ABA Engineering Academy Continuing Educational Series:
"Understanding Component Video"

Component Video is a common way to connect consumer home-theater equipment such as flat panels, televisions and VCRs or DVDs together. It carries a 4:2:2 YCrCb analog signal in separate form over a three-coax patch cable. Often the connectors are labeled as Y, PB, PR. It is higher quality than S-Video due to separate cables.

All conventional methods of sending an analog video signal from one device to another involve a few basic types of information.

These types are the scan information (e.g., when does a line of video start and end, and when does a frame start or end?), the brightness information (how bright should this part of the image be?) and the color information (what color should this part of the image be?). Composite video, s-video, component video, and the various types of RGB video all constitute different methods, or formats, for delivering this information. At one extreme is composite video; all of the information, from the sync pulses used to deliver scan information to the luminance (brightness) and chrominance (color) portions of the signal are all delivered as one unified, "composite" signal, traveling down one wire.

At another extreme is RGBHV; instead of one wire, there are five, carrying horizontal sync, vertical sync, and the brightness of each of the color components, red, green, and blue.

Component video is akin to RGBHV, in that its color information is broken out into pieces to keep red, green and blue separate. However, instead of delivering red, green and blue as such, component video is what is known as a "color-difference" signal.

To reduce the number of connections from five to three, the horizontal and vertical sync signals are combined with one of these signals, so that we have three connections.

The "green" connection, rather than carrying green as such, is the Y, or "luminance," channel, and in addition to carrying a signal for the total brightness value, it carries the sync pulses.

The "red" channel, Pr, instead of carrying the red value, carries a difference signal: R-Y, or red minus total luminance, usually referred to as "Pr."

The "blue" channel, likewise, carries B-R, blue minus luminance, or "Pb."

The display interprets the Y, Pb and Pr components of the signal and derives the values of red, green and blue from them. This, combined with the scan information, allows the display to render the intended picture.

Component video is a multiscan format, which is to say that it may be delivered, unlike composite or s-video, in however many lines and at whatever frame rate one wishes, in either interlaced or progressive scan modes. This is why, when you're hooking a DVD player up to a display, progressive scan mode is ordinarily only available through the component video output; and this is also why, when dealing with a device like an HD TiVo, one can only get the high-definition analog output when using a component video cable connection.