Genlock

Genlock (generator lock) is about syncing broadcast devices so that they will create video frames at the same moment in time.

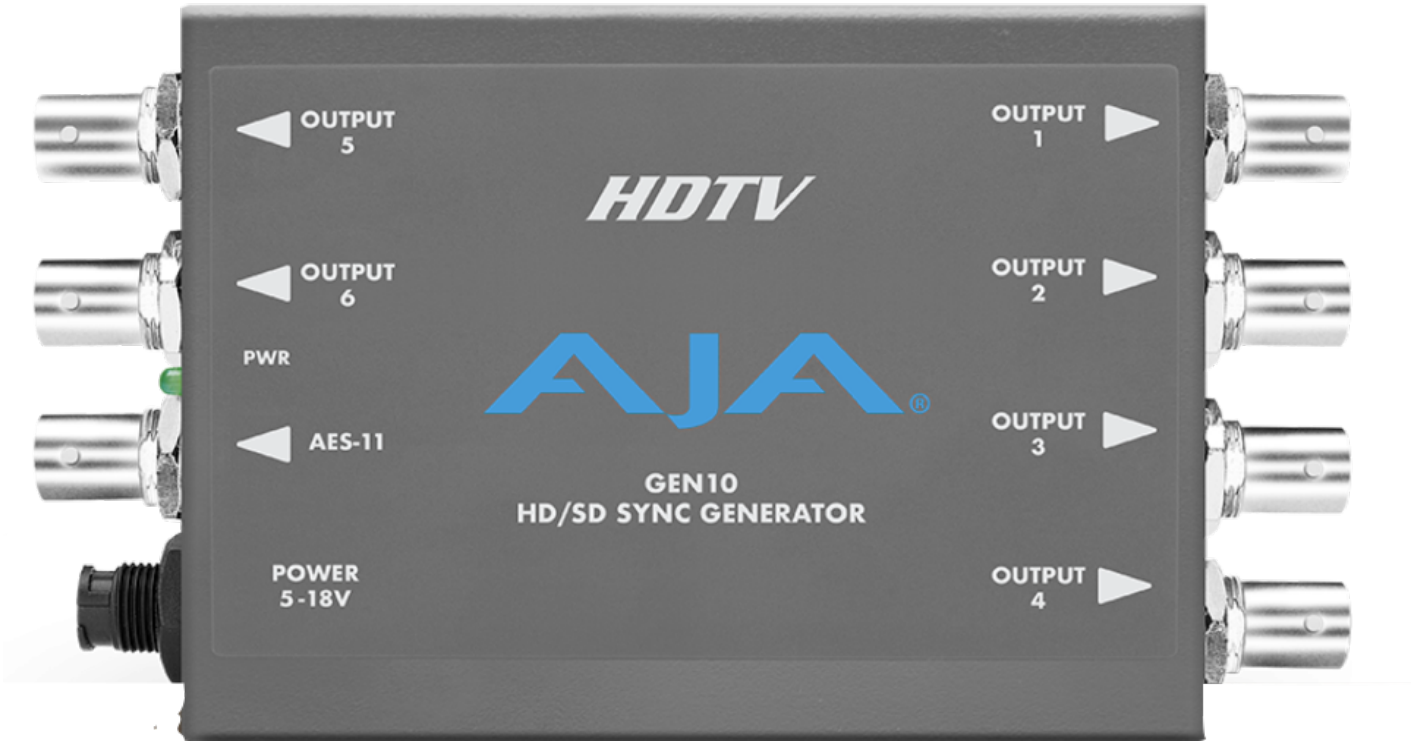
Technically speaking, genlock refers to the state of devices being “genlocked” to a sync signal. This sync signal is properly called a **reference** signal, but often colloquially, the term “genlock” is also used to refer to the reference signal itself as in “apply genlock to that device”.

> This reference guide will use the proper terminology, rather than colloquial.

Evertz 5601

All devices need a reference signal of some sort. If you don't supply it externally, devices will usually “free-run” on an internal reference. Some may also derive sync from an incoming video signal (using the video signal as a reference). If the device has a “reference in” port, it can run receive an external reference signal.

To generate your chosen external reference signal(s), you need a sync pulse generator.



AJA GEN10

This could be something basic like an AJA GEN10, or a full blown master clock like an Evertz 5601.

There are two types of external reference signals:

- Blackburst (bi-level, black and burst)
- Trilevel

Distributing External Reference

External reference signals are analog signals so you need an analog distribution amplifier to distribute it, not an SDI DA. Devices synced to external reference will perform actions (such as CUT on a switcher or switching signals on a router) in time with the external reference.

Sync Offsets

Even if you genlock everything to external reference, you may still have to adjust the sync offset on individual devices. This is most notable on graphics sources, as you may notice a small gap at the top or bottom of the image. To do this properly you need a real scope that can measure timing offsets.

Some devices lack this timing offset. You may have to steer an extra output of your sync pulse generator to handle this.

Terminating

Reference signals needs to be terminated. Each output that is in use should be terminated exactly once. Some devices will do this for you, some will have a switch, some will do it automatically when the loop through is not connected, and some will not do it at all and you will have to provide your own external terminator. You will usually need to read the manual to figure this out.

Deriving Sync In Other Ways

In lieu of an external reference signals, the device may have frame synchronizers built into its input stage. Lower level/prosumer gear often has this on all inputs. As you move up to mid-tier and higher level gear, this feature usually goes away as external reference is expected.

To genlock a wild signal without a proper external reference signal, the device uses a frame synchronizer. A frame sync will buffer a few frames and add or drop them as necessary to bring the source in time. This may be fine in a small setup where you genlock to an external reference signal what you can, and rely on internal framesyncs for the rest.

However, there are things to watch out for:

Frame syncs inherently add delay.

- If every device has to frame sync its inputs, delay can add up, which is usually undesirable, especially in IMAG situations. If you can genlock to an external reference signal, you can mitigate this.
- On some lower tier gear, you cannot disable the framesyncs, even if you can genlock the output of the device.

More Reading:

https://www.analog.com/en/analog-dialogue/articles/phase-locked-loop-pll-fundamentals.htmlx

https://resi.io/blog/what-is-genlock/

Comments

The following is a synopsis from a Reddit post by Eviltechie and with slight modifications by IanTech based on this post.

Revision #3
Created 2026-07-30 20:24:58 UTC by iantech
Updated 2026-10-24 19:11:17 UTC by iantech