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APPLICATION

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VIDEO SYSTEM SYNC PULSES

This month we will take the basic terms and relationships mentioned in issue 1 and apply them to video systems. First, let's assume that you have a stable and accurate synchronizing generator (If you don't, we recommend the VSG-201). Stable applies to the basic oscillator from which all pulses are timed, and we noted that a sync generator using a 14.318180 crystal, and accurate to less than 1 cycle (Hertz) per 10 degrees centigrade, or, in plain english stable and free of drift. Accurate means that all pulses are made from that same reference crystal, and are made in such a way that if there is any drift, then all pulses will drift together and in the same direction. I was talking with one of our customers last week about sync generators, and her use was for Black and White surveillance cameras, needing only not to 'flip' on a monitor or tape recorder when switched from one camera to the next. Her application did not need an accurate sync generator, in fact all the application really needed is a source of vertical sync for all cameras.

WHY VERTICAL SYNC?

Let's look at that statement and make some sense of why these sync pulses are around and why we use them. First, vertical sync and vertical drive. These two pulses are related in just the same way that horizontal sync and horizontal drive are related as shown in issue 1. Cameras use vertical drive to develop a ramp to drive an electron beam from top to bottom of the image tube. Video tape recorders strip vertical sync from the input video and compare that to tach pulses from the head scanner and then adjust the speed and phase of the scanner, if necessary. If you have a VTR which is recording from one camera, and then switch to a second camera which is not synchronous (their vertical sync pulses are not locked together in both frequency and phase) then the VTR will make wild noises for whatever time it takes for the servo to re-lock to the new input. Play that back and the picture rolls for a few moments. Make a test at home with your VCR, by just put it in Record and then switch channels while it is in record. Monitors use vertical sync from input video to steer the vertical oscillator. The same visual problem occurs in monitors with non-synchronous switching as happens in VTRs, the monitor rolls until it can re-adjust to the new vertical sync.

VERTICAL INTERVAL SWITCHING

Now that the need for vertical sync is a bit more clear, what's all the fuss about vertical interval switching? If your system has all sources synchronized, at least vertically, then vertical interval switching is a subject that might concern you. The idea of this process is to realize that any human might request a switch at any moment in time, and a vertical interval switcher will wait until the next vertical interval (possibly as long as 1/15th of a second) to actually switch. The reason is so that the VTR or monitor or whatever will have received the entire field of video rather than the top half of the screen from one source and the bottom from the second source for that moment of the switch, not a big deal in the scheme of life, but a bit more visually appealing. Now what if you have a vertical interval switcher and non-synchronous sources? Well, all of our vertical interval switchers will accept the command and wait until the vertical interval of the signal currently 'on air', and then switch to the new source, sort of a half of a vertical interval switch, and the best attempt to minimize the resulting trash. The schemes can get a bit more complicated, like switching exactly on line 10, but I'll put those away for a later time.

HOW ABOUT HORIZONTAL SYNC?

If your system uses editing or production switching, then you have to pay attention to horizontal sync. Cameras use horizontal drive to develop a ramp to scan an electron beam from left to right across the face of the imaging tube. VTRs generally can't do anything about horizontal sync, so they don't care, but time base correctors sure do, so don't get me wrong, just know that VTRs pass out what they get in as far as horizontal sync is concerned. Monitors have horizontal oscillators similar to the vertical oscillators in that they lock to the input video, and must correct to any change or new input. Usually the horizontal can lock before the vertical does, so you don't see the problem at home on your television or VCR, and in the case of a vertical interval switch, then it has the rest of vertical interval (usually 11 lines) to adjust before you see the first part of the picture. In production, when there is picture mixing, then the sources must be vertically and horizontally synchronous and phased. Imagine a split screen picture, with camera 1 on the left and camera 2 on the right, and the two pictures are synchronous but not phased vertically one picture would be shifted up or down (depending on the phase offset) relative to the other even though they both individually look OK. Now let's split that picture so that camera 1 is on top and camera 2 in on bottom. If they are not horizontally phased, then one picture would be displaced to the left or right (depending on the phase offset) relative to the other again even though both looked OK, individually. Horizontal and vertical phasing is a relative action. The easiest way to phase a system is to select the one thing which you can't, or don't want to adjust, declare that to be the reference, and adjust all others phases to match the reference (more on this later, also).

Next month we will continue with this discussion with the rest of the sync pulses, and move into the world of total system timing including ways to recognize and deal with timing problems. Your comments, suggestions, and questions are invited. Feel free to call or write Mark Everett with your input.