Dave Muller
4155 SE DANE RD
Iowa City, IA 52240,
319-337-4962

INVOICE

September 4, 1992

Sold To:

**The Vasulkas, Inc.
Route 6, Box 100
Santa Fe, NM 87501**

	Project	Date Completed			
	Expenses for Austria trip	07/09/92			
Date	**Description**				**Amount**
05/21/92	Allied Electronics, electronics parts				$260.79
06/06/92	Radio Shack, electronics parts				$35.26
05/27/92	JDR Microdevices, electronics parts				$38.33
06/05/92	Iowa Book and Supply, Rub-on letters				$4.49
06/07/92	American Airlines, extra luggage				$103.00
	2932				
	Dave Muller				
We appreciate your business!				**Total**	$441.87

Fax: 1 page and a cover page.

Dave Muller, RR 7 Box 6, Iowa City, IA 52240
(319)-335-2076 days, (319)-337-4962 evenings

Thursday, March 19, 1992

W P
F S
F D

Woody Vasulka

The Vasulka's Inc.

Fax Number (505)-473-0614

Dear Woody,

Here is a list of necessary test equipment:

Oscilloscope, analog, 50 MHz bandwidth minimum, dual trace, delayed sweep, with manual. OK

Video signal generator. OK

2 Digital multimeters, 3 1/2 digits. OK

2 Power supplies, variable with current limiting. OK

Video waveform monitor. OK

2 Video monitors. (color, NTSC, 14") OK

Video camera. OK

Lots of patch cords. OK

And these items would be nice:

Vector scope.

Digital storage oscilloscope.

Special effects generator. — HAVE IN SANTA FE

Time base corrector. — "

Dave Muller

FAXED 5/14/92

ARS electronica

To: David Muller 319/335-1753

URGENT!

Bon Voyage,
M

TELEFAX

DATE: 14/5/92

CONC.: David's flight

PAGES: 1 (INCL. THIS PAGE)

TO: The families D. Müller
001 (505) 473-0614

Please send this fax to David's as we don't have his fax number! Thanks K.

2. Hr. Müller (possible flight → please confirm!)

07.6.92	Cedar Rapids - Chicago	11.39 / 12.44	AA 4249
07.6.92	Chicago - Amsterdam	16.30 / 07.15	KL 612
08.6.92	Amsterdam - Linz	12.50 / 14.55	KL 701
09.7.92	Linz - Düsseldorf	07.25 / 09.20	VO 453
09.7.92	Düsseldorf - Chicago	10.30 / 12.40	LH 432
09.7.92	Chicago - Cedar Rapids	14.44 / 15.58	AA4236

Abflug von Iowa City nicht möglich, nächster Flughafen Cedar Rapids

Preis für o.a. Ticket ÖS 22.420 inkl. Taxen
Ticket kann nicht mehr hinterlegt werden.
Wir müssen dieses Ticket per Post versenden !

Hoffe, Ihnen mit diesen Angaben einstweilen dienen zu können und verbleibe,

mit freundlichen Grüßen
Geo Reisen Ges.m.bH.

A. Tischler

received
June 14 '92

Dear Woody,

4-13-92

The first 5 prints are the ones Robert spent time with to get really good. They are your equipment and Moog. Then are two snapshots of test equipment and Laser Disc boxes for insurance. Then come rough prints of everything else, with dirty neg's and rough exposures. The negs are in the Kodak folder. I paid Robert Peterson 150^{00}, and I bought the backdrop paper, and some lens tissue for the video cameras, for 44.98, invoices enclosed. All measurements seemed correct except for the control boxes which you can see in the pictures, are little itty-bitty things. I will see if I can make ours match. I hope you aren't dissapointed, Dave

Dave Muller, RR 7 Box 6, Iowa City, IA 52240
(319)-335-2076 days, (319)-337-4962 evenings

received
5-11-92

Woody Vasulka
The Vasulka's Inc.
Fax Number (505)-473-0614

Dear Woody,

The truck hasn't come and I have not been called. I must go to work tomorrow, so the trucking company will have to call me there. I can meet them at home, but I can't wait for their call. They may have my work number, but perhaps you can figure out who they are and let them know for sure.

Here is my short biography. Feel free to edit it if you don't think it sounds correct.

David Muller is currently an electrical engineer working for The Department of Physics and Astronomy, The University of Iowa, Iowa City, Iowa, USA, where he designs circuits and software for a satellite instrument that will take images of the Aurora Borealis. From 1984 through 1990, Mr. Muller was an audio engineer for The Experimental Music Studios, School of Music, The University of Iowa. During this period, he developed a computer music workstation for use by composers, conducted research and taught classes in techniques of computer composition for music, video, and other media, and composed works of music and graphic arts with the computer. Before his work with The University of Iowa, Mr. Muller held several positions as an electronics technician working in various fields such as audio, music, arcade games, and industrial controls. He was an engineering student at Iowa State University, Ames, Iowa, from 1976 to 1977.

By the way, we had thunderstorms and driving rain today (Monday). I cannot believe our luck weather-wise.

See you---
Dave

Dave Muller
RR7 Box 6
Iowa City, Ia 52240
319-337-4962

Expenses for Ars Electronica project, through May 11, 1992

AMFAC Hotel 1/2 of 49.84	24.92
Fast Photo, developing	17.41
Packaging Store, packing supplies	42.08
Paul's Discount, outlet strips	64.73
Radio Shack, parts	49.61
Radio Shack, parts	10.66
Radio Shack, parts	17.00
Radio Shack, parts	30.68
Packaging Store, crates and packing supplies	938.04
Payless Cashways, lumber for monitor boxes	92.33
Hagen's Furniture and TV, 3 X-Y monitors	31.20
Nagel Lumber, crating supplies, receipt lost, Carol's check	26.22
	1344.88

FAXED 4-27-92

THE VASULKAS, INC.
99 ROUTE 6
SANTA FE, NEW MEXICO 87501

TELEPHONE: 505/471-7181 FAX: 505/473-0614

RECEIVER:

Attention David Muller

Company Name home

Fax Number 319 / ~~335-2044~~ 4962

SENDER:

Individual's Name Melissa

Number of Pages (including this sheet) 1

Dear David, April 27, 1992

Thanks for all your work and thorough response (Oops, the Jones Frame Buffer was the last page).

We have the extra week - which makes the pick up date May 11. To finalize the shipping arrangements we need to get two things from the firm that crates the machines - estimated costs and estimated final weights. Of course, we would very much like them at the low end - $1.50 per cubic foot sounds great. As far as hauling them to the airport, that is not necessary. The Austrians are responsible for arranging the pick-up in Iowa City and so we will let them.

Based upon the figuring that I have done so far - floating each item in 6 inches of stuff & adding three "XY" monitors at 45 lbs. each. Also, the JONES FRAME BUFFER can be added to the Vasulka shipment and we will send it to Gary UPS after it is returned. So, there are five separate packing lots totalling 353.5 cubic feet & 1,768 lbs (including crates):

ETC -	133 cu.ft.	1,005 lbs.	(4 alum. crates with 122 cu.ft. capacity)
Vasulkas -	55 "	351 "	(fiberglass crate = 16 cu.ft capacity)
+ Hill	3 "	7 "	
MOOG -	88.5 "	105 "	
VIDIUM	24.25 "	90 "	
CLOUD MUSIC	31.25 "	219 "	

For the ETC we'll need packing supplies - plastic, cardboard, peanuts and foam. For the Vasulkas we'll need the same plus crating for 42 cubic feet. Also everything for the other three.

Could we get the estimate very, very soon?

Gracias amigo.

Melissa

Dave Muller, RR 7 Box 6, Iowa City, IA 52240
phone (319)-335-2076 days, (319)-337-4962 evenings
FAX Monday through Friday, days (319)-335-1753
FAX evenings, call me at (319)-337-4962 and I will set it up.

received 4-25-92

Saturday, April 25, 1992

Woody Vasulka
The Vasulka's Inc.
Fax Number (505)-473-0614

Dear Woody, MaLin:

1. No banana cords came with the vidium. I have not been able to locate any of those good X-Y monitors, but I have one Tektronics storage scope with green 6.5"w x 8"h viewing area that works with a glitch I'm sure I can solve.

2. The Paik Scan Processor (Wobbulator) is great. What impedence outputs of the amplifiers do I use? or who do I call?

3. Do we get the extra week?

4. My brother told me who to get to crate the machines. They are a trucking firm that specializes in hauling computers. I will call them Monday to come out for an estimate. My brother says the going rate is $4 per cubic foot, but for friends it can go as low as $1.50, and they can do it on site. They would also haul it to the airport for us, if you want that service.

5. All Woody's test equipment (monitor, waveform monitor, sync generator, oscilloscope) weighs 60 lbs. The Tektronics X-Y monitor weighs 45 lbs.

6. How many pages did you fax me? I count 34, but the last page has a number 8 in the upper right hand corner, and page 26 says 9 pages, although it isn't numbered so there are 9 pages. The last page I got says to send the Jones Frame Buffer to Gary Hill in Seattle. Correct

7. Progress report: So far I have repaired the Muse, Siegel Dual Colorizer, and Brown Field Flip/Flop Switcher, and designed the public control boxes for them. I have not yet looked at the Multikeyer. I have operated the Moog, Wobbulator, Vidium, CVI Data Camera, Rutt/Etra, McArthur S.A.I.D. I will get everything else going tomorrow (Sunday).

8. What else needs control boxes besides your three pieces and the Moog? What about the Rutt/Etra, McArthur & Schier, Vidium and Putney? I need to order the boxes early next week to give me a long, leisurely time to build them before we fly to Austria. I plan to have the plugs installed on the instruments and the circuits verified before the instruments are shipped.

9. For the architects: The cables that came with ETC's public control boxes are 11.5 feet long. They will need pedestals to sit on.

Dave Muller

Following is a copy of the FAX I am trying to send to Fadi, but his machine doesn't answer. Am I dialing the right way?

