KEITHLEY

A GREATER MEASURE OF CONFIDENCE

Product(s):

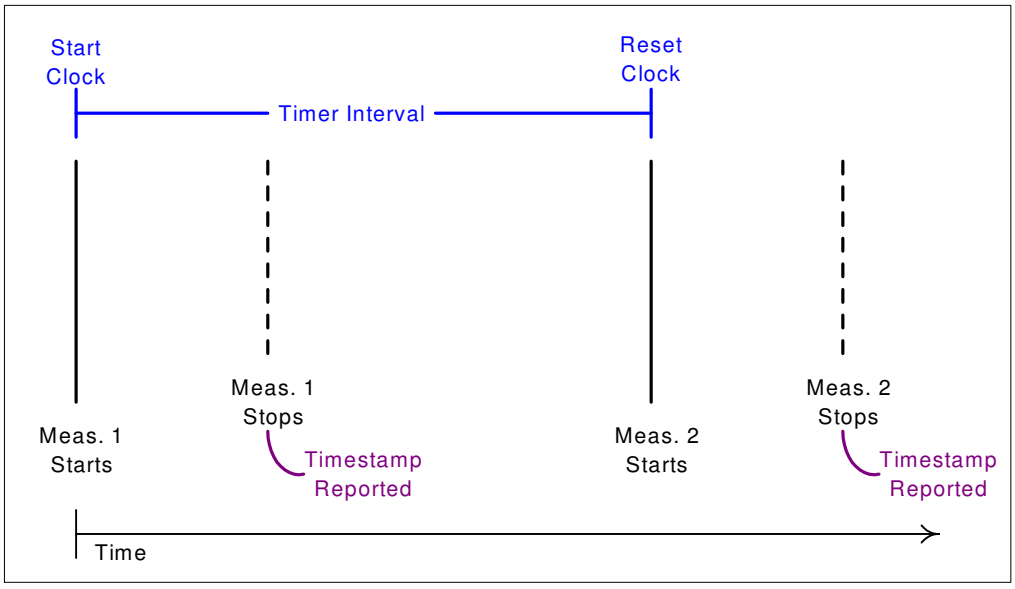
DMMs: 2700, 2701, 2750

Software: ExceLINX-1A

Question: What is the difference between the timer and delay parameters in the trigger model of the Integra Series products?

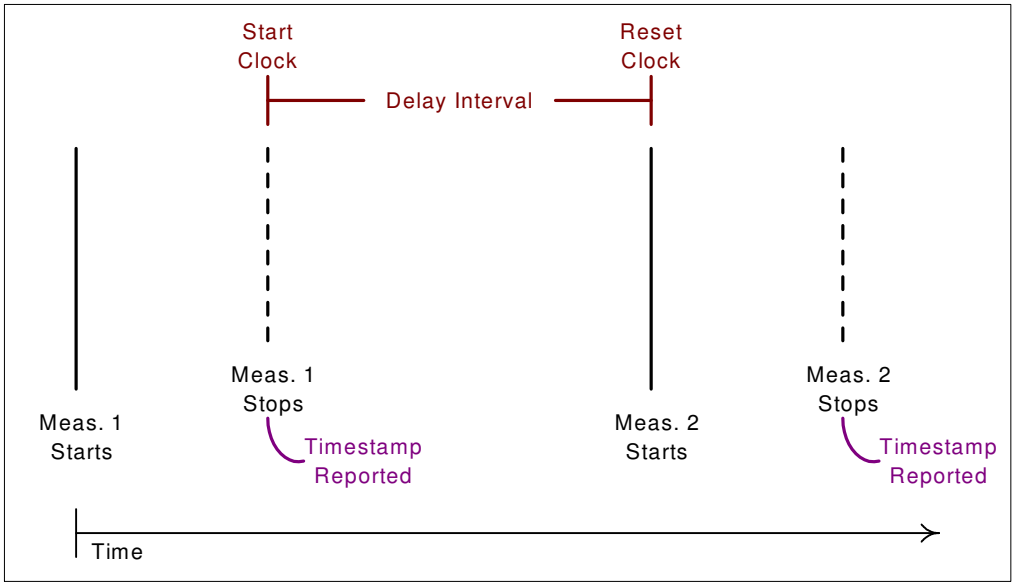
Answer: Timer is one of the selections for trigger source. It specifies the amount of time between the start of each measurement. Figure 1 illustrates the timer interval. Note that the reading timestamp is not synchronized with the start and stop clocks of the timer.

