Jimmie Songer and the Development of Video Assist

by David Waelder

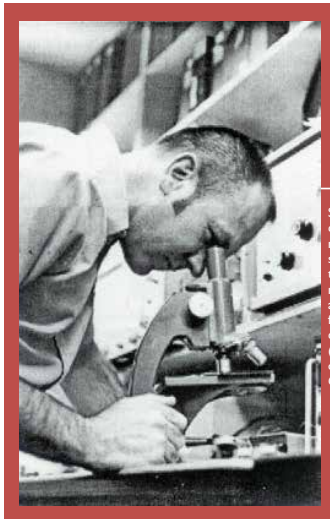
Video Village is a standard feature on the modern movie set. Producers, writers, clients and others can view the action clustered around a monitor far enough away from the set to stay out of trouble. Their segregation in the video ghetto allows camera people and others to go about their tasks without the distraction of people jockeying for position at the viewfinder. It also helps makeup and wardrobe personnel to see how their work appears on camera and it has become an essential tool for the director and continuity person. Even the sound crew benefits by having extension monitors to see the frame and position the boom microphone. All this is made possible by a video assist system perfected by Jimmie Songer, a Local 695 technician.

The advantages of using a video camera as an aid to directing movies were apparent from the very beginning. Several directors began to set up TV cameras adjacent to the film camera so they could see an approximate frame. This became a common practice particularly on commercials where the placement of the product is crucially important. To match the view and perspective, assistants would carefully adjust the aim and image size to closely approximate the view of the film camera.

Of course, that isn't really a video assist system. The image is useful for the simplest shots but not much help when the camera moves or the lens is adjusted. Every setup change or lens adjustment necessitates a recalibration of video camera position and exposure settings. To be a fully functional system, both the video and film cameras would have to view the scene through the same lens to avoid parallax errors and exposure sensitivities would have to track together. This presents a series of technical challenges.

It was a cowboy from East Texas with little formal education who took on the challenge and worked out all the engineering obstacles. Jimmie Songer grew up on a ranch in Burleston, south of Fort Worth, with a keen interest in how radio and television worked. He and his friend, Don Zuccaro, would purchase crystal radio kits, assemble them and string the antenna wire along his mother's clothesline.

As a teenager, he took a road trip that would set up the course of his life. He and his friends traveled north as far as Bloomington, Indiana, when funds began to run out. Looking for a job to replenish assets, he applied to the RCA plant on Rogers Street. Ordinarily, his lack of formal training would have been an impediment but RCA was just then



Some of the circuits were miniaturized to such a degree that it was necessary to use a microscope to follow the traces, circa 1971. (Photo: Courtesy of *American Cinematographer*)

experimenting with designs for color sets and there was no established technology to learn. By diagramming from memory the circuit design of a popular RCA model, he demonstrated familiarity with the major components and was hired on the spot to be a runner for the engineers developing the new color system.

His duties at RCA consisted largely of gathering components requested by the engineers and distributing them. Along the way, he asked questions about the function of each element and how it fit into the overall design. He stayed about a year, not long enough to see the model CTC4 they were developing go on sale. That didn't happen until a couple of years later in 1955. But, when he did move back to Texas, he had a pretty good understanding of how video, and color video in particular, worked.

Graduating from crystal radio sets, he and his friend, Don Zuccaro, made a mail-order purchase of plans for a black & white television. Components were not readily available at that time but Jimmie and Don were ingenious and purchased a war surplus radar set with A&B scopes and cannibalized it for parts. The task of hand-winding the tuning coil was simplified because Fort Worth had only one TV station so there was no need to tune anything other than Channel 5.

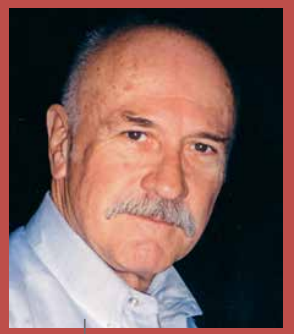
With skills honed from building his own set and working at the RCA plant in Indiana, Jimmie Songer quickly found work with appliance shops in the Fort Worth area that were beginning to sell television sets but had no one to set them up, connect antennas and service them when needed. This led to an offer, in 1953, to work setting up KMID, Channel 2, in the Midland Odessa area. After a few years with KMID, he worked awhile in the Odessa area and then returned to Fort Worth but he stayed only a year before setting out for Los Angeles in April 1963.

In Los Angeles, he worked at first for a TV repair shop in Burbank while he tinkered with his own experimental projects. Hearing that Dr. Richard Goldberg, the chief scientist at Technicolor, was looking for people with experience with color, he sought him out and secured a job calibrating the color printers. Dr. Goldberg was also developing a two-perforation pull-down camera for widescreen use. Songer became fascinated by the possibility of using that design at 48 fps to make alternate images, one atop the other, which might be used for 3D and built some experimental rigs to test the idea.

