USING A TIMEBASE CORRECTOR

By G8MNY

WHAT IS IT FOR?
A timebase corrector (TBC) is a device used with a VCR to remove timebase wobble
(jitter) due to the mechanical tape systems in the VCR.

VCR JITTER
The Jitter or line phase errors are caused by:-

a) The video 2 heads not being precisely 180 deg apart around the head drum,
this causes 25Hz line phase shifts (left right on alternate fields) at the head
switching point.

b) Tape stretch, this causes bending left or right (early or late) as the lines
get more and more out of place down each frame until the next head changeover.
This is effectively the same as tape tension faults.

c) Tape capstan speed varying very slightly, this makes the pictures move left
to right very slowly. Can be as a result of noise (hum) on the 25Hz control
signal off the replay head.

d) And of course different record & playback machine tolerances, that also cause
all sorts of timing errors.

Modern frame store video mixers negate the need for a TBC as the frame store is
a TBC that does not need genlock signal to be able to mix video. But for mixers
without frame stores or just the copying of a video the use of a TBC will
improve the end result.

HOW DOES IT WORK?
The VCR's wobbly video is written to a short term video store of a few lines,
and this is then read from the store later using a steadier timebase. This
timebase is normally loosely locked to the replay video.

To be able to store the
video in a digital or bucket
delay line the composite
video first has to be split
up into component parts,
usually Syncs, Luminance
(Y), & the U & V colour
signals. The low bandwidth
colour signals are
recombined into a single UV
colour signal to simplify
the storage. These
components are filtered to
reduce aliasing (patterning)
in and out of the store
as the store must clock
around 7MHz for VHS quality.
With digital stores a
further Analogue to Digital and Digital to Analogue processes are required.
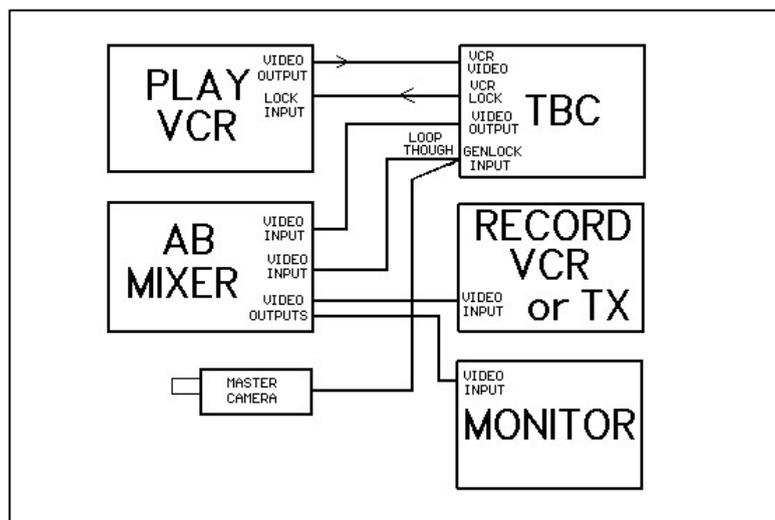
The syncs are used for generating the stores clocks. Two stores handle the Y &
UV signals separately as this give better definition with less memory than a RGB
store system. Once in the store the signal is clocked at a varying rate
depending on delay time required to iron out the VCR wobble.

The O/P of the store is then converted back into Y, U, & V components then with new syncs, all feed into a PAL encoder.

GENLOCK
Some TBC & VCRs enable full genlock to a master camera or stations syncs for mixing etc. Genlock can usually be normal camera video signal, but some simple studio kit may only work with a Black & Burst signal.
To lock up the VCR in playback mode, the head drum is required to be locked to external syncs, (some VCRs will do this with external video present) in the same way as it does in record mode. Then the TBC can generate a frame advanced VCR LOCK signal (syncs only) to feed to the VCR, the frame syncs are a few lines early so that the TBC output is exactly in lock.

FEATURES
As the video is split into many bits inside a TBC it is easy to add useful controls such as:- Video Gain, Black level, Colour Gain, Sharpness, and with genlock:- Line phase, fine & course colour phase.

D.O.C.
Drop Out Compensation designed for VCR without a DOC. If the VCR has a suitable RF output from the replay head to feed a missing carrier drop out detector in the TBC. The a full colour replacement line(s) using the incoming line into the store to replace the dropped out one can be done.
I have found that the VCR's own Black & White DOC (64uS glass delay line) of the last good line generally viewed better than replacing dropouts with coloured video from a several lines earlier.

IN USE
Providing there are usable syncs from the playback the TBC should give a wobble free O/P within a few frames. If a crash edit is played back the TBC may make the replay picture roll up or down until the frame syncs are again locked but still using it's steady syncs. This effect can be slower than a TV would be at regaining sync lock, but a re-recording of this should be no worse as it will not see a sudden frame sync phase change that usually causes a 2nd generation tape to loose total lock for a while.

With a genlock system, a badly tracking video noise bar can be hidden behind captions etc. making a poor video usable again.

Using 3 identical VCR machines I was able to modify them all to take external VCR drive signals from the TBC, and just use a 3 way video & sound crash switcher to have them all genlocked together to my master camera.

I have also been able to genlock a freeze frame from a colour video printer's frame store using the TBC.