1. Find the rate of the (nominally) 24 ns clock.

Line one occurs during the second 13:39:30. The internal clock reads 6FCD49C1.

Line two occurs during the second 13:39:31. The internal clock reads 72491226.

The difference between the two clock readings is 72491226

-6FCD49C1

27BC865

27BC865Hex = 41666661Dec

Therefore, the frequency of internal clock is 41,666,661 cycles per second.

One cycle of the internal clock takes 1/41,666,661 seconds, or 24.000 003 336 ns. This deviation from 24 ns is significant since we may be counting tens of millions of clock ticks.

2. Identify the lines which contain the event.

Line 2, column B begins with “8Hex” or “1000Bin”.

The leading 1 indicates the beginning of an event.

The next line with a leading 1 in column B is line 5: BHex = 1011Bin.

3. Find the times of each of the lines in the event.

At the time of line 2, the internal clock has counted off (742D3722 - 72491226) x (1/41,666,661) seconds since the time 13:39:31. That is,

13:39:31 + 31,728,892 x (1/41,666,661), or 13:39:31.761 493 512.

If we had not done step one, we would have gotten 13:39:31.761 493 408, off by 104 ns.

Lines 2, 3, and 4 have consecutive numbers on the internal clock so we can find the times for the other lines by simply adding 24 ns for each. This time the 0.000 003 336 ns error doesn’t matter because we are only adding three of them, not 31 million. The times, therefore, are

13:39:31.761 493 536 and 13:39:31.761 493 560 for lines 3 and 4 respectively.

4. Find the times of the leading and trailing edges of the signals from each counter.

Counter 3 (columns H and I) has a leading edge on line 2: 3DHex = 0011 1101Bin. The one in bit 6 (3rd from the left) indicates the edge. Bits 0 through 5 indicate 11101Bin = 29Dec intervals of 0.75 ns since the beginning of line 2. 29 x (.75 ns) = 21.75 ns.

Counter 3 (columns H and I) has a trailing edge on line 3: 36Hex = 0011 0110Bin. The one in bit 6 (3rd from the left) indicates the edge. Bits 0 through 5 indicate 10110Bin = 22Dec intervals of 0.75 ns since the beginning of line 3. 22 x (.75 ns) = 16.50 ns. This is 16.5 + 24 ns since the beginning of line 2.

Counters 1 and 2 have their leading edges in line 3 and their trailing edges in line 4.

5. Diagram the event.

49.75 ns

55.50 ns

40.50 ns

27.00 ns

24.75 ns

21.75 ns

2

1

3

13:39:31.761493512