This work with Dr. Goldberg in the early '60s brought him to the attention of Gordon Sawyer at Samuel Goldwyn Studios. Sawyer wanted him to help with an ongoing project for Stan Freberg involving simultaneous video and film recording. Freberg was using side-by-side cameras to create video records of film commercials. The side-by-side positioning produced parallax errors but his commercials were mostly static. Generally, the results were good enough for timing and performance checks. But issues of accurately tracking motion would arise whenever the camera did move and Stan Freberg wanted a better system.

Under general supervision from Gordon Sawyer, the team first addressed the issue by adjusting the position of the video camera. They attached a small Panasonic camera to the mount for an Obie light. This put the video lens exactly in line with the film camera lens and only a couple of inches above it. Left-right parallax was effectively eliminated and the vertical alignment could be adjusted to match the film camera with only minimal keystone effect. By affixing a mirror just above the lens mount at a 45-degree angle and mounting the video camera vertically to shoot into the mirror, they reduced vertical parallax to almost nothing. Jimmie Songer addressed the keystone problem by devising a circuit that slightly adjusted the horizontal scan, applying an opposite keystone effect to neutralize the optical effect that was a consequence of slightly tilting the video camera to match the film camera image. Most of the time, this system worked well but there were still limitations. The video system needed to be recalibrated with every lens change. Even with careful adjustment, use of a separate lens for the video meant that depth of field would be different so the video image would only approximate the film image. Blake Edwards knew Gordon Sawyer and approached the team to design a system suitable for movies with moving cameras and frequent lens changes.

The limitations could only be resolved if the video camera used the very same lens used by the film camera. Accomplishing that would



A recent picture of Jim Songer. (Photo: Courtesy of Mr. Songer)

require exact positioning of the video lens and adjusting sensitivity of the system both to obtain sufficient light for exposure and to track with the film exposure. Jimmie Songer set about developing a system that could be built into a Panavision Silent Reflex camera (PSR) that used a pellicle mirror to reflect the image to the viewfinder. They left the image path from the lens to the film completely untouched but introduced a second pellicle mirror to reflect the image from the ground glass to a video camera they built into the camera door. This one design change eliminated many of the limitations of previous systems in one stroke. Since the video used the film camera lens and picked up the exact image seen by the film and the camera operator, issues of parallax and matching depth of field were completely eliminated. There was no need to recalibrate the system with every lens change and the video camera was configured to use the same battery supply as the camera. The introduction of a second pellicle mirror did flip the image but Songer corrected this easily by reversing the wires on the deflection coil. But the issue of having sufficient light for the video image still remained.

In one way, a pellicle reflex system is ideal for video use. Unlike a mirror shutter, the pellicle system delivers an uninterrupted image to the viewfinder so there is no need to coordinate the 30-frame video system with a 24-frame film camera. While there would be more frames in a single second of video, the running times would match and that was all that was important. Furthermore, the video image would be free of the flicker seen in the viewfinder of a mirror shutter camera. However, the pellicle mirror used in the reflex path deflected only about one-third of the light to the viewfinder. That was no problem when filming outside in daylight but there was insufficient light when working interiors.

Jimmie Songer needed to make three refinements to the system to address the exposure issue. First, he replaced the vidicon tube that was normally fitted to the camera with a newly available saticon tube that was more sensitive and also provided 1,600 lines of resolution. That helped but wasn't enough. He then adjusted the optics so that the image, rather than being spread over the full sensitive area of the tube, was delivered only to the center portion. By concentrating on the image, he obtained more exposure and adjusting the horizontal and vertical gain allowed him to spread out the smaller image to fill the monitor. But, there are limits to how much can be gained by this approach. Even with a high-resolution saticon tube, the image will

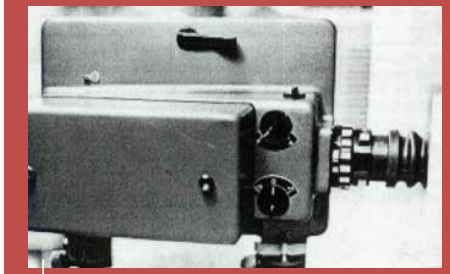
begin to degrade if magnified too far. There was still not enough light for an exposure but the video system had been pushed to its limits so Songer turned his attention to the film camera.

Recognizing that the ground glass itself absorbed a considerable amount of light, Songer contacted Panavision and asked them to fabricate a replacement imaging glass using fiber optic material. Although the potential of using optical fibers for light transmission had been recognized since the 19th century, the availability of sheets of tightly bundled fiber suitable for optics was a recent development in the 1960s. The fiber optic ground "glass" was the trick that made the system work, allowing the video camera function with the light diverted to the viewfinder.

Jimmie Songer and his assistant used the system, first called "instant replay" but now renamed "video assist" to avoid confusion with sports replay systems, on *The Party* in 1968 and then *Darling Lili* in 1970. It worked flawlessly, delivering the exact image of the main camera so Blake Edwards, the Director, could follow the action as it happened. It never held up production; to the contrary, Edwards said that it streamlined production because the certain knowledge of how the take looked freed him from making protection takes.

