Matthew Schlanger's video hardware development work for the Experimental Television Center, and for Design Lab, included a contribution in building the last generation of custom Jones analog and digital image and sound synthesizers currently installed at the Television Center. He also has constructed various audio and video synths including a unique modular Jones video synthesizer.

While an undergraduate at Binghamton University, Matthew Schlanger had worked with Richard Brewster, learning circuit design and construction and building his first audio synth intended also as a control and image source for the Hearn Videolab on campus. Though Rich and Matt had met at the Experimental TV Center, where Brewster was working building video and audio hardware with David Jones, Richard had left the Center some years before and was back at Binghamton studying philosophy and playing bass and synthesizer with his new band (2 years earlier when working at the ETC, Rich played bass with the Flux, an early band of Lee Rinaldo, of Sonic Youth fame). Richard had been responsible for building a great deal of the ETC's first generation of Jones/Brewster video synthesizers and ETC's dual yellow box analog synthesizer. Schlanger's first analog synth was built with designs taken from Bernie Hutchins' Electranotes and The Preferred Circuit collections, as well as modules based on Curtis Music chips and circuits designed by Brewster.

Schlanger studied video and cinema with Ralph Hocking and upon graduating was invited by David Jones to participate in a weekly meeting of video synthesizer construction. It was called the Tuesday afternoon club. Peer Bode, Barbara Buckner, Mimi Martin, Neil Zusman and Schlanger would gather at Jones' house in Barton NY. Circuits were hand wired in David's Lab. All were Jones designs and the work was generally limited to video synths. Jones had many ideas and was not able to prototype them all fast enough. The group became the prototypers and built their systems in the process (unfortunately sometimes the prototypes did not always turn out to be as good as the final published designs). Each person was given the choice of what they wanted to build, and Jones was responsive to creating personal modifications for each system to meet the personal needs of the builder. Peer built a prototype of the Jones frame buffer. Zusman was working on a modular synth and completed a sync repositioner that turned a Sony AV3400 black and white camera into a wobulator. Mimi Martin was working on a colorizer. Schlanger completed a modular Jones video synthesizer that became the core of his system. David would write schematics on notebook paper, give pointers on construction and test each circuit or circuit element upon completion. Mostly David would build and draft while others constructed circuits around him.

After some time Schlanger began constructing synths for the ETC, Design Lab, and for Ralph Hocking. Schlanger participated in the four board project which was funded by a NYSCA grant and whose goal was to build four circuit boards, based on David Jones designs, considered basic building blocks for personal video systems. Up to this point the project was behind schedule and hiring Schlanger was intended to push the work forward. The four circuit boards were a keyer, a sequencer, a colorizer, and a high frequency lockable video oscillator. Though each circuit design benefited from the prototyping that

had been taking place at David's house, each printed design was significantly different from what came before. The grant also included building these same modules for the ETC. Schlanger taped-up the circuit boards for photo-processing (this was before CAD was readily accessible) and built the current Jones colorizer, the dual keyer/ sequencer, and the Jones Oscilator bank which are installed at the ETC (the oscillator bank had been started a year or so before and some of the circuit boards were hand wired by Neil Zusman and others). Schlanger also built the ETC routing switcher and the Jones Frame buffer. The frame buffer project was also funded by NYSCA and included the construction of four buffers. Schlanger built all four as well as one for himself. (The first four buffers were later, upgraded and transferred from the surplus racks so often used in ETC construction to a more contemporary, roomier and cleaner package by David himself.) Schlanger also repaired and modified existing ETC synths as was needed.

Aside from the construction itself, Schlanger's contribution included design and modification of some circuits, documentation , interface design, and the addition of 2nd level controls in places not originally planned for. Printing circuit boards had allowed the development of hardware at the ETC to accelerate, but the wiring of the boxes still took a great deal of time. As the Jones synthesizers had more second level control than any other video synths they also took the most time to wire. (In designing a synthesizer this is one of the parameters to consider as many circuit boards have been built which have never made it to being wired into a case.)

