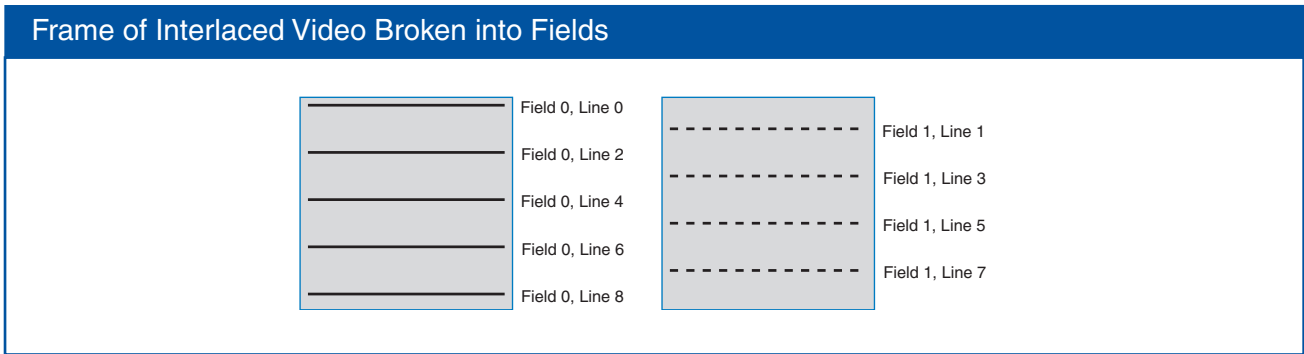


**Overview**

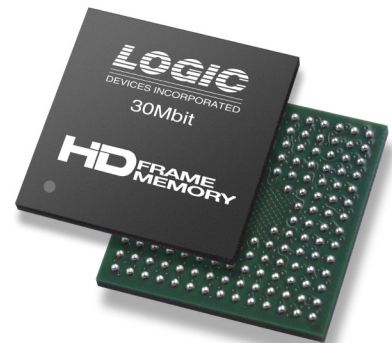
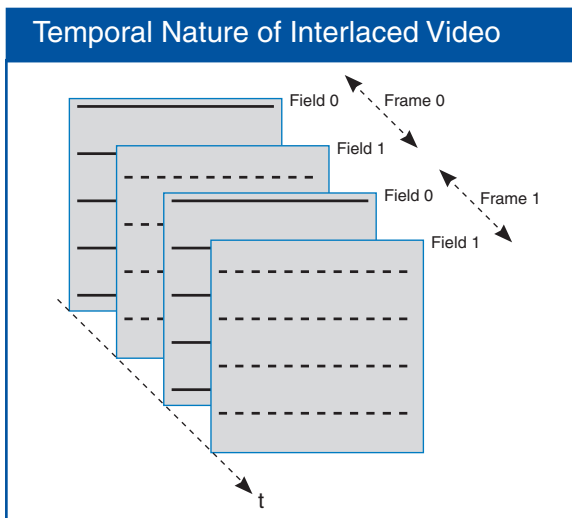
Let the LF3312 Frame Buffer be the storage workhorse for your de-interlacing application. There is an increasing need for high performance de-interlacing systems as we convert more and more media into progressive scan format for consumption. The LF3312 is well positioned to provide a flexible video storage platform for these systems.

A frame of Interlaced Video is comprised of 2 fields, Field 0 and Field 1. Field 0 contains all of the even numbered lines, and Field 1 contains all of the odd numbered lines. The interlaced video is displayed by placing Field 0 on the display, and then Field 1, etc. By alternating these fields fast enough, the viewer's eyes integrate the two fields into one complete frame. The following discussion explains why LF3312 can be essential video storage components in your high performance de-interlacing system.

The diagram below illustrates the two fields of a frame of interlaced video.



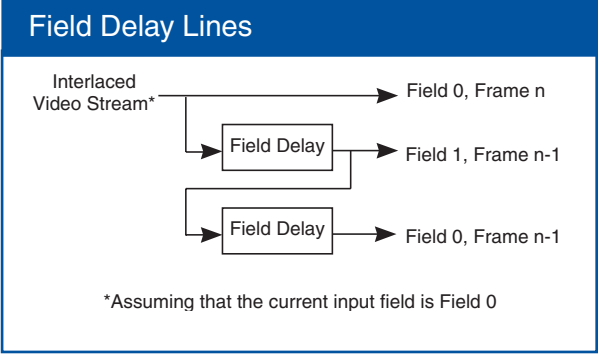
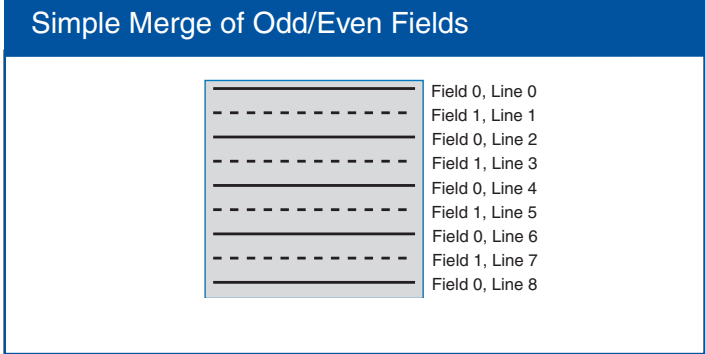
Temporally, the fields are being presented to the viewer as in the following diagram.



