

# PM 6680 Timer/Counter Characterizing Rapidly Changing Frequencies

A manufacturer of transducers needed to characterize a new design. This new transducer converts a magnetic field into an ac signal. The nominal frequency of the signal is roughly 72 kHz, and it will vary with the strength of the magnetic field.

In a common application, the magnetic field to be measured is the result of a 60 Hz line frequency. The problem was to measure the deviation from the nominal frequency at the peaks of the 60 Hz signal.

## A Simple Solution

A simple solution would be to use the statistical functions of the PM 6680 to display the maximum

frequency of a set of readings. By programming a measuring time that is a small fraction of the period of the frequency variation (say, 1ms), an adequate number of samples may be taken over each 60 Hz period to characterize the maximum deviation, as shown in Figure 1. By setting the statistical sample size to 1000, about one second's worth of cycles could be sampled.

## Measuring only the Peaks – Arming

The drawback of the previous method is that it will provide only the maximum peak. If frequency transients are present in the signal, the

reading will reflect these. A better measure would be to *average* a number of peak readings.

This requires **arming** the counter to make a frequency measurement only at the peak of the 60 Hz line. To do so, the 60 Hz line is attenuated and then connected to channel B of the counter. A start arming delay of  $16.67\text{ms}/4 - (1/2 \times 1\text{ms}) = 3.67\text{ms}$  (which can be also thought of as  $90^\circ$ ) is programmed. When start arming is turned on, the counter will then make measurements only at the peak. By varying the delay, any desired part of the signal may be measured.

Statistics may then be used to average a number of peak values. If a

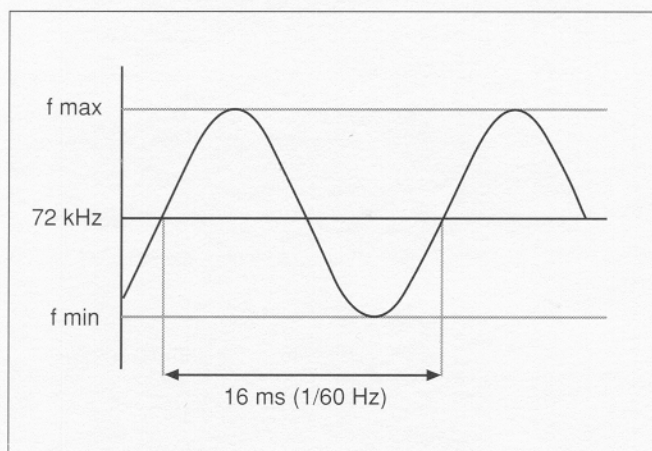


Figure 1. Frequency variation as a result of a 60 Hz magnetic field. Note that this is a plot of frequency versus time.

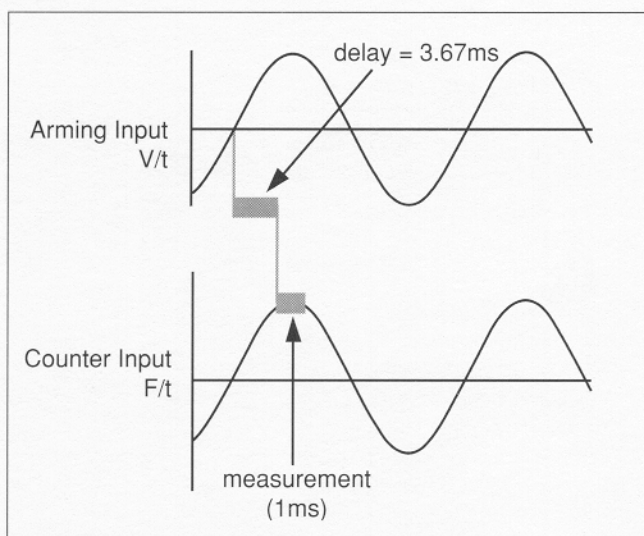


Figure 2. Using the 60 Hz line to provide an arming signal. The delay from the zero crossing of the arming signal causes the counter to make measurements at the peak of the signal. Note that the top plot shows voltage versus time, while the bottom shows frequency versus time.



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computer is available, these peak values can be transferred for further analysis.