Dave Muller, RR 7 Box 6, Iowa City, IA 52240

FAXED 4-23-91

THE VASULKAS, INC.
100 ROUTE 6
SANTA FE, NEW MEXICO 87501
TEL. (505) 471-7181/FAX. (505) 473-0614

David Muller
RR 7, Box 6
Iowa City, IA 52242
319/337-4962

Dear David,

It looks like you have become one of the center of our spreading whirlwind. I'm sending three sections to cover:

Power reqirements

Instrument descriptions

Packing

Hope you are well and looking forward to the next few months.

Warm regards,

Woody

THE VASULKAS, INC.
100 ROUTE 6
SANTA FE, NEW MEXICO 87501
TEL. (505) 471-7181 **FAX. (505) 473-0614**

Date: April 23, 1992
To: David Muller
From: The Vasulkas, Inc.
Re: Power requirements for Fadi
# of Pages - 1

Could you add the following estimates to your list and send it to Fadi in Linz:

FEEDBACK INSTALLATION		120 Watts
BUCHLA SYNTHESIZER		125 Watts
	plus audio amplifier	50 Watts
HEARN VIDIUM		200 Watts
	plus 3 XY displays @80	240 Watts
IP		160 Watts
	plus 3 video monitors	450 Watts
	plus audio amplifier	50 Watts
BECK VIDEO WEAVER		80 Watts
	plus 3 video monitors	450 Watts
MAARTHUR & SCHIER		240 Watts
	plus video monitor	150 Watts

THE VASULKAS, INC.
100 ROUTE 6
SANTA FE, NEW MEXICO 87501
TEL. (505) 471-7181 **FAX. (505) 473-0614**

Date: April 23, 1992
To: David Muller
From: The Vasulkas, Inc.
Re: Instrument Descriptions
# of Pages - 23

****

Following are some recently received written descriptions by Jeffy and notes by David Jones. More will follow, but you should be in direct contact with Jeffrey.

Jeffrey Schier - 510/653-5825 (tel & fax)

Also a note from the most recent user of the VIDIUM

The Eric Siegel EVS synthesizer

4/19/92 Jeff Schier

The EVS Video synthesizer contained many components of the Special Effects Generator, with the additions of a color encoder and free form patch matrix. Built in a BIC-VERO rack with front panel knobs and switches, a large horizontal plug matrix is present to patch together video effects. The patch panels were pulled from IBM style card sorters, with connections formed by min-banana plug cables in adorable colors. In the front of the patch panels are a row of 16 white flat rocker switches, arranged horizontally to resemble a piano keyboard. The matrix had 15 rows by 20 columns with various input and outputs scattered throughout the panel. The processing connections are carried back to the main rack unit. All voltages at the patch matrix were 1 Volt P-P allowing connection of any output to other inputs. The outputs of the modules are low impedance and can drive multiple inputs. The synthesizer box had provisions for two video input sources, and a duplicate set of video outputs.

In the rack of electronics sits circuit boards which :

1) A power supply for the modules

2) Three voltage controlled two in one out video mixers. These can switch at video rates, as well as mix the two video inputs depending on the control signal input.

3) A horizontally and a vertically locked sawtooth generator with a square and logarithmic waveform output. These can be used to form horizontal or vertical patterns for use as a video or control source. The oscillators can be independently voltage controlled and "unlocked" to the horizontal or vertical timing source, to cause the patterns to "wobble" horizontally or vertically.

4) A horizontal and vertically locked triangle/square waveform generator with logical combinations of the H and V patterns. This formed 4 basic patterns : A Horizontal bar, a Vertical bar, A square pattern formed from the "Anding" of the H and V bars, and a diamond pattern formed from the gating of the H and V triangle waveforms. All four output are available simultaneously at the patch panel. Size and position of the triangle/bars were from knobs on the front panel.

5) Dual voltage controlled oscillator/generators with dual video attenuators. The voltage controlled oscillators can be free running or locked to horizontal or vertical sync. The frequency of oscillation was selected through a rotary switch to switch the capacitive time constant. The video attenuators can linearly attenuate the input to output in response to the control input.

6) The output color encoder/colorizer. The main component of the Siegel colorizer is contained here. It is conventional "doubly balanced modulator", to perform the hue and saturation generation from the control inputs. In place of a conventional R-Y and B-Y inputs, dual inputs are present on both modulators for an inverting and non-inverted phase shifts. The first modulator axis is adjusted for orientation along the Red/-Blue (actual CYAN) axis, while the second modulator is set 90 degrees in quadrature on the Green /-Magenta color axis. The modulators outputs are summed together and form the chrominance signal, and along with the color burst is run to output Proc Amp for combination into a composite video signal.

Substitution of luminance video with and without waveform ~~The~~
odulation helps to generate the unusual colorizing, with the hue and
aturation changes set driven by the horizontal components of the controlling
aveforms. The overdriving of the dual modulators with video signals has been
escribed by Eric Siegel as "Ultra-phase modulation" (quoted from Don Day)
. The output of the colorizer goes to the Processing amplifier. The output
roc Amp, merged and cleaned up (blanked) the synthesized video to a form
at was video compatible. It is here that the burst, sync and blanking is
rmed and gated, and the luminance and chrominance combined. Knobs
re available to mix the Luma and Chroma proportions into the main video
tput. A dual set of outputs was present to drive a color monitor and video
pe recorder.

VIDIUM

4/20/92 Jeff Schier

The Vidium "MK II" was a hybrid analog synthesizer, which acted as a "hyper Lissajous pattern generator". As recounted by Larry Shaw ... The basic Lissajous pattern, name after the French Physicist Jules A. Lissajous consist of a circle formed by driving an X, Y display (or oscilloscope set to XY mode) with two sine waves. With the X axis "in-phase" and the Y axis "out-of-phase" a shape is seen on the display. If the phase shift is 90 degrees a circle is formed, 45 degrees an ellipse, and 0 degrees a diagonal line. By driving each axis with its' own oscillator, with a precise phase shifting and modulation signals, elaborate shapes could be formed. These were expansions on the classic circle and figure eight pattern to form harmonically pinched doughnuts, and vector textures of slowly changing form. Programmable waveforms of sinewaves shifting to triangle waves, then square were applied to form sinuous curves and boundaries.

A modified color television was used for the X, Y display with the deflection yoke replaced with a new yoke driven from audio amplifiers. The audio amp was in turn driven from the main analog waveform generator rack. Color was added by wiring to the color "hue control", forming a voltage controlled phase shifter, wrapping in phase 540 degrees of the normal 360 degree hue space. Color saturation and brightness were set by the TV's front panel controls. A special analog velocity/position detector calculated : the square root of (X squared plus Y squared) deflection signals that fed the color hue shifter. A threshold detector blanked the beam, if the X and Y settled to zero (a dot in the center of the screen). The hue shifter allowed drawing of textural surfaces in smoothly changing colors. The hue shift tracked the shapes automatically.

The main control box consist of two 3 feet by 3 feet racks mounted side by side. The left side contained the "voltage sequencer" outputs with 60 multi-turn knobs, while the right side contained the control and signal processing modules.

The main control of the synthesizer was from an analog voltage sequencer. The "sequenced voltage source" has six controllable "steps", each gating on 10 voltages, the voltages set by ten-turn potentiometers located on the left half of the rack. This six by ten matrix of voltages were interconnected by "Pomona Stacking Banana Plug cords", to other modules located on the right half of the rack. Commonly the sequencer was wired in tandem, the first module triggered the second module, etc.till the sixth sequencer step was triggered. An oscillator at the front end could start up the chain of events. Each "step" had its own time delay (a monostable multivibrator), and a light bulb to indicate it had triggered. Text labels of OSC START , SEQ OUT - a level mimicking the state of the sequence, and EOS (end of sequence) to wire to the next module.

Control voltages were available on colored banana jacks with RED representing analog outputs, BLUE for analog inputs, BlACK for digital inputs (bi-level signals : on or off), and WHITE for digital outputs. The output signals had a "Wired-Or" property, allowing wiring multiple outputs together, with the lower voltage being the victor. Analog voltages could also be "bare-collector" wired, the lower voltage winning out if tied together.

The "pattern generator side was built to form the basic sinewave and phase shifted sinewaves. The modules consisted of oscillator frequency sources, and processing modules. Multiple oscillators were present, including a voltage controlled function generator. The allowed voltage control of frequency and phase as well as a sync input. The output generated a collection of waveforms : triangle, square, sawtooth and sine. A digital version of a "trigger out" and a waveform triggered indicator "logic out" are available on separate jacks. A more elaborate version was proposed to allow a voltage control of waveform shape, the input voltage would shift the output waveform from sine through triangle to square.

Another signal source was an envelope generator. A trigger pulse "ENV START" started a pulse output, and "ENV STOP" turned off the pulse. The rise/fall time of this pulse was voltage controlled, and digital outputs indicated the envelope had triggered. The envelope pulse would later be combined with the main oscillators to smoothly qualify the underlying waveform.

Closely tied to the idea of Lissajous pattern generation is the need for controlled phase shift of the sine wave signal. A modified filter circuit with an operating frequency around 1KHZ was constructed, with inverting and non-inverting inputs. The control input progressively shifted the phase of the input signals in response to the control voltage.

