Aemulus

Measure Array Demystified

Application Notes

Version 1.0, 04-2013

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Section 1: Overview

This application notes discusses how to manipulate NPLC, sampling rate and sample size for the following APIs in Aemulus .NET wrapper library that return arrays of voltage or current data:

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   - ReadCurrentWithAverage
   - ReadVoltageWithAverage

2. Read Array
   - ExtTrigGet_ReadCurrentArray
   - TrigGet_ReadCurrentArray
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   - TrigGet_ReadVoltageArray

Section 2: Read-Average Function

By default, the sampling window is determined by the number of PLC (NPLC). If NPLC=1, then sampling window is 20ms.

The sampling rate is fixed at 1MSample/sec, which means sampling interval is 1us. If NPLC = 1, then there will be 20K samples returned from tester. If you do not allocate sufficient memory to receive the returned array, software exception may occur.

For Read-Average function, the sampling window will be determined by both NPLC and sample size. The following checks are performed within the API before a measurement is made:

1. Check the current NPLC and integration frequency (50Hz or 60Hz).
2. If current NPLC is more than 3, then it will be reset to 3.
3. Actual sample size is calculated using formula below:
   Actual sample size = NPLC * ((1.0 / (Integration frequency)) / 1e-6)
4. If the required sample size is not equal to the actual sample size, NPLC will be reset based on following formula:
   NPLC = Sample size / ((1.0/ (Integration frequency)) / 1e-6)
5. Program updated NPLC to tester.
6. Perform array measurement.
7. Reset NPLC to original setting.

Section 3: Read-Array Function

The sampling window is determined by the number of PLC (NPLC). If NPLC=1, then sampling window is 20ms.

The sampling rate is fixed at 1MSample/sec, which means sampling interval is 1us. If NPLC = 1, then there will be 20K samples returned from tester. If you do not allocate sufficient memory to receive the returned array, software exception may occur.

There are 2 ways to manage the sample size and NPLC:

1. You decide the size of the measurement array first. Example:

   ```
   int sample_size = 500
   double[] result = new double[sample_size]
   ```

   Then you calculate the NPLC that can produce the sample size you want, and program this NPLC to tester. Example, if you set sample size to 500, then NPLC can be calculated from

   ```
   NPLC   = sample_size * 1us / 20ms
          = 500 * 1us / 20ms
          = 0.025
   ```

   where:
   1us = sampling rate
   20ms = 1 PLC (assuming integration frequency is 50Hz)

   In this case, sampling window is 500us. There are 500 samples, with each sample taken at 1MSample/sec rate.

2. You decide NPLC (thus the sampling window), then you calculate sample size before you create an array to keep the returned array from tester.

Section 4: Revision History

1.0	APR 2013	INITIAL RELEASE