**HD FRAME MEMORY**

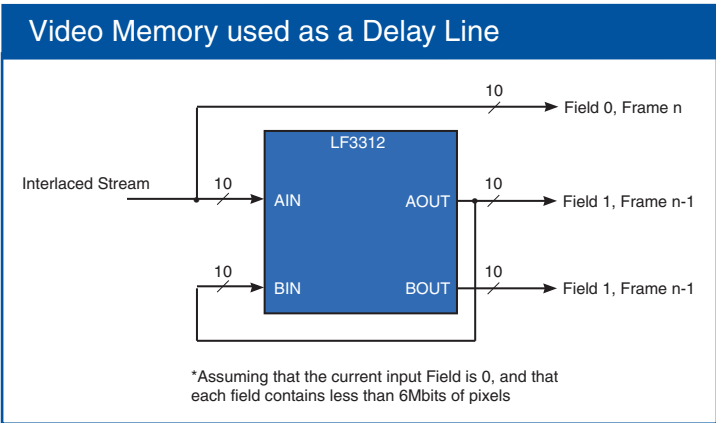
When the two fields are merged, the basis for very simple 'mesh' deinterlacing, a complete frame is constructed.

Motion across fields can ruin fluidity of this resulting composite frame, resulting in motion artifacts. Motion compensated (or motion adaptive) de-interlacing algorithms have been developed in order to combat these troublesome artifacts. Motion compensation involves looking at a sequence of fields in time and determining the changes between them. That is, the fields and frames are inputs of a temporal process. The end result must be a sequence of composite frames that resolve the motion artifacts while maintaining full vertical resolution.

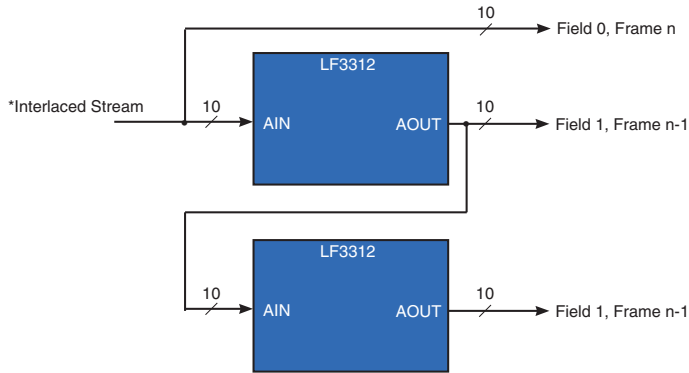


Identifying regions of motion can be accomplished by comparing multiple fields concurrently. This requires a delay line similar to a FIR filter. In this temporal delay line, we require delay elements that are a field in depth. Similar to FIR filtering, the composite output video can be a weighted sum of various fields and/or regions of interest.

Implementing this on the LF3312 can be done by configuring the device in "Dual Channel" FIFO or Shift Register mode. In these modes, the device provides two independent memory blocks,



### Multiple Video Memories used as Delay Lines



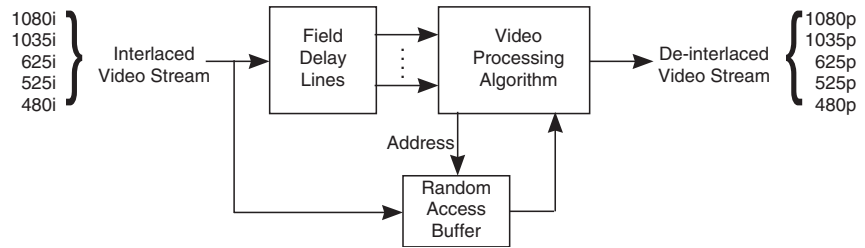
\*Assuming that the current input Field is 0, and that each field contains less than 12Mbits of pixels

In high-resolution HD formats, where a field is approximately 12Mbits, two LF3312 devices must be used to handle the depth of data. In this situation, each device handles one field. Each LF3312 should be configured as a "Single Channel" memory.

Multiple fields are generally required by a motion adaptive algorithm. This algorithm defines what constitutes 'motion', determines where the motion is heading (motion vectors), and calculates how to adapt the coefficients of the 'filter' to best accommodate this motion.

In addition to simple field delay lines, it may be important to use memory solution that allows fast access to arbitrary regions (Random Access) of a field or frame with little controller overhead. This is often true when motion vectors are used. The memory can be used both as a flexible video 'source' and as a 'target'.

### Motion Adaptive Algorithm for Format Conversion

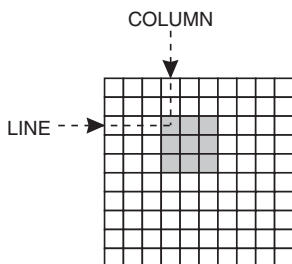


A motion vector identifies a section of a field/frame and where that block of pixels are likely headed. The vector can describe where a block of video from a 'source' should be written onto the 'target'. This vector information can be translated into addresses and applied to the LF3312.

The LF3312 has the capability of behaving like a Random Access memory in that one can write or read to/from arbitrary locations of memory on a clock-by-clock cycle basis. To further simplify video buffering, the linear address of the memory can be internally organized and accessed using separate vertical (line #) and horizontal (column #) addresses.

The LF3312 can be configured to support random access writing OR random access reading. In these 'Random Access' modes, the port (write/read port) not configured as having Random Access is configured as being a sequential access port. That is, this 'other' port's pointer acts like a FIFO sequential pointer. The Random Access port has the option of addressing the memory in a row/column fashion, as shown in the above diagram.

### 2-D Row/Column Addressing



A region of pixels associated with motion can be detected and isolated in a field/frame using Vertical/Horizontal Random Access addressing