For processing of waveforms a Voltage Controlled DC coupled Amplifier is present acting as a two quadrant multiplier, with a summing input stage. The amplifier summed multiple inputs together, while the voltage control input, attenuated the summed result and sent them to output. The control could come from the envelope generator, the sequencer voltage or the oscillator waveform. Output = (In_1 + In_2) * Control

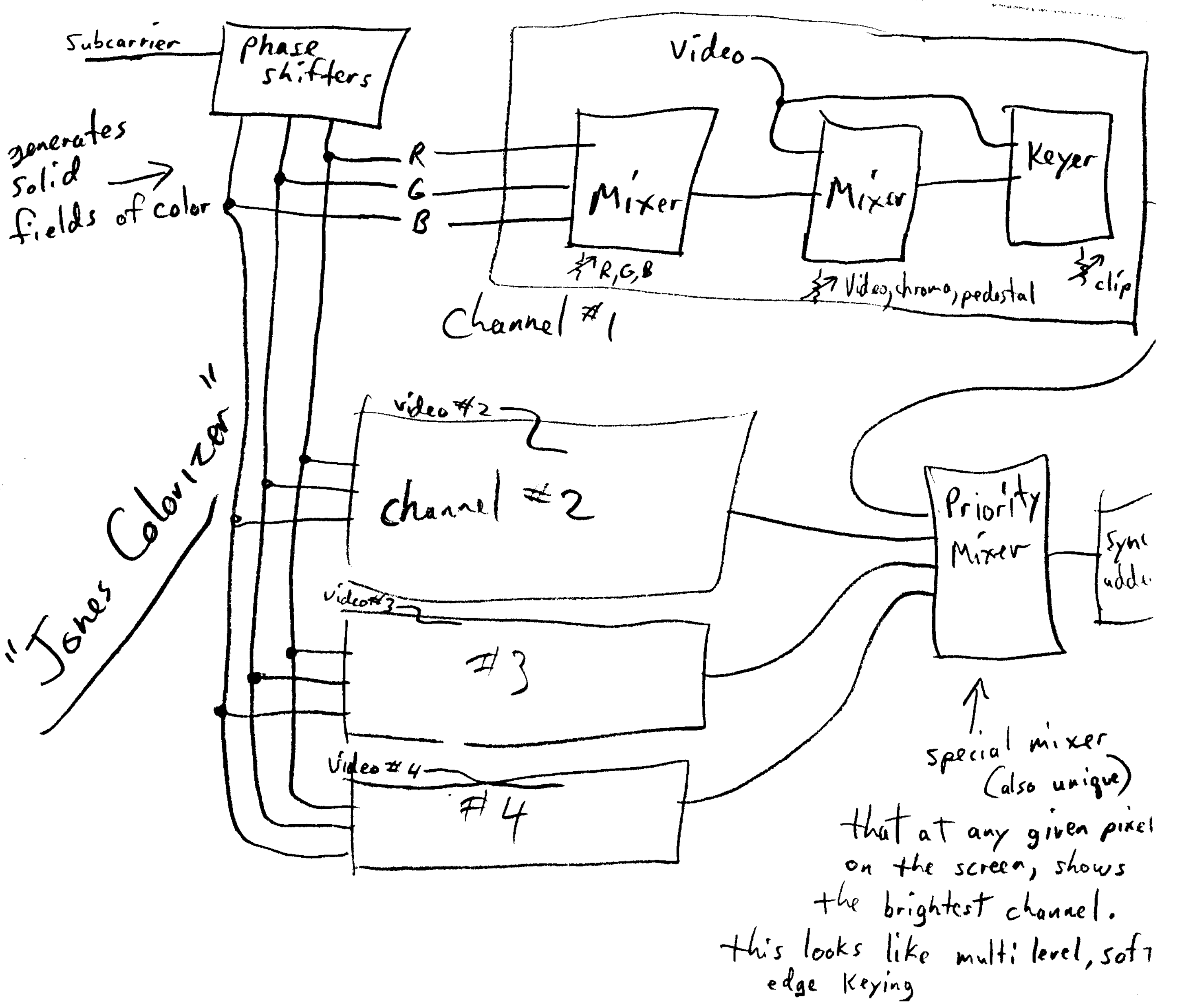
A precision Four quadrant multiplier with two sets of inputs, an A and B with a inverting and non-inverting polarities were used to modulate the oscillator waveforms. Output = (IN_A1 - In_A2) * (In_B1 - In_B2) This four quadrants allowed both attenuation and inverting of input waveforms.

The combination of the Voltage controlled summing AMPs, with the Four quadrant multipliers, and phase shifters allowed multiple oscillators, envelopes and knob controlled voltages to be combined into curious patterns of X and Y signals. The hue shifts were closely linked to the pattern drawn by the X and Y waveforms, forming the unique interlocked VIDIUM Lissajous surfaces.

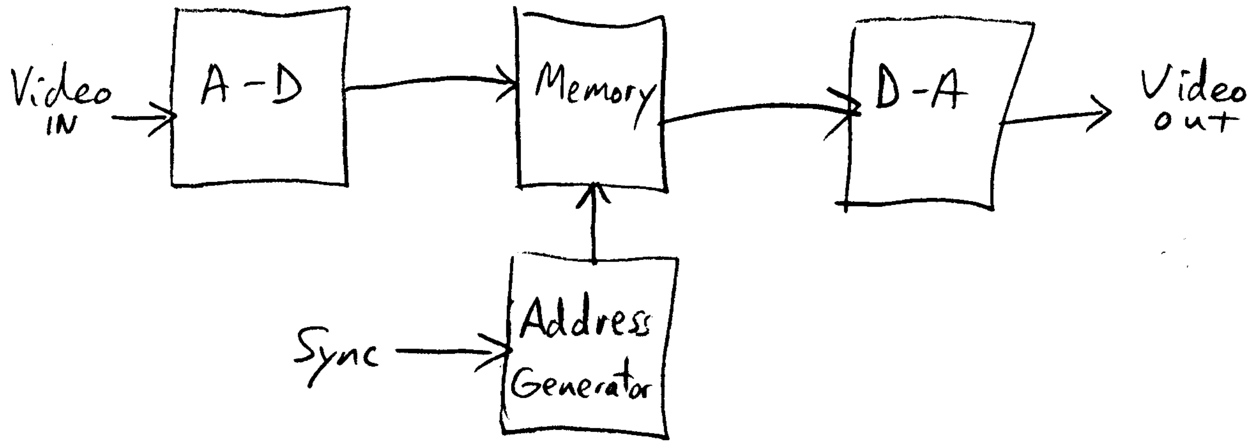
Woody & Steina

The thing that is unique about my colorizer is that it doesn't use a color encoder like other colorizers. Below are block diagrams of the colorizers that I'm familiar with. If you change your mind about using my colorizer, it is working and in Ralph's studio. I could pack it & ship it to you in 1 day, if you want.

Dave

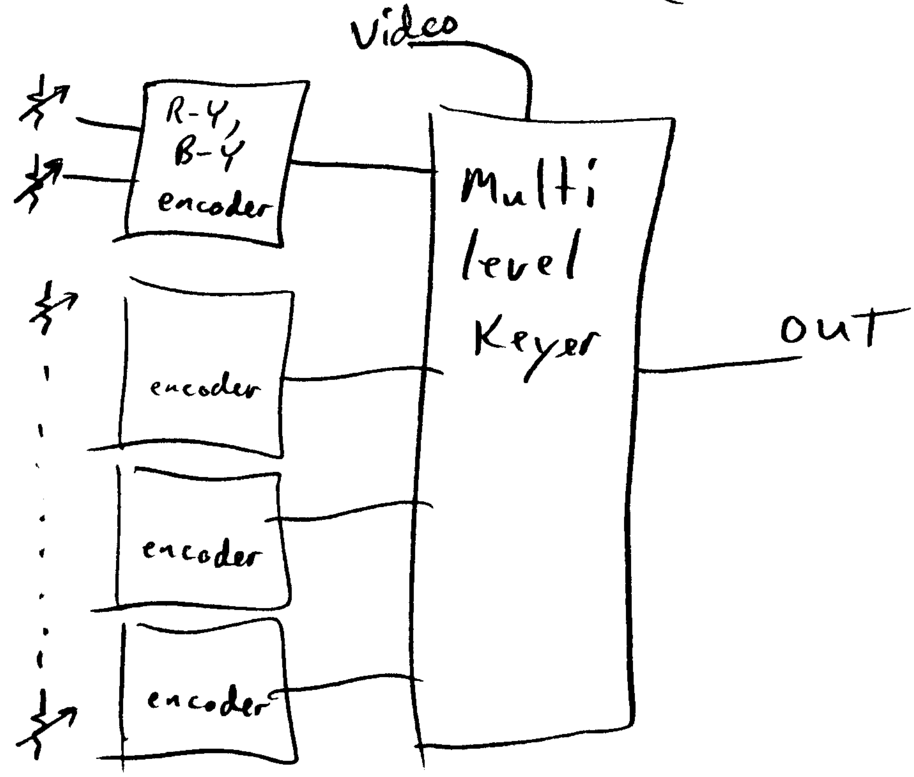


64x64 buffer

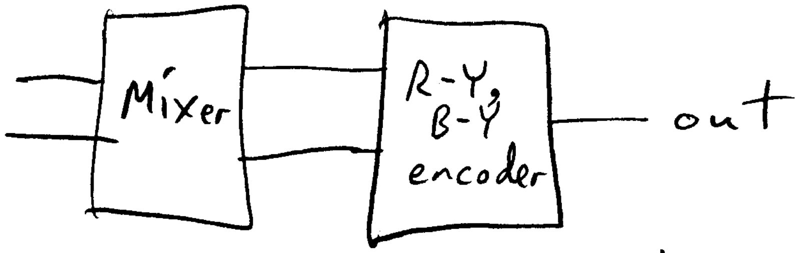


~~This frame buffer is a simple device that can freeze a video image and display it. It is an early digital video that converts the video image into a system~~

E.A.B. (Hearn) (late 1970's version)