Schlanger's own video system had evolved during this period. Matthew left Owego in 1985 with a system that included a multi-module video synthesizer, a frame buffer, and three racks of audio synth modules designed for music, control and image sourcing.

Schlanger's Jones video synthesizer is comprised nearly exclusively of Jones designs. The Schlanger/Jones video synth includes a video patch panel made of an inset piece of hardwood with minijacks carrying 2vpp differential video (subsequent modules use Plexiglas). The advantages of this standard is that it limits crosstalk and noise, and making a video signal negative one simply uses a cable that flips the polarity of the wires. It was thought for a time that this system would be embraced by Jones in general, however no synthesizer at the ETC uses the format (the system at the ETC patches standard single ended 1v video through a slide matrix). Using differential video was a great idea but as an unusual standard it only made sense for patching within the panels of multi module synthesizers, and other than a few of the Tuesday afternoon participants, it was an idea that was not really implemented. Unfortunately Jones never manufactured multi module synths as Hearn did.

Unlike the processors that were built for the TV Center, second level control on Schlanger's video synths includes both audio rate and video rate inputs. All analog (audio synth) control is input on minijacks and uses a +-5v (10vpp) standard, and 0-5v for logic control signals (these inputs are buffered to prevent damage from miss-patching). The video rate control inputs uses the 2vpp differential standard. This synth includes 2 luminance keyers, two video comparators, an eight channel sequencer, 2 4-input video mixers, 2 pos/neg video amplifiers, a sync generator, sync distribution, a black burst

module, 2 subcarrier phase shifters, 4 high gain input amplifiers, and an output amplifier. All the modules are voltage controllable.

The keyers, and mixers include amplifiers on the video inputs that offer control for gain and pedestal (knobs, +-5 VC jacks, and video rate VC jacks for each). This offers a great deal of control but also demands a great deal of adjustment for each patch. The video VCAs (the pos/neg voltage control video amplifiers) are different in that they have a gain control that goes from full negative to full positive with 0 gain in the middle of the pot. They also have both an input pedestal and output pedestal control (not totally uncommon in Jones synths).

The keyers (one is a prototype and one a customized version of the keyer that came from the four board project) are hard edged and, as indicated, have gain and pedestal for each channel input. They also have switching for on/off and normal/reverse, as well as logic inputs for force A and force B. One approach for colorizing is to patch phase-shiftable subcarrier into the video rate VC input of a pedestal for a given video signal (often a pedestal of one of the keyers). Additional color control can be offered by first patching the phase shifted subcarrier through a video amplifier, affording amplitude control of the subcarrier.

The comparators can be cascaded into either digital or analog control inputs and used to control the video mixer. But as they are also hard edged these elements ended up not being as useful as was hoped, there were already 2 hard edged keyers in the synth. Still a comparator is an important conceptual element in video synthesis. Keying with a Hearn is accomplished by using the “key Source“ modules to control video sources in the mixed video amp matrix. The key source modules output hard-edge (like a comparator) and soft edge control signals (a high gain amplifier with gain control). The later yielded nice results.

Schlanger was inspired by the Hearn Videolab design and Jones designed some modules for Schlanger based on that metaphor that probably do not appear elsewhere in Jones’ synths. At the center of the Hearn is a video matrix which is 4 or 6 rows of cascading video mixers, yielding a 4x4 or 6x6 matrix. The 2 Jones video mixers are designed upon a similar concept except they are not cascaded and they have more second level control. Unlike the rest of the Jones modules, these are relatively stingy on control, each mixer has a master pedestal knob, and each channel has a a video input, a video rate gain input, an analog (+-5) gain input, and a pedestal knob. With a Hearn the matrix (the video mixers) are used for everything, keying, dissolves, sequencing, which is why there were 4 or 6 rows. This illustrates the opposition between two views of design: smaller conceptual generalized modules that can be patched together to perform functions, and larger modules that are dedicated to a single function. Hearn and Sandine synthesizers sit at the former end of the continuum while commercial video processors, a switcher, would live toward the latter end. (A similar continuum can be found in programming when deciding between very generalized versus non-generalized code architecture, and though this metaphor ultimately fails, in both cases generalization can offer both efficiency and burdens.) Jones tended toward designing complete video building blocks, like keyers and

frame buffers, rather then further break down those functions to the component parts as Hearn did. (It should be mentioned that Hearn's modular design is in part the brilliance of his synthesizer.) Schlanger built with an eye toward splitting the difference between the two approaches. With the other modules in this system, two rows of 4 channel mixers were enough. The mixers became the core of Schlanger's system, they were a great success. They allow for waveform mixing and control of video but also are used for cross dissolves and soft edge keys.

