JVC Professional's CineLine; Enhanced Video for Today's Independent Filmmaker

Brian A. Rutz
District Sales Manager
JVC Professional Products Co.

For many years there has continued a merging of videotape and film. With the advent of products such as Rank Cintel's Flying Spot Scanner, producers began to take advantage of the speed and cost efficiency of videotape as a method of finishing productions destined for the small screen. Programs could be shot on film for that "film look" yet the post-production process, assembly, titling, color correction, audio sweetening, etc. was accomplished in a much shorter period of time.

But still, the look of videotape did not really lend itself to the actual shooting of motion pictures or episodic television. Programs shot on tape looked no different from the news or other live productions and did not have the archival look of film to say nothing of the resolution. Many attempts were made to create electronic cinematography using analog videotape but the systems were very expensive.

Today, there are high definition (HD) systems on the market but they too, cost a great deal of money and are well beyond affordability for the independent film maker.

Many productions have been shot on videotape utilizing the PAL (625/50) format as the frame rate in this television standard is 25 frames per second (fps), very close to film's 24fps. But PAL equipment is much more expensive to purchase and maintain than NTSC (525/60) equipment.

With the advent of high quality, lower cost digital videotape recording systems, video production equipment for independent producers became more affordable. A number of film-release productions have been shot on digital tape, some more successfully than others.

Manufacturers of video cameras and recording equipment have introduced a handful of products capable of recording at 24 frames per second (24Psf; Progressive segmented frame or 48 "fields" per second) in an attempt to satisfy the demand for video production/ film release.

But what has been missing in much of this is the quality of the video image produced by the camera section of the camcorder, something ultimately much more important than the frame rate.

JVC's engineers realized this and began to investigate ways of modifying the camera to provide a more film-like result on digital videotape.

THE JVC PROFESSIONAL APPROACH

Before a camera can be designed to provide a more film-like image the technology had to be in place to allow it to happen. JVC Professional's unique and powerful Digital Signal Processor (DSP) employed in today's camera systems was the key to opening the door.

First, some basics: The camera section of today's camcorder is essentially an analog device. The Charged Coupled Devices (CCDs) used as image sensors are analog components. They must be so. After all, light and color are both analog, as are our eyes.

These CCDs are also capable of producing much more video or "dynamic range" than we can normally handle; a whopping 400%. Obviously, we cannot in fact simply record this much video so some way had to be found to handle it. Most manufacturers tend to apply what is called a "pre-knee" circuit to this video prior to it going through the analog to digital (A/D) process. Generally speaking, this video is attenuated above 115% so that the actual video entering the A-D converter is greatly reduced and thus more easily and less expensively handled.

JVC does things differently. The full 400% video actually goes through the A-D converter allowing the eventual recording of bright areas of the picture with accuracy virtually unattainable in other camera systems. The importance of this will be discussed later. Once in the digital domain, the signal then enters the Digital Signal Processor where it can be manipulated and controlled to provide the utmost picture quality, resolution and colorimetry.

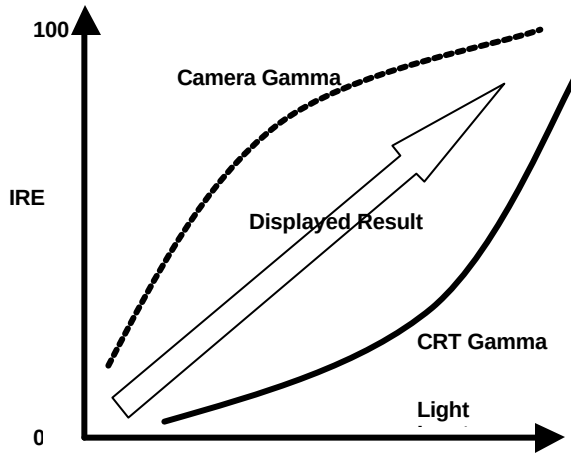

Fig. 1: CRT and Camera Gamma Curves

JVC cameras provide accurate video gamma. Gamma, as defined by the American Cinematographer Video Manual, "describes the tonal reproduction characteristics of a video signal." Basically, the relationship between the light coming into the camera versus that which is displayed on a monitor (CRT). Ultimately what we want to see is a perfectly flat response from the black or dark areas of the picture all the way to the white or brightest areas. Were it that simple!

All CRT monitors have a concave gamma response as indicated in Figure 1. Quality cameras are designed with a gamma "curve" the inverse of that of the monitor (Fig. 1) so the resultant gamma appears as a straight line. If the camera's gamma characteristic is not exactly the opposite of the monitor the color reproduction will be incorrect and may present a darker or reddish skin tone.

A camera with an incorrect gamma curve also makes lighting more challenging especially in the darker areas of a scene.