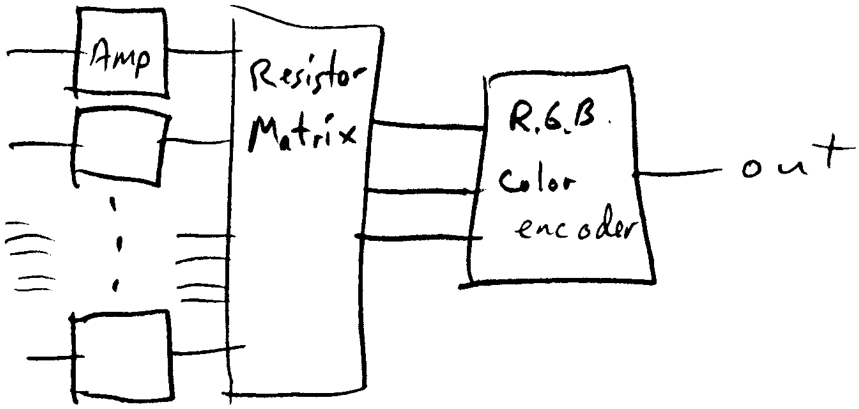


Eric Siegel colorizer

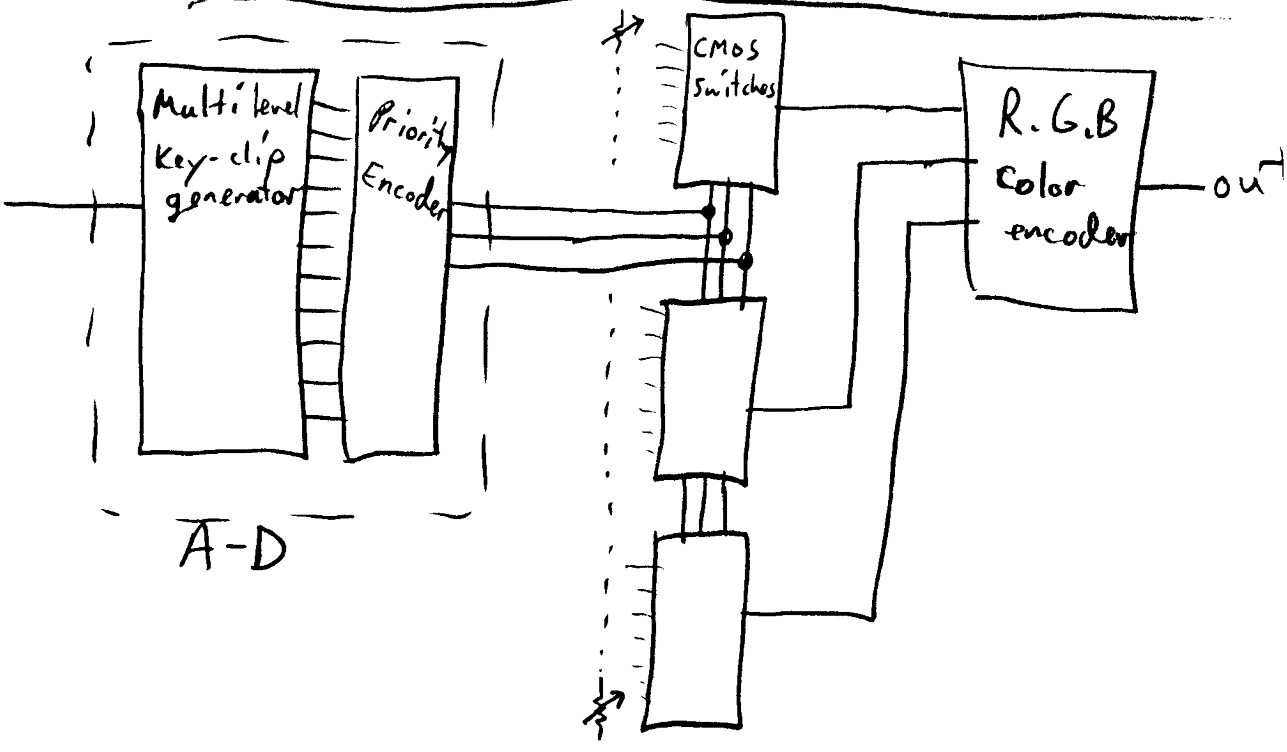


* note:– this is based on 1 quick look at a schematic in 1977 of the siegel at "Woodstock Co Vi

Paik-Abe

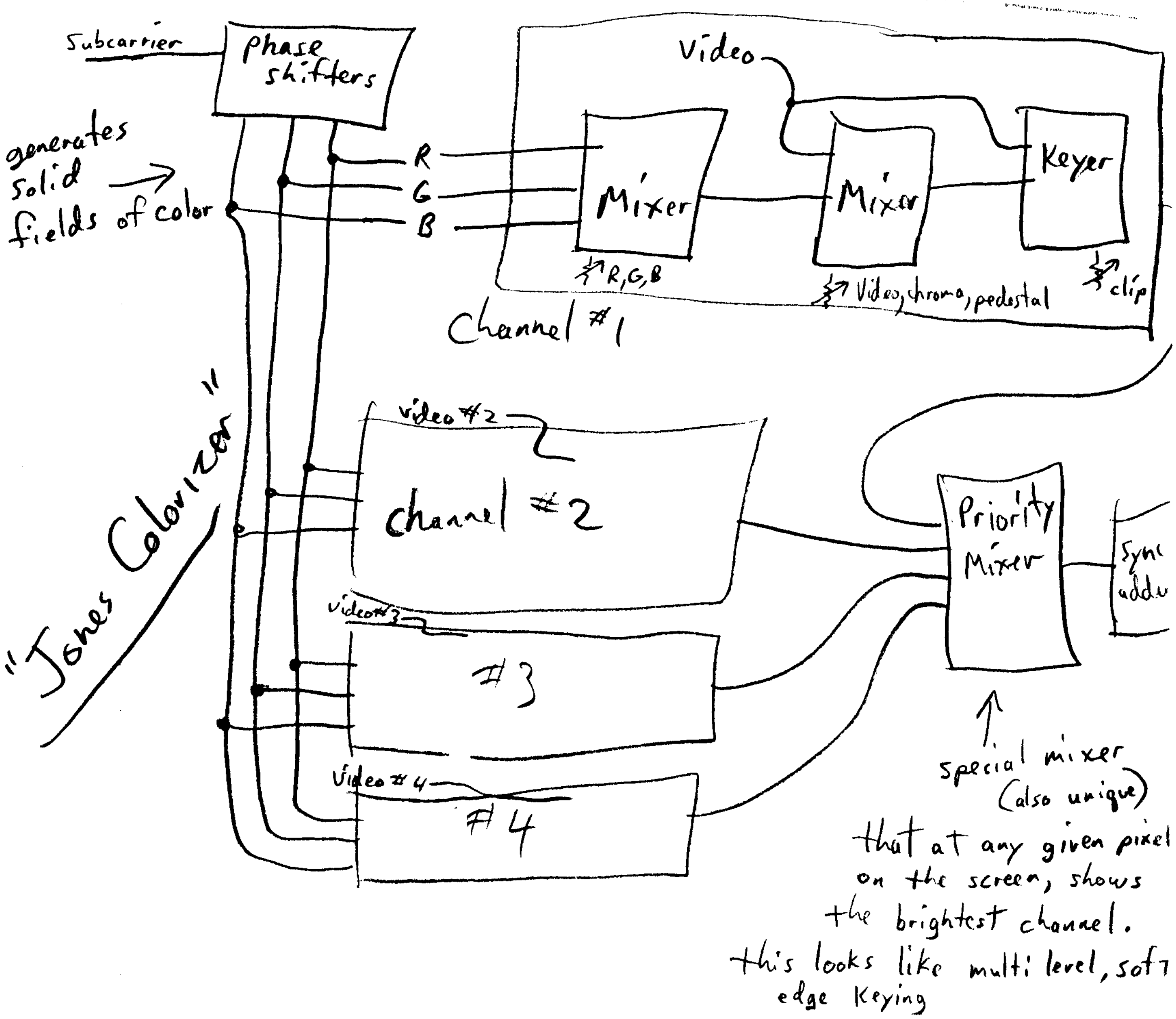


George Brown (aka. CTL colorizer) (circa 1973)



Woody & Steina

The thing that is unique about my colorizer is that it doesn't use a color encoder like other colorizers. Below are block diagrams of the colorizers that I'm familiar with. If you change your mind about using my colorizer, it is working and in Ralph's studio. I could pack it & ship it to you in 1 day; if you want. Dave



(10)

SONOMA STATE UNIVERSITY

1801 East Cotati Avenue
Rohnert Park, California 94928

Department of Physics and Astronomy
707 664-2119

4/8/92

The Vasulkas Inc.
100 Route 6
Santa Fe, NM 87501

received
April 14 92

Mr. MaLin Wilson,

Thank you for the letter describing the terms of the loan of the VIDIUM for the ARS ELECTRONICA exhibition. I have somewhat different dimensions than the ones given by Mr. Hearn for the VIDIUM;

Height	Width	Depth	Weight
21"	72"	10" (18" with attached base board)	est. #80

The IRV / IRV* values are somewhat "in the eye of the beholder". As an appraiser, you are the expert in this regard.

The unit is functioning, at least the four or five channels that I have used. Some technical knowledge is required. I would pay attention to the grounding and polarity and so on when adapting the power transformer. The unit is attached to a plywood base that is noted in the depth dimension. This base could function as a stand if it were painted and had legs attached to it. It is presently sitting on a lab bench. Please see enclosed photograph.

I have taken the liberty of including the Laser Affiliates' 10 year catalog. We are a group of laser performance artists that have produced visual art performances and holography exhibitions in the Bay Area for some time. We also have a videotape compiled of performance segments that captures more of the kinetic nature of these events. If you are interested, I can send a copy. In the development of theseevents I have made devices very similar to the VIDIUM for generating laser graphics. We also have a computer generated animation system not depicted in the catalog.

I will look forward to meeting Pavel and Woody on March 28. I am excited that other people will be able to enjoy this unique instrument.

Steve Anderson

Steve Anderson
Equipment Tech. III
Sonoma State U., Physics & Astronomy Dept.

11

VIDEO ARCHITECTURES - APPROACHING REAL TIME

Jeffrey Schier
Aurora Systems
185 Berry Street
Suite 444
San Francisco, Ca. 94107

SUMMARY

Overview of video architectures that are specialized toward real time interaction and response. Issues of Analog vs. digital techniques, and resolution/speed tradeoffs are discussed. Novel systems are described that achieve real time performance.

