{Total Active Power} &= P_{Aa} + P_{Ba} + P_{Ca} \\ \text{Total Reactive Power} &= P_{Ar} + P_{Br} + P_{Cr} \end{aligned}$$

Where, P_{Aa} is the active power of phase A and, P_{Ar} is the reactive power of phase A. An example of how to calculate total active and reactive power using Wavewin is shown below.

Step 1: Isolate the voltage and current channels for phases A, B and C.



Step 2: Use the Software Analog Channels (SACs) to find the active and reactive power for each phase. Then, use two additional channels to total each as shown below.

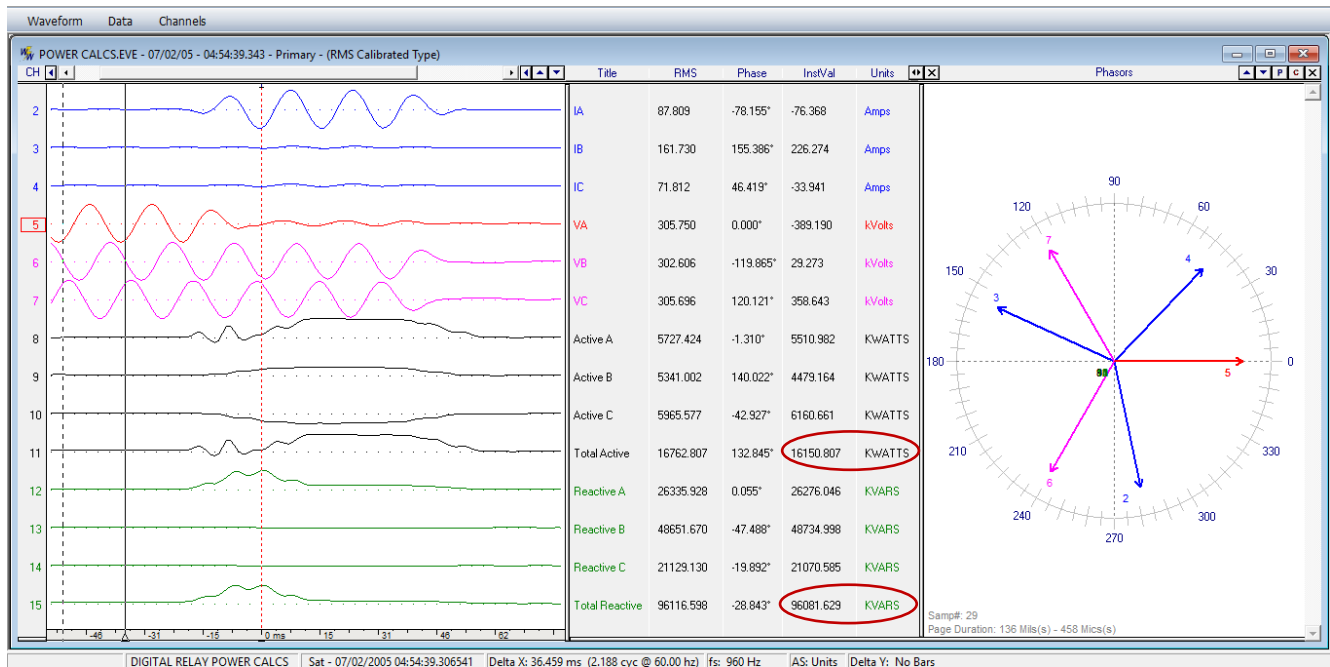
Software Analog Channels for: C:\WaveData\POWER CALCS.EVE

Station: POWER CALCS Device ID: 250

Use the Operators Drop Down List to Select the Fast SACs. Once Selected the SAC equation will be Displayed. The Channel Numbers will be Populated with the first 3 Marked Channels in the Data Display.

Chan	Titles	Operators
8	Active A	+5d/-2d/c/*5r/*2r/p=k/u=Watts/
9	Active B	+6d/-3d/c/*6r/*3r/p=k/u=Watts/
10	Active C	+7d/-4d/c/*7r/*4r/p=k/u=Watts/
11	Total Active	+8/+9/+10/p=k/u=Watts/
12	Reactive A	+5d/-2d/s/*5r/*2r/p=k/u=VARs/
13	Reactive B	+6d/-3d/s/*6r/*3r/p=k/u=VARs/
14	Reactive C	+7d/-4d/s/*7r/*4r/p=k/u=VARs/
15	Total Reactive	+12/+13/+14/p=k/u=VARs/
16	{Software Channel}	
17	{Software Channel}	

File: TotalPower.SAC



Step 3: To isolate channels, highlight them and press enter. Then, read the instantaneous values for total active and reactive power.