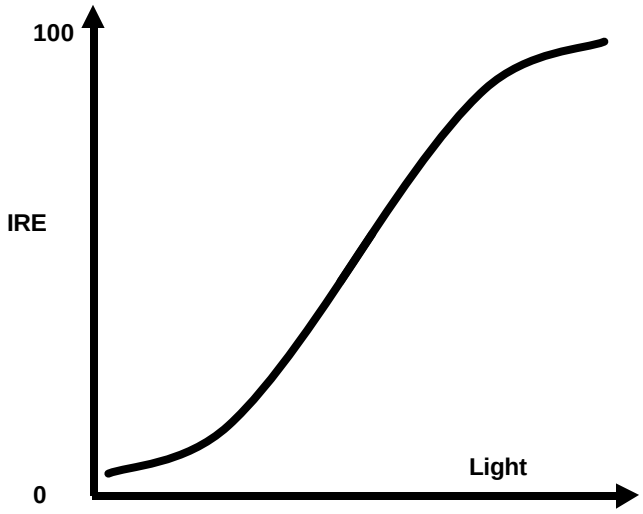

Fig. 2: "Film-like" Gamma Curve

Film stock, on the other hand has a curvilinear gamma curve as indicated in Figure 2. As can be readily seen, the gamma is extended through the dark or black areas of the picture and again in the bright or white area. The actual shape of the curve varies with different film stocks and the stock is chosen for its specific "look".

JVC's CineLine camcorders, the GY-DV700WUCL (MiniDV format; 4:1:1/25) and the DY-90WUCL (D9 format; 4:2:2/50) provide a number of different gamma curves allowing the producer much greater creative freedom.

Figure 3 displays pictures taken of two views from a standard video waveform monitor and represents a gray scale chart shot with a CineLine camcorder. In the upper display the straight line gamma of video can be readily seen (the "X") while the lower display shows the more curvilinear film-like response. The left part of Figure 3 shows the easily accessible menu settings for the various gamma curves. Just as with different film stocks a producer can choose the gamma curve most applicable to the production.

MENU	GAMMA	
MAX		0.45
7		0.45
6		0.45
5		0.55
4		0.66
3	S+3	
2		S+2
1		S+1
NORMAL	S	
-1		S-1
-2		S-2
-3		S-2
-4		S-2
-5		S-2
-6		S-2
-7		S-2
MIN		S-2
OFF		OFF

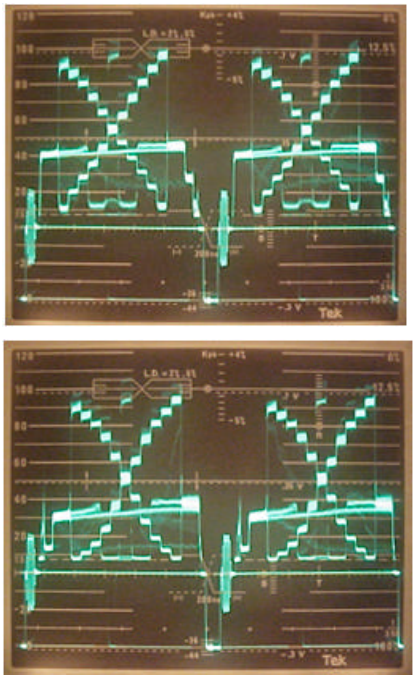

Fig. 3: CineLine Menu Settings and Waveform Displays

It is relatively easy to deal with the black (dark) areas of the picture utilizing varying amounts of black compression. This is the lower area of the film-like gamma curve. Many other cameras including JVC Professional's GY-DV300 and GY-DV5000 camcorders provide an enhanced black compressed gamma curve referred to as CINEMA mode.

But the CineLine camcorders go much further. Not only do the different CineLine gamma settings provide a range of black compression, they also give the producer corresponding curves in the brighter area of the picture.

Here's where that 400% dynamic range comes into play: Because the JVC cameras do not throw this video information away the bright areas of the picture – such as the back window of a car shot from the inside – still show much of the detail of the original scene. These video highlights are "squeezed" into the upper areas of the picture between approximately 85% and 110% video. With most other cameras, the window would appear as only a large, soft, shapeless white area.

JVC employs the use of a powerful auto knee circuit which dynamically addresses these bright areas, increasing and decreasing the video level as necessary. It is this which allows the CineLine cameras to provide curvilinear control over the bright areas in the picture to satisfy the needs of the production.

And then there is the legendary sensitivity or low light capability of JVC's cameras. By rough calculation the DY-90WUCL and the GY-DV700WCL can provide the equivalent of 2000 ASA.

JVC empowers the filmmaker with many more tools built right into the camera. Black Stretch and Black Compress are easily accessible via a switch located on the operator side of the camera. In the easy to use menu system an operator can find control over Master Black Level, Detail, Color Matrix, and Skin Tone Detect. A Time Code input and output is provided to provide SMPTE Time Code to or from outboard equipment such as synched audio recorders and smart slates.

A film-like look is but a menu item away and can be called up in seconds. Of course the CineLine camcorders may be used for high quality video productions as well!

With the power of JVC's CineLine technology, today's independent filmmakers can get the quality they need at a price they can afford.