REAL TIME VIDEO

Some working definitions of Video time-scales are :

Real Time

Real time refers to visual tools that generate pictures fast enough to accurately portray movement and instantaneous interaction of the machine with an image. This speed is commonly locked to the transmission or recording Frame rate :
24 frame/sec. for film,
29.97 frames/sec. NTSC video, and
25 Frames/second for European video (PAL, SECAM). Sequences of frames at rates greater than 15 per second, give a reasonable illusion of smooth movement.

B) Interactive Time

Interactive Time refers to a performance level where actions generate visible results which perceptually can be connected to their stimulus. Echoing a character to a display, tracking of a cursor, and responding to a command are operations working in Interactive time. Roughly this speed is from 1/15 of a second to 5 seconds.

C) Animated Time

Animated Time - Animated time will inherit all speeds slower than a human tolerance for interaction : between 5 seconds to 1 day/frame. Full movement is perceptible only in its aggregate form, after accumulating the entire sequence of frames. Time lapse photography is an example of animated time; but frame by frame video recorders and optical disks are seeing increasing usage in computer graphic animation.

THE VIDEO SIGNAL

Achieving real time video involves 'running alongside' the video signal to maintain adequate bandwidth. The relation of active video time to blanking time, gives the proportion of overhead : how much time is spent synchronizing versus the amount of time for signal transmission. The use of two fields displaced 262.5 lines apart to achieve interlace, causes images to be displaced in time by 1/60 of a second. Processing of motion and vertical features need to account for the odd lines scanned in one field, with the even lines following 1/60 of a second later, in the other field.

Gross field/frame related changes must be completed in the Vertical Blanking interval to prevent 'flashing' the screen with partially complete operations. Color changes and input switching are commonly locked to the vertical interval. (Figure 1)

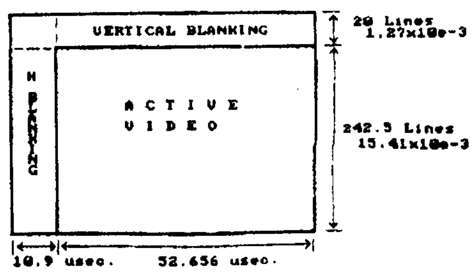


Figure 1. NTSC VIDEO FIELD TIMING

ANALOG and DIGITAL PROCESSING

For processing of video images, analog and digital techniques are in everyday use. Certain processing modules appear frequently in video equipment : the video amplifier, adder, multiplier, electronic switch, and keyer, are some examples. Module operation is governed by numerous control inputs. These controls can be static (fixed) or dynamic - changing at speeds up to the video rate. In the analog domain the controls are voltages and currents, while in the digital domain they are digital control codes.

The Digital components require specifying the maximumum clock rate, the number of bits of resolution, and the number base and arithmetic exceptions (saturating/nonsaturing addition etc.). The examples shown are synchronous, having a clock to line up data marching through the modules. The Analog components perform 'saturated' arithmetic, and have bandwidth 'rolloff' and low level noise which limits their resolution.

PROCESSING MODULES

Video Amplifier -
  Analog : Hi-freq OP AMP
  Digital : Multiplier

Voltage Contrplled Video Amp -
  Analog : Video rate multiplier/ Programmable gain amp
  Digital : Multiplier with second input as control

Comparator - High Gain Video Amp operating in differential mode. It achieves a two-state output : a '1' if IN_1 > IN_2 or a '0' if IN_2 < IN_1. Useful in flash A/D converters and KEY generation.

Electronic Switch - one of many inputs are routed to a single output by a control signal. A Video rate switch is a 'Hard Edge Keyer', with the control input being the KEY. (Figure 2)

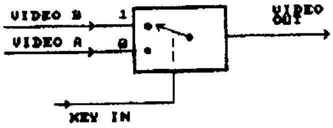


Figure 2. HARD EDGE KEYER

Delay Element -
  Analog : Cable Delay, Amplifier delay, tapped delay line, quartz delay line, Video tape delay line.
  Digital : reclocking register, shift register (arbitrary length) FIFO, Line buffer, Field buffer, Frame buffer, Magnetic Video Disk Optical Video disk , Laser Video Disks.

Adder - Provides the sum of two or more inputs
  Analog : video Op-Amp
  Digital : two input adder

Boolean Logic - uniquely digital functions : OR, AND, EXOR and Complement

ALU (Arithmetic Logic Unit)
  Digital : processes the additive and Boolean functions

Priority Encoder :
  Digital : Ouput = binary encoded number of the greatest numeric input

Multiplier : Output is the product of the two inputs

Memory Elements -
  Analog : Hybrid CCD delay line, CCD image sensor/memory
  Digital: Lookup tables, Frame/field buffer

Ancillary Processing Components

Phase Locked Loops : aligns the clock phase of internal clocks to external sync. Used in gen-lock (Sync Generator lock) to match the external timing to internal address/timing.

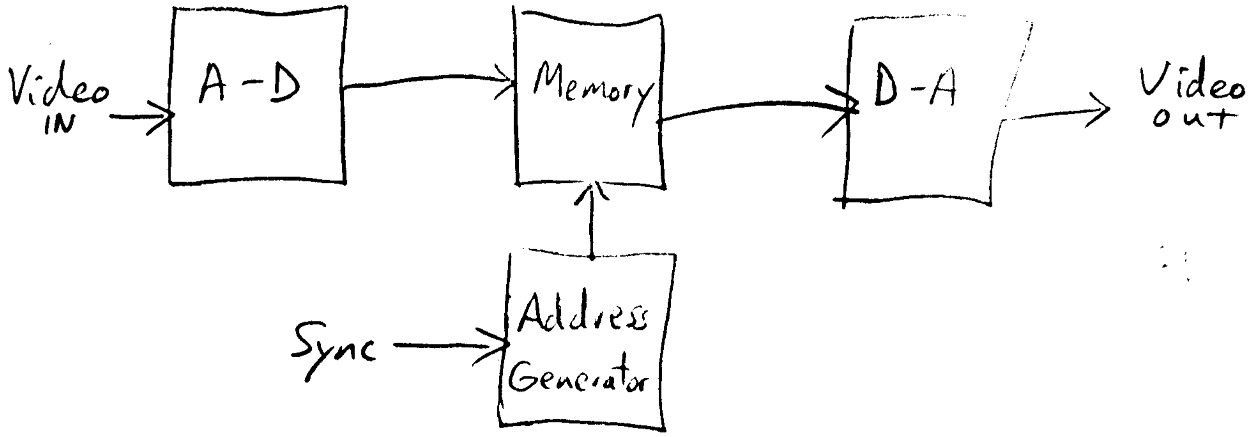
A/D converter - converts analog voltage levels to digital codes

D/A converter - converts digital video to analog outputs

DC restoration - Analog correction of 'AC' coupling in video

Color Encoders / Color Decoders - converts R,G,B signals to/from a composite form for transmission or recording.

64x64 buffer



~~This frame buffer is a simple device that can freeze a video image and display it. It is an early digital video that converts the video image into a system~~

(by David Jones)

DIGITAL VIDEO AMPLIFIER

The digtital video amplifier is a 2 input Multiplier, with Input_1 the Video-In, and Input_2 = Gain. The multiplier is either an LSI circuit commonly (8 to 16 bits), or composed from programmable memories (PROMS, EPROMS) with fixed gains. (Figure 3).

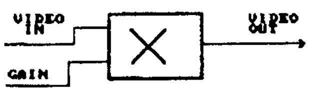


Figure 3. VARIABLE GAIN VIDEO AMPLIFIER

THE UBIQUITOUS LOOKUP TABLE

Unique to digital video processing is the extensive usage of memory as a processing element. The ability to delay, store, retrieve data, and generate functions are major applications of memory components. One example is the Lookup table or Mapping memory. The Lookup table is a fast clocked memory which translates data on input, to new data on its' output : Output = F (Input). A fixed table is 'hardwired' or programmed to one set of values, while Read/write lookup tables allow programming a variety of functions. While the most general of processing elements, its limitations stem from the number of input bits and output bits which can be placed in one memory array. The greater the number of entries (addresses), the larger the memory; the longer it takes to load or modify. Some contend that the frame buffer is a large lookup table with 2 inputs : an X-Display address and a Y-Display address. For a 512H by 512V size frame buffer this needs 256K entries, not conveniently loaded in one Video blanking interval (1.3 milliseconds).

Color Lookup Table (Pseudo-Color)

Given a digital video data stream, the input data often 4-12 bits 'deep' is translated through a set of 3 read/write lookup tables. Each table is assigned to an output channel; one to red, one to green and one to blue. The output of the tables are routed to Video speed Digtial to Analog Converters (D/A's) and sent to an R,G,B monitor or NTSC color encoder (Figure 4). The tables set the correspondence between the monochrome input and colors at the output. If all 3 tables are set to unity (a ramp), the monochrome input generates a monochrome output. If specific entries are set to different values in each table, a color will be output when the table entry shows up on the video stream.

If the input to the table comes from a frame buffer scanned out at display rate, the tables connect color to frame buffer data. In computer graphic Paint systems, operations are perfromed on the frame buffer with a corresponding color map, tagging color to pixel data.

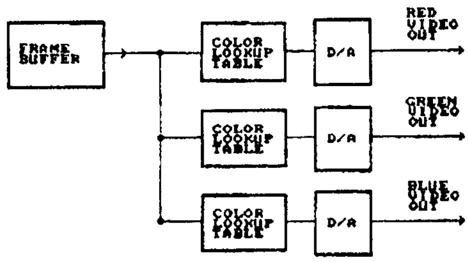


Figure 4. PSEUDO COLOR LOOKUP TABLES

Color-Map Rotation :

An interesting effect used in paint systems is the 'rotation' of the color map entries. The entries are bubbled up through the table by copying the entries from locations below to one location above. The top entry is move to the bottom of this 'Map ribbon'. With a sequential grey scale fluid movement, and Marquis effects simulated. This operation must be performed at frame rate, in the vertical blanking interval to prevent 'flashing' the screen while changing the table entries.

Remapping Memory

Another use is to map input to output through a desired function. The input marches through the memory and arrives at the output one clock later, mapped through a new function. This function can be exponential linear, clustered numbers, or singular entries. (Figure 5)

Figure 5. REMAPPING MEMORY

Gamma Correction - Fixed functions are used as gamma correction tables placed before output D/A converters to correct for the 'intentional' non-linear response of video monitors.

