help desk

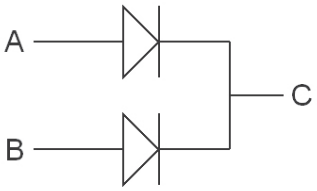
Precedence and priority | By Wayne Howell

"At first glance, merging data looks trivial. However, there are a number of pitfalls for the unwary . . ."

It's been a remarkably busy month with most of the industry, myself included, focused on product launches at the PLASA Show in London. What a great show - I think the trade show crown has been returned to London!

Trade shows have many uses in addition to the headline of selling product. One of them is the opportunity to listen to customer questions and look for product opportunities. This year at PLASA, I talked to a number of customers about switching and merging DMX512 and realised there is a fair amount of confusion . . .

The concept of merging dates back to early analogue control consoles. The problem was: "how do we connect two control consoles to the same dimmer racks?" The answer was a lot of diodes. It is not advisable to simply connect the analogue (0 to +10V control) outputs of two control consoles together. Doing so will dump current into the outputs of the driver chips and may damage them. So, two diodes are used, as shown below:



A represents an output from the first control console. B represents the second control console and C is the output which drives the dimmers (or moving lights or LED strips).

A diode is a semiconductor that allows voltage to flow in one direction only (the direction of the arrow in the symbol). This means that if A is greater than B, A wins and vice versa. This is called Highest Takes Precedence (HTP) merging because the highest level wins.

It transpires (and I'm sure this is more luck than judgement), that HTP is exactly how one wants to control intensity of light. Consider a theatre with a front of house control console A and a backup control console B. If control console A failed or was disconnected, then control console B would take over.

PRECEDENCE

The advent of colour control changed the perception of merging and the concept of precedence became significant. The graphs in *Figure 1* show how HTP actually works.

It is important to appreciate that the merging concepts are equally valid when considering how to combine the outputs of multiple control consoles and how sub-masters interact with each other inside a single control console. In the graph above, A and B could be different control consoles or different sub-masters controlling the same channel. Let's say this channel is controlling a group of ACLs. Submaster A is running a fast chase, while submaster B gradually ramps them all to full. For intensity control this works perfectly as the audience perceives the fast chase gradually morph into full intensity.

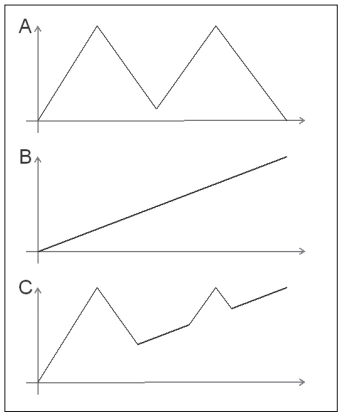


Figure 1

HTP is great for intensity, but not very helpful for all other lighting control attributes such as colour, pan and tilt. Consider the above graph when trying to control pan. Let's say that level 0% means 0° and 100% means 180°. With HTP, at the end of the graph, submaster B is forcing pan to 180° and submaster A has no say - that is not useful.

LATEST TAKES PRECEDENCE (LTP)

Latest Takes Precedence (LTP) was invented to resolve the problem. As the name suggests, the latest (most recent) input that changes will win control. The graph in *Figure 2* shows how it works. During the first half of the graph A has control of output C as it is changing. During the second half, B has control as it is now changing.

LTP makes sense when controlling non-intensity channels, but it does have potential problems. I mentioned that HTP works in the same way whether one is merging two different control

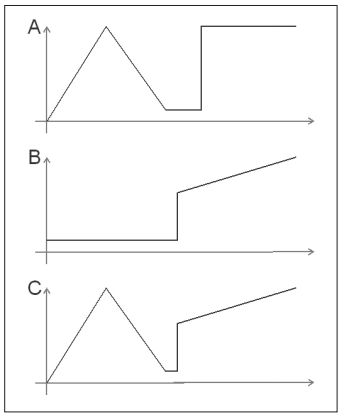


Figure 2

Wayne Howell is the CEO of Artistic Licence, the lighting controls company that he founded in 1988. Wayne invented Art-Net and is actively involved in the ESTA technical standards programme.

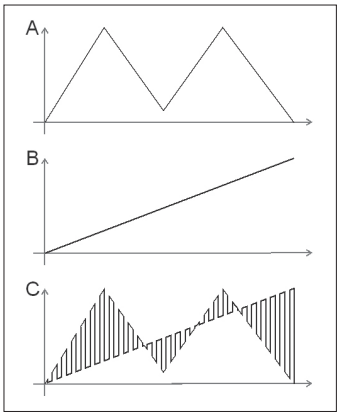


Figure 3

consoles or combing two sub-masters in a control console. The same is not true for LTP due to different definitions of 'Latest'.

DEFINING LATEST

When operating a control console, Latest is defined as the most recent operator-initiated event, perhaps pressing a Go button. If sub-master A and B both contain LTP channels, the one that was initiated most recently wins. This mechanism 'feels' correct for the operator and avoids a situation where LTP channels flicker as control passes back and forth between sub-masters.

Merging LTP channels is rather different. If we consider an LTP DMX512 merger, it has no knowledge of the most recent operator event. It can only see changing levels. In this scenario, Latest is defined as the DMX512 channel that changed most recently. The graph in *Figure 3* above shows the problem.

If both A and B are changing, the result will be unpleasant flickering. This key difference in how LTP works in a merger compared to a control console has tripped up many people. The rule is, to LTP merge the outputs of two control consoles you must be able to ensure that only one will initiate cues at a time. Implicit in this is that LTP merging is useful for switching between control consoles and zoned control, but not for combining their outputs.

PRIORITY

The concept of merging control data is available at a network level using protocols such as Art-Net and sACN. The protocols work in different ways and the choice gives a system designer greater flexibility.

Art-Net provides HTP / LTP selection on a universe by universe basis. This allows conventional merging (as described above) to operate.

sACN introduced a concept called Priority. Each universe is allocated a priority number between 1 and 200. If a gateway receives multiple universes, it will use the one with the highest priority number. This technique is particularly useful for implementing backup consoles.

CONCLUSION

At first glance, merging data looks trivial. However, there are a number of pitfalls for the unwary. When designing a system, give some thought to whether you need to merge data or switch data. The decision will inform your equipment choice.