Figure 1 – Timer Interval



The delay parameter of the trigger model allows the user to set the amount of time between the end of one measurement and the start of the next. Figure 2 illustrates the delay. Again, note that the timestamp and delay interval are not synchronous.

Figure 2 – Delay Interval



Another way to relate the timer and delay intervals is to say that the measurement time is encapsulated within the timer interval, but is excluded from the delay interval.

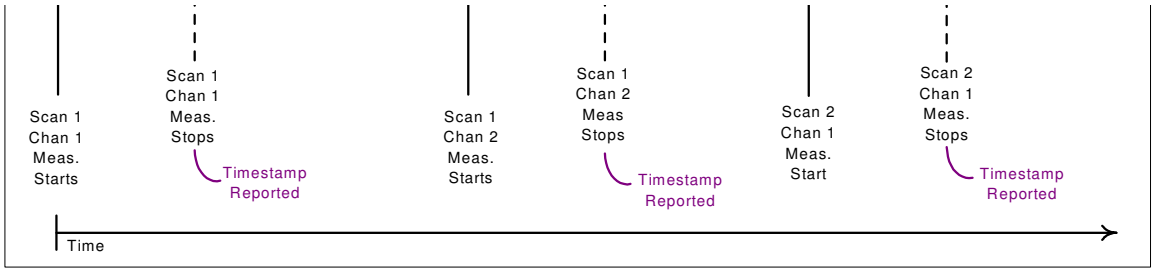
For single channel operation *only* the greater of the timer or delay values is used.

For multiple channel operation, there are two modes, scan and step. How the timer and delay values are used is a result of which mode is enabled in the instrument.

In step mode, the multimeter is configured to measure each channel and output a trigger after the measurement of each channel. In step mode only the greater of timer or delay is used.

In scan mode, the channels are treated as a group so that the instrument sequentially measures each of the channels in the scan list and outputs a trigger after each time it completes the entire scan. Both timer and delay may be used in scan mode. Timer denotes the amount of time between the start of scans and delay denotes the amount of time between the end of the measurement of one channel and the start of the measurement of the next channel. Figure 3 below illustrates the relationship between timer and delay intervals in a scan.

Figure 3 – Timer and Delay Intervals in Scan Mode



In correlating the relationship between timer and delay, it is also important to understand the timestamp of the reading. The timestamp is taken when the reading is completed. Although the timer value ensures that the start of measurements occur at specified intervals, the difference between the timestamps of the measurement will not be the same as the timer value. As an example, assume the timer interval is set to 1sec and the delay is set to 0sec. Your data might appear as follows:

Scan #	CH 101	Time	CH 102	Time	CH 103	Time
1	-0.005588	0	0.040909	0.021	0.005263	0.047
2	0.030513	1.014	0.052254	1.034	0.079677	1.06
3	0.042289	2	0.080678	2.021	0.048272	2.047

Note that the difference between the timestamps for CH 101 measurements in scans 1 and 2 is more than one second whereas the difference of timestamps for CH 101 in scans 2 and 3 is less than one second. These differences are not due to the uncertainty of the timer. Timer is an internal clock that controls the start of measurements, but the times for the start of measurements in both scans are not given in the data. The measurement for CH 101 in scan 1 started before the 0sec timestamp. The same is true for the measurement for CH 101 in scan 2.

On the other hand, it is possible to see the delay interval in the scan data. Note the example data below where the delay interval is set to 1sec:

Scan #	CH 101	Time	CH 102	Time	CH 103	Time
1	-0.005588	0	0.040909	1.026	0.005263	2.044
2	0.030513	3.068	0.052254	4.092	0.079677	5.113
3	0.042289	6.132	0.080678	7.182	0.048272	8.2

The delay interval begins at basically the same time that the time for the measurement is stamped. Therefore, after the first CH 101 measurement at 0sec the clock began to tick. One second later, the measurement for CH 102 began. Since we have the timestamp for the CH 102 measurement, we can assume that the measurement for CH 102 took 26 ms (1.026sec – 1sec). Adding one second to the timestamp of CH 102 measurement, we arrive at the start of measurement for

CH 103. Using the same line of thought, we know that the measurement for CH 103 took approximately 18ms.