Thresholding - By turning specific entries in the table OFF, with the remainder set to a grayscale, only designated gray values make their way through the table. This is useful to view restrained section of the input grayscale, or to mask out unwanted gray values.

Intensity Compensation - If an input signal/image has a nonuniform grayscale response caused by incorrect exposure or brightness offset, the table is set to the inverse function, effectively cancelling out the input error.

Selector - since the table maps Address to Data, certain address bits can be masked off through the table, eliminating them from the mapping function. This eliminates the contribution of groups of gray levels, 'Masking' or turning them off. If the input is from the frame buffer, bit plane masking can be achieved in the output lookup table.

Control Table - As a control table, instead of greyscale values being mapped into other grayscale values; the output of the table is used to control other hardware. This control information corresponds to the grayscale value of each pixel, allowing each pixel gray value to have an independent function assigned to it. Control of input selectors, ALU functions, and destination controls are applications for control tables. (Figure 6)

Figure 6. CONTROL TABLE

FRAME BUFFER

The frame buffer is a large block of memory applied to storage of the entire video frame. When the memory is time locked to the horizontal and vertical sync, the output pixels form a stable pattern for display. Allocation of memory cycles, input/output data and address selection are essential to achieve full speed video rates. Time must be allocated for 'refresh' when using dynamic memories to maintain data integrity.

The number of inputs and outputs are the PORTS of the frame buffer. For a given memory bandwidth memory, the fight for memory bandwidth by each port is a major concern of system performance. For a display related frame buffer one Read Port is dedicated to the screen access. To ship information into the buffer a Write Port must be dedicated.

Single Cycle Memory

In a single cycle memory system (the memory bandwidth can only sustain one access per pixel), the write function can only occur while Not reading. To prevent interruption of the screen display (resulting in the distasteful flashing or glitching of pixels), access must be limited to the video blanking intervals.

Video Digitizing and Read/Write Access

Curiously the need for bidirectional access to the frame buffer is often ignored. Early frame buffers for computer graphics left out provisions to 'READ BACK' the images just written. The data went in, reached the display but could not be extracted as pixel data by the computer port. Similar ommisions are found in Lookup tables that are Write-Only. This ommission was provoked by building 'Display-Only' devices, that generated line drawings and boxes. With greyscale image generation and retrieval, the Read and Write port should always be present. What goes in must come out.

The other side most often ignored in frame buffers is video input capability. If the memory can be scanned out at video rate, it can also be 'scanned in' in real time (video digitizing). In a single port system the output can 'echo' the input video giving an output while digitizing, useful for adjusting or focusing the input source. The video input is received from the video rate A/D converter. To digitize real time video, the display system MUST GEN-LOCK, to align its internal timing to the external video source. (Figure 7)

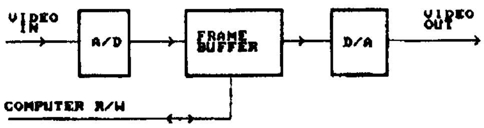


Figure 7. Video Digitizing

In a read/modify write frame buffer, the image pops out one frame later than it's input video. This delay is useful in image accumulation, color noise reduction, adn other frame comparison operations. A minimum set of ports for a real time video buffer are :

1) A real time video input Port (Write Port)
2) A real time video output Port (Read Port)
3) A computer Write Port and Readback Port

FEEDBACK PROCESSING

Given a delay element and a processing element, feedback processing is possible. A portion of the output data is rerouted and combined with the input. This technique is employed in recursive digital filters; and with the delay set to one frame - time and motion effects can be processed.

Configuration -

Video_In routes to one input of an ALU, output of the ALU goes to digitizing input of the frame buffer, output of frame buffer runs to the second input of ALU. The input is compared against the output, with the result of the comparison selecting the ALU function. Variations on this configuration perform :

1) Frame Accumulation -
(Noise Reduction, Frame averaging)
The input is added to the previous frame, scaled by one half, then rewritten to the frame buffer. This is run for N frames. Stationary low light level images will be accumulated into the frame buffer. If the feedback gain and input gain are adjusted this configuration will perform noise reduction. (Figure 8)

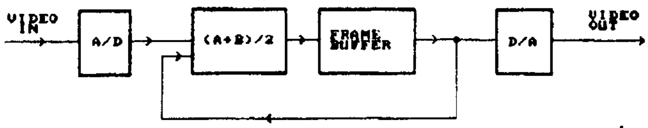


Figure 8. - Frame Accumulate

2) Motion Detection -
(Motion Detection, Noise accumulation) The control selection is set to two ALU functions. A comparator is used to select the ALU function, based on the difference between the current input and the previous frame. This writes only changing information back into the frame buffer, if the input video exceeds a certain THRESHOLD. Levels below the threshold are considered noise and are not accumulated. (Figure 9)

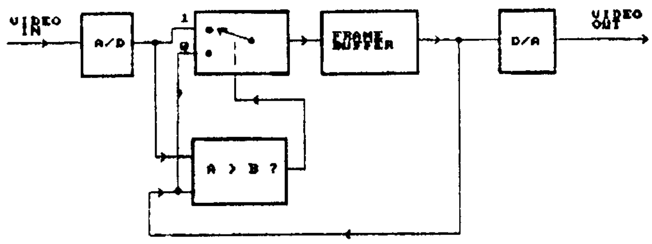


Figure 9 - Motion Detection

SCAN PROCESSOR

A unique real time video processor is the scan processor. Its principle of operation is to intercept the sweep signals of a display monitor and modulate these signals with control voltages. An Analog example is the Rutt/Etra scan processor, with a simplified block diagram shown in Fig. 10. The raster is manipulated by control voltages feeding two chains of four-quadrant multipliers and a summing amplifier, placed between the H and V ramp

(16)

generators, and their corresponding deflection yokes. The video signal runs through a multiplier followed by a summing amp for intensity and brightness control.

The control voltages are driven either from 'static' voltage sources or from Function Generators locked to : Horizontal sync, Vertical sync, or themselves ('freerunning'). AM and FM control allow cascading these control signals. Images are 'rescanned' by a camera facing the modulated monitor, with optical effects achieved by placing objects between the rescan camera and the monitor.

The raster's size, position and intensity can be modulated through voltage control signals. The ability to modify the underlying scan process along with the video signal are unique properties of the scan processor.

The need for intensity compensation of small rasters, resolution loss due to the rescan process, and the difficulty of achieving repeatable raster movement using Analog control generators have been some of the shortcomings of this scan processor. Digital control signals run through D/A converters, can simplify the control structure and improve repeatability.

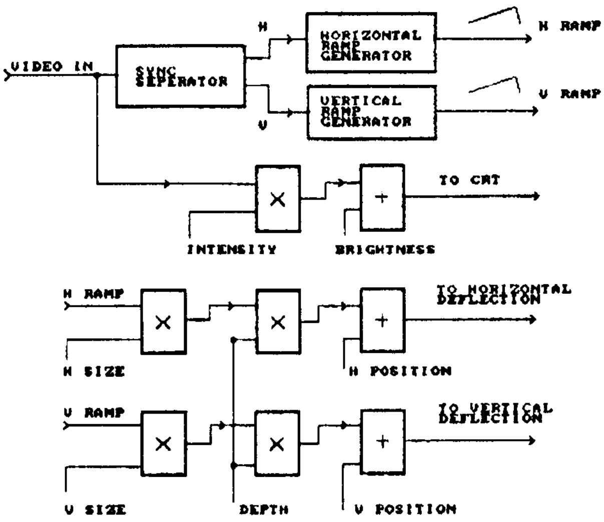


Figure 10. RUTT/ETRA SCAN PROCESSOR SIMPLIFIED BLOCK DIAGRAM

PROCESSING AMPLIFIER

Composite processing of the video signal is exemplified by the aptly named Video Processing Amplifier (or PROC AMP). The Proc Amp's primary function is to cleanse the composite video signal of aberrations injected after routing through a long chain of video components. The Proc Amp seperates the Luminance, Chrominance, and Sync information; only to place them back together with independent control of their levels. The luminance brigthness (Black Level), its contrast (Luminance Gain), Detail (Edge enhancement), White and Black clipping (to inhibit overshoot/ undershoot) are adjustable through Voltages driven from front panel controls. The chroma infromation is extracted (by its 3.579545 MHZ frequency) and the Saturation (GAIN)) and Hue (Phase) are adjustable. The sync signal is further 'Regenerated' to reconstruct any vertical or horizontal sync distortions, with a new color Burst signal inserted on the back porch for the chroma reference phase. A reconstructed video signal is built up through control of its 'component' parts.

The Proc amp while designed for video correction can also become the active component of a video effect unit. Substituting front panel control voltages, with video rate control voltages, the Colorizer is born. The Colorizer's basic function is the insertion of color onto a monochrome signal. The video signal thus emerges as both an image source and a control source for selecting color. The generation of the video image, directly from signals or voltages is termed 'Direct Video Synthesis'. Stephen Beck, Dan Sandin, Dave Jones, Bill Hearn, Eric Siegel, and George Brown are have each developed video processors, whose images are generated and controlled from video and non-video rate signals.

COLORIZER

The majority of colorizers are expansions upon the Proc Amp with the controls derived from the luminance signal. The distinction between a composite black and white signal and a composite NTSC color signal is the presence of the 3.579545 MHZ subcarrier and its reference Burst. Given a black and white signal, the burst and subcarrier is synthetically generated, converting it into a color signal. The method of subcarrier generation distinguishes different breeds of colorizers. Three distinctions will be made - the modulation based colorizer the 'slicing' threshold based colorizer, and the NTSC encoder/colorizer.