After *Darling Lili*, the key figures behind the project formed a company, Video West, to further develop the system. They met with rep-

The Ampex 660 was an early broadcast-quality video recorder. Jim Songer bought one of the first examples but modified it extensively for work in the video assist system.



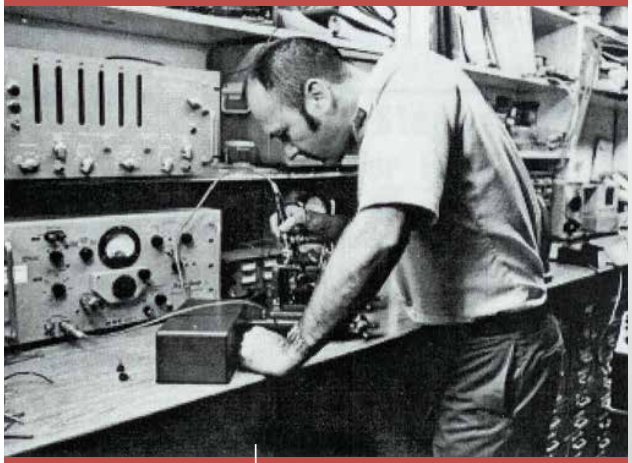
The first production examples had the video camera built into the door of a Panavision PSR camera.
(Photo: Courtesy of *American Cinematographer*)

resentatives of the ASC to draw up a series of specifications for video assist systems. Don Howard was brought in to interface the camera with the playback system and operate it in the field. Harry Flagle, the inventor of Quad-Split viewing technology and one of the Ampex engineers who worked on the development of the Model VR-660 portable two-inch recorder, joined the team soon after.

They next used the system on *Soldier Blue*, directed by Ralph Nelson, and then *Wild Rovers*, again with Blake Edwards. It proved so popular with producers that Songer and Don Howard, his assistant who was primarily responsible for operating and cuing the video recorder, scheduled projects months in advance and went from film to film. The work was so tightly booked that they sometimes had to ship the camera directly from one project to the next without a return to the shop.

Jimmie Songer joined Local 695, sponsored by Gordon Sawyer, shortly after *Darling Lili* and continued as a member until his membership was transferred to Local 776 in 1997. In the course of his career, he obtained seventeen US patents for a variety of innovations in high-definition TV and 3D video imaging.

In 2002, he received a Technical Achievement Award from the Academy for his work developing video assist. He lives today on a ranch near Fort Worth but continues to refine the video engineering work that has been his life.



Jim Songer at his workbench, circa 1971.
(Photo: Courtesy of *American Cinematographer*)

Glossary

Deflection coil – In a CRT (cathode ray tube), the beam of electrons is aimed by magnetic fields generated by coils of wire surrounding the tube. Adjusting the electrical energy sent to different coils directs the electron stream.

Obie light – A diffuse light mounted very near the camera lens, typically just above the matte box, to provide soft fill on faces in close-ups. Lucien Ballard, ASC developed the light to photograph Merle Oberon after her face was scarred in an auto accident.

Pellicle mirror – A semi-transparent mirror used in optical devices. A pellicle reflects a certain percentage of light and allows the remainder to pass through. In the Panavision PSR camera, a pellicle mirror deflected approximately 30% of light to the viewfinder and passed about 70% to the film plane.

Saticon tube – A saticon tube is a refinement of the vidicon tube design that adds particular chemicals to the photosensitive surface to stabilize the signal.

Vidicon tube – A vidicon is one of the early image capture devices made for television cameras. An image focused on a photoconductive surface produces a charge-density pattern that may be scanned and read by an electron beam.

Video Assist

A quote, attributed to Tacitus, claims that success has many fathers while defeat is an orphan. It's just so with the invention of video assist which is claimed by several people. Jerry Lewis is often cited as the inventor and he certainly incorporated simultaneous video recording in his filming practices very early. He began development work in 1956 and first used a video record and playback system during the filming of *The Bellboy* in 1960. He used the system to view and evaluate his own performance immediately after each take. But the system he used on *The Bellboy* was the simplest version; a video camera was lashed just above the main lens and would be adjusted to approximately match the view of the film camera lens with each setup. Later, Jerry Lewis also worked to develop a system that would use a pellicle mirror to view the image through the primary lens.

The assertion that Jerry Lewis "invented" video assist is overstated. The original patent for a video assist system dates to 1947 and subsequent patents in 1954 and 1955 added the refinements of merging optical systems to eliminate parallax and adding a second beamsplitter to permit simultaneous use of video and film viewfinders. The integrated video systems that came into general use in films were the work of many individuals each building on the accomplishments of predecessors. Jimmie Songer's contributions were many and essential as recognized in 2002 by the Academy of Motion Picture Arts and Sciences.