Re: SR clock sync problem

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- *From*: "Tom S." <nospam@xxxxxxxxxx>
- *Date*: Fri, 6 Apr 2007 13:21:41 −0500

"Tom S." <nospam@xxxxxxxxxx> wrote in message
news:VoqdncADTrW464vbnZ2dnUVZWhednZ2d@xxxxxxxxxxxxxxx

> "David" <dseppala@xxxxxxxxxxxx> wrote in message
> news:2eo913lgss6eca3n1s88bovf40gub9v8rb@xxxxxxxxxx
>
> > I don't see how to resolve this problem. According to the rest frame observers, clock Ch is running at the same rate as every moving frame clock. Clock Ch got set to zero at the same time as Clock A in the moving frame and Clock Cd were set to zero. According to the rest frame observers, Clock Ch is running at the same rate as Clock A and Clock B, so therefore this must have been some problem with the initialization of Clock B. But I could not determine how the rest frame observers say the initialization of Clock B should have been done.
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> David, there are _two-_ relativistic effects going on here:
>
> (1) 'moving' clocks tick slower than 'rest' clocks according to the rest frame. This means that if the rest observer watches any _one_ of the moving clocks as it passes by a line of rest−frame−synchronized clocks, the moving clock will lag more and more behind each successive rest−clock that it passes.
>
> (2) moving clocks that are strung along the x axis of the moving frame and synchronized according to the moving frame are _not synchronized_ according to the rest frame. This means that two different moving clocks do not read the same time simultaneously according to the rest frame.
>
> As others have pointed out, you are overlooking (2). When (2) is taken into account, everything is consistent.

David. In many previous posts you have demonstrated that you have the ability to correctly use the Lorentz

transformation equations. Why don't you use these equations to answer your question for yourself? I would guess that virtually every serious student of SR has done something like the following.

Cut out two long strips of paper. Along one strip (the 'rest strip') draw circles representing the faces of stopwatches spaced at equal intervals of distance, say 0.866 light−seconds. Use a pencil to draw all the second hands pointing to zero on these watches. This strip represents the watches in the rest frame at time t = 0 in the rest frame.

The other strip will represent the 'moving' frame as viewed by the rest frame at time t = 0 in the rest frame. According to your scenario, the moving frame is moving in the negative x direction relative to the rest frame with a speed 0.866c. For convenience, let the clocks in this frame be spaced at 2 times 0.866c according to the moving frame. Due to length contraction, you will need to draw these watches spaced at only 0.866 light−seconds since we are considering how things look from the point of view of the rest frame. So, the clocks will be drawn with the same spacing on both strips. Assume the middle watch on each strip marks the origin of each frame. Use the LT to determine the reading of each watch in the moving frame at time t = 0 according to the rest frame.

Place the strips along side each other so the origins are adjacent. This represents the state of affairs at time t = 0 according to the rest frame. You will see how the rest frame claims that the moving clocks are not synchronized. Now let time in the rest frame advance by one second. You will need to advance all of the second−hands of the moving clocks by 0.5 seconds (time dilation). These moving clocks will of course still be unsynchronized with one another according to the rest frame. Finally, you need to slide the moving strip in the negative x direction relative to the rest strip by an interval of 0.866 light−seconds (i.e., equal to the spacing of the clocks). Now you have the state of affairs at time t = 1 sec according to the rest frame.

Repeat this as many times as you wish to advance forward in time according to the rest frame. You can also add two more clocks at the origin of the rest frame, one ticking at half the rate of a rest clock and one ticking at twice the rate of a rest clock. These represent your Ch and Cd clocks. You will discover that the Cd clock always reads the same time as whatever moving clock is coincident with Cd even though, according to the rest frame, each moving clock is ticking at the same rate as Ch.

Tom

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