Direct Subcarrier Modulation Colorizer

An example of a modulation' colorizer is the Eric Siegel Colorizer shown in block form in Fig 11. A monochrome signal is input, filtered of extraneous 3.58 MHZ components, its luminance component is 'detail enhanced' then run to a chroma Phase SHift Modulator. This modulator links the contrast component of the input to the output Hue . This phase shifter, is a two stage circuit enabling greater than 360 degree rotations in hue space from a black to white video excursion. The amount of phase shift and its polarity is selected through front panel controls, as well as starting phase and saturation. This device is representative of the Direct Subcarrier Modulation colorizer.

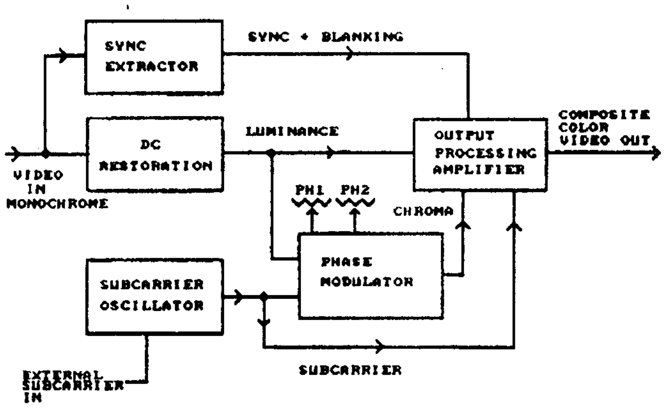


Fig. 11 - Eric Siegel Colorizer Simplified Block Diagram

(18)

Luminance Classifying Colorizer

The Threshold based colorizer, classifies luminance into multiple bands, with independent control within each gray region. Two examples of this are the Bill Hearn EAB colorizer, and the David Jones multiband colorizer.

The luminance component is filtered then shipped to a bank of comparators. Each comparator detects a luminance threshold and combines to form 'bands' of gray, which gate on a set of chroma/luma controls. If the thresholds are non-overlappping, the controls operate independently to set brighness, saturation, hue, and contrast; in each gray band.

NTSC Encoder / Colorizer

This colorizer is based around the RGB to NTSC color encoder, as the active color encoding element. The R,G,B camera inputs are exchanged with other control signals, some of them at video rates. The use of the NTSC encoder restrains the output, to be within the bandwidth restrictions of NTSC. Correct observation of these limitations helps avoid 'color smear', and lost detail in the encoded color picture. If the 3 inputs are from a digital video source we arrive at the Pseudo Color colorizer.

Digital Pseudo Color Colorizer -

The number of classfying bands has been limited practically to 10 analog bands. Beyond this, the number of control points becomes inordinately large and unwieldy to control. Interestingly 'Flash A/D converters' consist of the same classifying arrangement : a bank of comparators compare the input video against a chain of voltage references. The references are equally spaced, and not independently adjustable. The A/D further converts the detected levels into an encoded binary value before output. This 'digitized' video signal is passed through to a triple set of lookup tables and D/A converters, then to the RGB to NTSC color encoder. This digital method simulates many of the linear functions of the analog colorizer .

Schier/ McArthur/ Vasulka Image Processor

This digital video processor contains a vertical interval control bus, gen-lock timing, and a microcomputer to orchestrate field by field control of the image. The digital video paths are connected to the processing modules through front panel patching permitting a variety of interconnections schemes. The components parts are :

1) A DEC LSI-11 microcomputer coordinating control words for processing and user interface functions.

2) A Vertical Interval Control Buffer LSI-11 Interface Control info. is loaded into the control buffer during the active field, for transfer to processing modules during the next vertical blanking interval. An interrupt is generated to the LSI-11 after the control buffer is transferred.

3) A Gen-Lockable Sync Generator - timing is based upon 512 H by 486 V active screen coordinates. Both video sync and Horizontal / Vertical timing is available on the control bus, for pickoff by modules.

Processing Modules :

A) Video Rate Analog to Digital Converters (A/D)

B) Selectors - 3 groups of selectors - choosing between 8 horizontal, and 8 vertical frame locked patterns, and an External digital video source. The selectors allow bit-wise selection of horizontal, vertical and input components.

C) Arithmetic Logic Units (ALU's) - Combines two digital input streams into a single output through combinations of arithmetic and Boolean logic functions. The Boolean functions of 'AND', 'OR', 'EXOR', 'EXNOR', Ones Complement are present. The arithmetic functions 'A PLUS B PLUS CARRY', 'A MINUS B PLUS CARRY', and 2's Complement are also available. Certain combination of arithmetic with logical operations are possible, with a 'Constant' available on the 'B' input, useful for bit masking.

D) Lookup Table - an R,G,B lookup table with common digital 'Address input' is present, to perform intensity/pseudo color transformations

E) Window generator - three Window generators, form an adjustable frame for gating/routing the digital sources. The 'Window Frames' are programmable on a pixel/line basis. Wipe patterns and title boundaries are formed here.

F) Digital to Analog Converters (D/A) - one apiece for red, green and blue channels.

G) RGB to NTSC color encoder - the final output is derived from the Red, green and blue components then converted to composite NTSC.

Input is received from camera sources, video tape or from the internal pattern generator (H and V timed bar patterns). Camera/VTR sources first go through the A/D converters, are front panel patched to the processing modules, route to the D/A's for conversion to Red green, and blue. The signals then hop into the RGB to NTSC encoder, converting to a composite NTSC video output, for display or further post-processing.

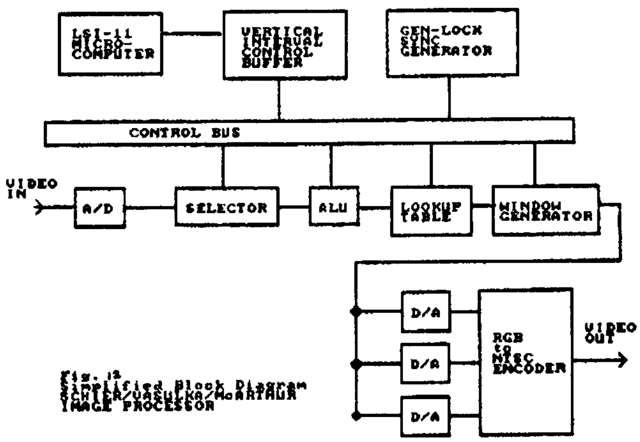


Fig. 12 Simplified Block Diagram SCHIER/VASULKA/McARTHUR IMAGE PROCESSOR

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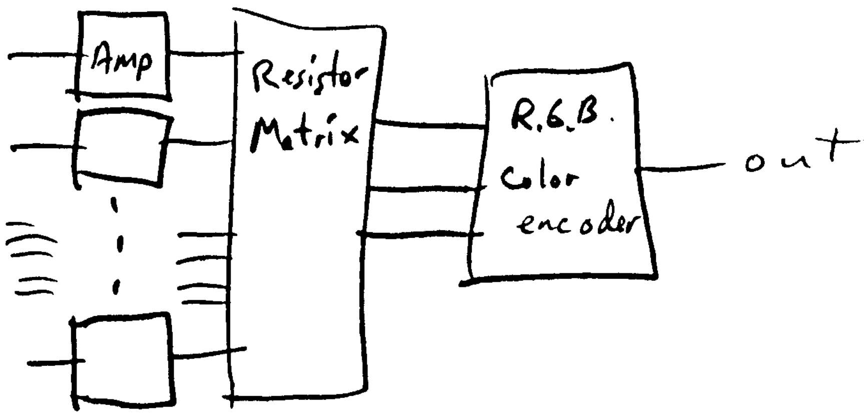
RS170A (tentative Nov. 8, 1977)

Paik-Abe Video Synthesizer Nam June Paik & Shuya Abe 1971

The Paik-Abe Video Synthesizer is a multi-channel colorizer that mixes and adds color to as many as 7 video images. It has a special video mixer that consists of seven amplifiers, each having a different amount of distortion. This distortion creates new shades of gray in the images which cause new colors to be displayed. The output of the mixer goes to a normal "RGB color encoder" that generates the color video signal. Each input to the P.A.V.S. creates a different color. As more images are mixed together, more colors are generated. The Paik-Abe was created out of a collaboration between video artist Nam June Paik and engineer Shuya Abe. There were several Paik-Abe Video Synthesizers built and used during the 1970's.

(by David Jones)

Paik-Abe



(by David Jones)

Jones Frame Buffer David Jones 1977

This early digital video device freezes an image and displays it by converting the analog video image into a digital signal and storing the image in memory chips. The data stored in the memory chips is played repeatedly at high speed and converted back to a video signal. A section of the circuit generates the grid on the screen where pixels will appear. This grid is 64 pixels wide by 64 pixels high. This frame buffer was part of a video image processing system that was built by Gary Hill and David Jones in 1977. It was used in video tapes, performances, and video installations.

(by David Jones)

THE VASULKAS, INC.
100 ROUTE 6
SANTA FE, NEW MEXICO 87501
TEL. (505) 471-7181 **FAX. (505) 473-0614**

Date: April 23, 1992
To: David Muller
From: The Vasulkas, Inc.
Re: Packing
# of Pages - 9

URGENT: Please weigh Woody's test equipment (page) and send to me so that I can complete the list for the shipping company.

Also, I have asked the Austrians for an extension of at least one week so that pick-up would be May 11th. I will let you know immediately when they respond.

<u>Separation and clustering of equipment for shipping:</u>

- -Attached are lists of the equipment and their owners, i.e. they need to be packed separately so that they can be returned to the right places
- -On each list is an estimate of cubic feet, based upon floating each item in 6 inches of material
- -Based upon these calculations the items from the ETC should fit in the metal containers Pavel brought
- -The fiberglass crate should be used for Vasulka stuff
- -The laser discs should be OK in their factory boxes
- -More crates or very heavy-duty carboard boxes will be needed for:
  - Additional Vasulka stuff including test equipment
  - MOOG (oversized)
  - Hearn VIDIUM (oversized)
  - JONES FRAME BUFFER
  - CLOUD MUSIC INSTALLATION

<u>Packing recommendations from Bailey at an art packing service:</u>

- -Put each item in a plastic bag
- -Fold and taped single-sided corrugated cardboard around each item
- -In each container line the perimeters with 2 inches of urethane foam
- -Pack items in layers surrounded by peanuts - Be sure to shake them down
- -use 1 inch layers of urethane to separate interior layers

I hope that you can get an estimate from one of your clan for materials and labor to do this packing. Let me know...

