

# HRM Access Time

*Impact at 15 Hz*

Thu, Oct 17, 2002

Although HRM development is not yet complete, current measurements indicate that the time for the PowerPC to access the memory on the PMC board is  $1.1 \mu\text{s}$ . This note considers what that time can mean in a 15 Hz environment.

Every 15 Hz cycle, the number of points of data collected for each of the 64 channels is 666. If it were important to deliver this much data at 15 Hz, the time required to access the data points would be  $666 * 1.1 = 733 \mu\text{s}$ . The protocol currently in place for delivery of waveform data includes a time-stamp as well, which means that the time stamps would also have to be accessed, and since the time stamp is a 32-bit value in the PMC memory, this would cost an additional  $1466 \mu\text{s}$ , assuming it were accessed via 16-bit words. But since the differences between time stamps are small in this case, we could access only every other word, for a cost for the time stamp portion of  $733 \mu\text{s}$ . This means the total time for accessing one word of data plus one word of time-stamp is  $1466 \mu\text{s}$ .

But the current client side can request 5 channels at one time, so this number could be amplified by 5, yielding a total access time for collecting 15 Hz data for 4 signals of  $1466 * 4 = 7330 \mu\text{s}$ . One might say that this is overkill, since the time-stamps are the same for all of the signals. But that is true only if they all come from the same group of 64 channels. Plans for HRM support software permit this to be true for more than one set of 64 channels. It may be necessary to optimize it for channels that are part of the same block of 64 channels, perhaps by caching the time stamps.

Suppose one asked how much time would be needed to copy the 256KB array of time stamps into faster memory. Keeping up with real time, one would have to copy 666 time stamps every 15 Hz cycle. Each consists of 2 words, and if they were accessed as words, it would cost  $666 * 2 * 1.1 = 1466 \mu\text{s}$ . Accessed as longwords, the time might be a bit less, but it would be about 1 ms. If there were more HRMs, it would be 1 ms per HRM.

This is probably silly, but how much time would be required to access all 2 MB of memory that contains the slow data? If it were copied at a rate of 2 words/ $1.6 \mu\text{s}$ , say, then it would take  $(64 * 666) / 2 * 1.6 = 34 \text{ ms}$  per 15 Hz cycle. That would be for one HRM and would certainly be a silly waste of CPU time.

The above description assumes that a client can receive and use data at 15 Hz. This may be true for the Macintosh Parameter Page "Fast Time Plot" option, but it may not be true for the Acnet clients. (At least, the Acnet client side for the RETDAT protocol cannot receive 15 Hz replies reliably.)