The input amplifiers are used to take single ended standard video into the synth and deliver it as 2v differential video on the patch panel. They have Gain and pedestal control and as they are high gain they can also be used with the video mixer to obtain nice soft edge keys. However, unlike a Hearn comparator, instead of offering complimentary outputs from the input amp, a "Y" cable that has one end of the Y inverted (negative) is used to drive the two sides of the key.

Schlanger's sequencer is eight channels with pedestal controls on each channel. Any oscillator, or vertical sync, is patched as a clock and channel control is obtained with 3 switches which define a binary number indicating, depending on sequence mode, which channel the sequence will count to before returning to the first channel, or which channel is on. These switches also have VC inputs so control signals can be used to seemingly randomize channel selection.

The output amp is the same as the standard Jones output amp. Though there were complaints of clipping chroma at 0 and 100 ire rather than –20 and 120, this is a very stable device that affords the user excellent control. With an input and output pedestal the user can adjust video pedestal for 0 gain and full gain.

Schlanger's Jones frame buffer is the same as the other first generation buffers he built for the ETC except that it has additional second level control. Another difference between the other Jones buffers is the addition of 2v differential video inputs and output. At first the frame buffer was controlled by a Sinclair ZX81 micro computer. Plans were made to update to a Z81 big board (or Xerox 820), but when the Amiga 1000 came to market Jones modified the I/O and software to control the frame buffer from the Amiga. This was a great improvement, with the Sinclair simple programs were written in basic. The only way to save a program was to use audio tape. For the most part the Sinclair was used to simply poke a memory location to put the buffer in the write or read mode and control came from analog patches on the panel. Here is a unique device that offers digital processing with analog control. The internal keyer cuts between a live digital plane and the memory plane. This version had 4 memory boards with 64 frames of memory. Later Jones added a pseudo color option which is also present in this version. Schlanger and others were writing routines in Amiga Basic that were compiled to C to control the buffer, however no one ever built the libraries that were needed to blank switching, so the routines tended to be a little noisy.

Schlanger's Jones synth is unique for Jones devises in that it is built as a modular synth, where as most of what Jones distributed has been buffers, keyers and sequencers built as

discrete units needing patching from standard video panels or matrix. One thing that is lacking, and it was lacking in general from Jones, Sandine and others, is a cohesive approach to color phase shifting and delay lines, as was done with the Hearn, and any commercial switcher (however the advantage of those two cases is that limiting the ways in which you can use, or patch, the device makes a phase compensation scheme much simpler to implement). In general a complicated patch will take a great deal of adjusting/tweaking and a look at the back porch can at times reveal an ugly site (a good output amp aside), most gruesome being seen from the frame buffer which had a substantial delay. But while Hearn's Videolab offers a concise metaphor and system for processing with careful consideration for phase shift and delay, it does so at the cost of simplification, though granted a Hearn can yield a great deal of variation. Schlanger's Jones system (as well as the ETC system) on the other hand offers greater variation with the addition of maximized second level control and clean stable circuits, however it does so at the cost of yielding a very complicated synth to operate. With Schlanger's Jones synth, complication of use is also increased by the panel layout. In order to save the cost of multiple cases and power supplies, and while Schlanger, like most others, designed interfaces for general consumption to be have panels divided by module and by function, his own synths tended to group all knobs, video patches and analog jacks by type, and then by module and in very tight space. This approach was learned from Rich Brewster who also did the same thing in building his personal audio synths.