## Using TimeView™

TimeView™ software works with the PM 6680 and a PC to provide powerful analysis capabilities. In this instance, TimeView™ can be used

with the counter to make measurements at the fastest possible rate of 2,000 per second. Figure 3 shows an example data set captured using this method. The frequency versus time characteristics of the signal may be seen clearly.

Once the data has been captured, TimeView™ can be used to analyze

the data with cursor measurements, histograms, and even fourier transforms. TimeView™ can also be used to capture the data using a delayed arming technique as described above. A histogram of this data can be used to study the distribution of the frequency readings at the peaks.

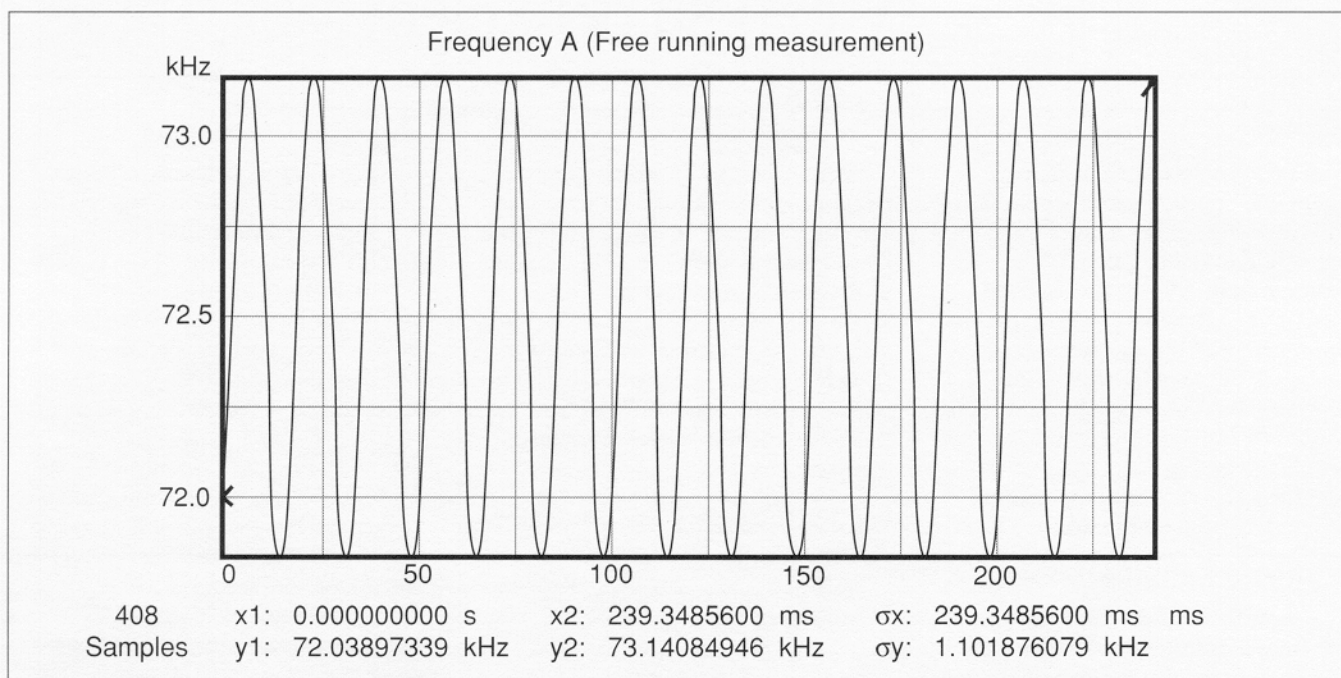


Figure 3. Frequency versus time characteristic is easy to see in this TimeView™ Plot.

## Literature

Request literature #G0285A for a PM 6680 Timer/Counter brochure.

For information on additional PM 6680 Timer/Counter applications, request:

Lit.# G0293A TimeView™ brochure

Lit.# B0225A Advanced Arming

Delay by Event Counts

Lit.# B0226A Characterizing

Frequency Bursts

Lit.# B0230A Sources of Error in

Time Interval Measurements

Lit.# B0231A Exploring the


Modulation Domain

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Printed in U.S.A. B0227A-04U9203/SE EN

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