SCENE SAVERS
Making History Modern

Analog Video Connections
Which Should I Use and Why?

When converting video to a digital file, there can be several options for how the deck is connected to your digitizing work station. Whether you are doing this work in-house, or outsourcing the work, it is important to understand the different types of video connections and which should be used for the best quality.

For the sake of brevity, this article will only focus on NTSC analog video. Converting digital video adds a level of complexity both in terms of available connections and the proper way to digitize content from tapes. These concerns won't be addressed in this article.

Let's begin with identification of formats and an explanation of how video information is carried over the different connections. Analog video includes the following, along with the type of video connection typically available:

	Analog Connections			
Analog Video Format	**RF**	**Composite**	**S-Video**	**Component**
VHS & S-VHS	x	x	x	
1/2" EIAJ & 1/2" CV Video	x	x		
3/4" U-matic Video	x	x	*sometimes*	
1" Video (Type A, B, & C)		x		
2" Quad Video		x		
Betacam & Betacam SP Video		x	x	x
Betamax Video		x	x*	
Hi-8mm Video		x	*possibly*	

Betamax has S-video connection on later model machines

The following types of connections are discussed in order, from worst to best quality: RF, Composite, S-Video, & Component.

RF Connector (Radio Frequency): RF is the oldest type of connection for analog video (and audio) and is most familiar to those of us who had older television sets. It is the same type of connector typically used with cable and consists of a central wire that carries audio and video information, and a ground. Sometimes, the video output from a tape deck would use a modulator, which allowed the video and audio information to be played on a specific channel on an analog television set (usually channel 3 or 4). Remember how you used to have to tune your television to channel 3 or 4 to watch your VCR? Ok…maybe I'm showing my age, but this was because of the modulator in the VCR.

424 SCOTT ST. COVINGTON, KY 41011
859.291.5100
www.scenesavers.com

RF is the lowest quality connection and should only be used as an absolute last resort. For instance, I was recently at a client location and they had an older ¾" U-matic videotape deck and a modern, flat-panel television. The television did not have any composite video inputs available, so the only possible connection was from the RF output on the tape deck to the RF input on the television. Since this is only being used as a viewing station to determine content on the tape, this is acceptable, but this connection would not be suitable for making copies of tapes.

RF Video Connector

Composite Video: Composite video combines all of the video information, including Chrominance, Luminance, Hue and Saturation onto one video cable. This is connected from the deck using either an RCA or a BNC cable (shown below).

Without getting too technical, a YUV video signal (which is typical analog video) is comprised of three different signals, Luminance (signified as "Y"), "U" and "V" carry the chrominance information, which is hue and saturation. Going back to the days of black & white television, luminance information was sent as a main carrier, while chrominance information was sent as a subcarrier (a subcarrier is a separate signal carried along with the main signal which carries additional information, such as audio, or in this case, color information). It was designed this way so that color broadcasts would be compatible with earlier B&W televisions. The B&W televisions simply ignored the additional color information (the subcarrier).

While convenient because only one cable is required, this type of connection usually results in noise in the video signal because of crossover between the different signals and because frequency modulation is required to combine all signals into one. Once the video signals are combined into a composite video signal, they can't be cleanly separated again, resulting in images that aren't as crisp and colors that aren't as sharp as the original. Note that, while RF can carry audio and video on the same cable, Composite cables only carry video information, with audio being carried on separate cables. If your composite cable or connector is RCA, it is usually yellow; red and white typically represent right and left audio.

SCENE SAVERS
Making History Modern

Typical RCA cable

Typical BNC cable

RCA Video and Audio Connection

BNC Video Connection

S- Video (Separated Video): S-Video is a single cable that usually has 4 pins (see image below). Don't confuse the connector with S-VHS, which is a method of recording higher resolution to a VHS cassette. This type of connection separates luminance and color information, as compared to a composite signal which combines them. Because of this, it can be referred to as a Y/C cable, with Y being Luminance and C being color information. Since the luminance signal is carried on its own wire, there is no crossover with the color information, resulting in a cleaner video signal. While not as high a quality connection as a component video connection, it offers higher quality than a composite connection.

S-Video cable and Connection

424 SCOTT ST. COVINGTON, KY 41011
859.291.5100
www.scenesavers.com

SCENE SAVERS
Making History Modern

Component Video: S-Video can be considered a type of component video, because the luminance and color information are separated into individual components. However, when talking about component video in a professional environment, most people are referring to three individual wires that carry the video signal. This is often referred to as YPbPr or Y, R-Y, B-Y. This is because of the way the video signal is separated. Y, again, is luminance. Pb is blue color information and Pr is red color information. Green is not represented because the device receiving the signal can reconstruct the green channel by combining the Y (luminance) and R-Y and B-Y (color difference signals), so the green information doesn't need to be transmitted. Basically, you have luminance, red minus luminance and blue minus luminance being sent to your capture or display device (showing how much red or blue information is in the signal, relative to luminance).

Component video is the best quality video, because the luminance and color information are not mixed. Since there is no degradation in quality over the cable or at the receiving device (where the device might not be able to accurately separate luminance and color back into individual components from a composite source), the displayed image is nearly identical to what is being sent.

Here is a bit of a strange trick. If you have a component output on your source and a component input on your receiver (either television monitor or capture station), but you don't have component cables, you can still connect these together using typical analog audio and video cables. Often a composite video cable will be combined with stereo audio cables (red and white). You can use one of these cables to connect the three outputs from your source to the three inputs on your destination. Just make sure to connect Y to Y, Pb to Pb and Pr to Pr. Simple.

Component video cables

Component video inputs

424 SCOTT ST. COVINGTON, KY 41011
859.291.5100
www.scenesavers.com

SCENE SAVERS
Making History Modern

So what does this all mean?
Some source formats were recorded using composite video, such as 1" Type C and U-Matic. When converting these formats to digital file, you will likely only have a composite output from your deck, so this is the best quality you can use for these formats. However, other formats, such as VHS may have S-Video or Betacam SP may have component video. Make sure to use the highest quality connections when viewing or digitizing your source materials. If you're working with someone handling your materials, ask them how they connect the equipment for the digitization. Using the best signal path will result in the highest quality digital files.

424 SCOTT ST. COVINGTON, KY 41011
859.291.5100
www.scenesavers.com