(1)

THE VASULKAS, INC./100 ROUTE 6/**SANTA FE, NEW MEXICO 87501**
TEL. (505) 471-7181/FAX. (505) 473-0614

Owners, all equipment to be returned to:
Ralph Hocking and Sherry Miller Hocking
Experimental Television Center Ltd.
180 Front St.
Owego, New York 13287
Tel & Fax: 607/687-4341

ARS ELECTRONICA EXHIBITION/JUNE 1992
Packing list

	Model #	Height	Width	Depth	Weight	IRV*
PUTNEY SYNTHESIZER						**3,500**
Main Unit	Synthi VCS3a	17.5	17.5	17.5	20	
Keyboard	Synthi DK2	3.5	30.0	9.25	11	
Pitch to Volume	739/3	3.25	20.0	7.5	7	
Interface Control Panel					2	
					40 lbs	
ESTIMATED PACKED DIMENSIONS = 12.5 CUBIC FEET						
CVI (Colorado Video Inc.) QUANTIZER		12.0	19.0	12.0	20	**5,000**
Control Panel		6.0	6.0	12.0	6	
Interface Control Panel					2	
					28 lbs	
ESTIMATED PACKED DIMENSIONS = 5 CUBIC FEET						
CVI DATA CAMERA		**5.0**	**14.0**	**10.0**	**8**	
Control Panel		4.0	19.0	12.0	8	
Power Supply		4.0	19.0	15.0	12	
Interface Control Panel					2	
					30 lbs	
ESTIMATED PACKED DIMENSIONS = 8 CUBIC FEET						
PAIK/ABE SYNTHESIZER &		**10.5**	**19.0**	**12.0**	**21**	**15,500**
PAIK SCAN MODULATOR (a.k.a. as the "Wobbulator")						**15,000**
Display	SMC156B	10.0	18.0	29.5	35	
Control Panel	none	4.5	14.5	10.0	5	
McIntosh Amp	MC-60	8.5	14.5	10.5	50	
Heath Kit Amp	AA151	5.5	16.0	12.0	25	
Interface Control Panel					2	
					138 lbs	
ESTIMATED PACKED DIMENSIONS = 15.75 CUBIC FEET						

Owners:
Ralph Hocking and Sherry Miller Hocking
Experimental Television Center Ltd.

RUTT/ETRA SCAN PROCESSOR					**12,000**
Control Panel Oscillators	9.0	19.0	15.0	14	
Control Panel Display	9.0	19.0	21.5	22	
Ramps	4.0	19.0	12.0	4	
Audio Interface	5.5	19.0	9.0	6	
Power Supply	9.0	19.0	20.25	35	
Display	9.0	19.0	16.25	24	
Tube 1040AKB4	11.0	8.0	7.0	2	
+Cables					
Interface Control Panel				2	
				109 lbs	
ESTIMATED PACKED DIMENSIONS = 29.25 CUBIC FEET					
MCARTHUR SAID (Spatial and Intensity Digitizer)					**7,000****
Main Unit	20.0	20.0	12.0	25	
Control Panel	5.0	14.0	10.0	8	
Interface Control Panel				2	
				35 lbs	
ESTIMATED PACKED DIMENSIONS = 9 CUBIC FEET					
21 (Twenty-one) PORTABLE CAMERAS: Each $180					**3,780**
Each	8.0	6.0	9.5	4	
		Sub-Total Weight		84 lbs	
ESTIMATED PACKED DIMENSIONS, Each 1.5 = 32 CUBIC FEET					
21 (Twenty-one) LENSES: Each $50					**1,050**
	5.0	2.0 diameter			
		Sub-Total Weight		21 lbs	
ESTIMATED PACKED DIMENSIONS, Each .5 = 10.5 CUBIC FEET					
5 (Five) CCUs (Camera Control Units): Each $100**					**500**
	8.0	10.0	3.0	4	
		Sub-Total Weight		20 lbs	
ESTIMATED PACKED DIMENSIONS, Each 1.25 = 6 CUBIC FEET					

CABLES & ODDS & ENDS/ ESTIMATED

AVAILABLE SHIPPING CASE

2 (Two) Metal, Each 95#	25.0	42.0	36.0	190
2 (Two) Metal, Each 155#	48.0	44.0	38.0	310
				500 lbs

ETC

Estimated packed dim = 133 cu ft
Weight (including crates) unpacked 1,005 lbs

(3)

THE VASULKAS, INC./100 ROUTE 6/SANTA FE, NEW MEXICO 87501
TEL. (505) 471-7181/FAX. (505) 473-0614

Owners, all equipment to be returned to:
The Vasulkas, Inc. (same as above)

ARS ELECTRONICA EXHIBITION/JUNE 1992
Inventory for shipping

N.B. All measurements in inches and pounds.
IRV* = Insurance Replacement Value of fully functional equipment in US$.

	Model #	Height	Width	Depth	Weight	IRV*
BROWN FIELD FLIP/FLOP SWITCHER						**7,500**
		6.0	19.0	11.0	13	
Interface Control Panel					2	
					15 lbs	
ESTIMATED PACKED DIMENSIONS = 3 CUBIC FEET						
SIEGEL DUAL COLORIZER		**8.0**	**19.0**	**12.0**	**9**	**6,000**
Control Panel		2.0	17.0	7.0	3	
Interface Control Panel					2	
					14 lbs	
ESTIMATED PACKED DIMENSIONS = 5.5 CUBIC FEET						
BROWN MULTIKEYER		**17.0**	**20.0**	**14.0**	**21**	**8,500**
Power Supply		2.0	5.0	10.0	2	
Interface Control Panel					2	
					25 lbs	
ESTIMATED PACKED DIMENSIONS = 8 CUBIC FEET						
MCARTHUR & SCHIER DIGITAL IMAGE GENERATOR						**13,000**
Image Generator		7.0	19.0	18.0	20	
Power Supply		5.0	19.0	6.0	10	
Host Computer		4.0	19.0	18.0	14	
Disc Drive		5.0	8.0	12.0	6	
Interface Control Panel					2	
					52 lbs	
ESTIMATED PACKED DIMENSIONS = 11.5 CUBIC FEET						

LASERDISC EQUIPMENT/Multiple Units

Shipment from Iowa to Linz:

	Model #	Height	Width	Depth	Weight	IRV*
4 (Four) PIONEER LASERDISC/Boxed/each $700						**2,800**
LD-V2200/ Each		10.0	23.0	22.0	26.5	
				Sub-Total Weight	110 lbs	
ESTIMATED PACKED DIMENSIONS, Each 3 = 12 CUBIC FEET						
AVAILABLE SHIPPING CASE						**250**
1 (One) Fiberglass		40.0	31.0	25.0	75 lbs	

Vasulkas:
Estimated packed dim. = 55 cu ft
Weight w/out test equip unpacked = 291 lbs
60
351

(4)

THE VASULKAS, INC./100 ROUTE 6/SANTA FE, NEW MEXICO 87501
TEL. (505) 471-7181/FAX. (505) 473-0614

Owners:
The Vasulkas, Inc. (same as above)

ARS ELECTRONICA EXHIBITION/JUNE 1992
Inventory for shipping

N.B. All measurements in inches and pounds.
IRV* = Insurance Replacement Value of fully functional equipment in US$.

**ADDITIONAL EQUIPMENT as per the request of Fadi

TEST EQUIPMENT

LYON LAMB SYNC GENERATOR/ ENCODER	**2.0**	**19.0**	**17.0**	**?**	**3,200**
TEXTRONIX VIDEO WAVEFORM MONITOR	**6.0**	**9.0**	**17.0**	**?**	**1,800**
NEC VIDEO MONITOR, COLOR NTSC, 17 INCH	**16.0**	**12.0**	**10.0**	**?**	**350**
OSCILLOSOCPE, 50MHZ BANDWIDTH MIN, DUAL TRACE, DELAYED SWEEP	**7.0**	**10.0**	**17.0**	**?**	**400**
				? lbs	
				60 Total	

ESTIMATED PACKED DIMENSIONS = 11.75 CUBIC FEET

Need weights

THE VASULKAS, INC./100 ROUTE 6/SANTA FE, NEW MEXICO 87501
TEL. (505) 471-7181/FAX. (505) 473-0614

Owner, instrument to be returned to:
Attention: Norman Lowrey, Chairperson
Music Department
Drew University
Madison, NJ 07940
Tel: 201/408-4321 (office)
201/316-8142 (home)

ARS ELECTRONICA EXHIBITION/JUNE 1992
Packing list
Dimensions, Weight & Insurance Replacement Values

N.B. All measurements in inches and pounds.
IRV* = Insurance Replacement Value of fully functional equipment in US$.

	Model #	Height	Width	Depth	Weight	IRV*
MOOG SYNTHESIZER						**22,000**
3 (Three) Racks with						
components/ each		36.0	54.0	12.0	25	
		36.0	54.0	12.0	25	
		36.0	54.0	12.0	25	
Keyboard		4.0	32.0	10.0	8	
External Power supply		18.5	25.0	12.0	20	
Interface Control Panel					2	
					105 lbs	
Patch Cords						

ESTIMATED PACKED DIMENSIONS = 88.25 CUBIC FEET

(6)

THE VASULKAS, INC./100 ROUTE 6/SANTA FE, NEW MEXICO 87501
TEL. (505) 471-7181/FAX. (505) 473-0614

Owners:

Sara Seagull & Larry Miller,
Executors
Estate of Bob Watts
107 W. 28th St.
New York, NY 10001
212/564-5477 (studio)
212/268-6757 (fax)

David Behrman
10 Beach St.
New York, NY
212/966-2943

Bob Diamond
7109 Via Carmella
San Jose, CA 95139
408/629-0305 (office)
408/365-1251 (fax)
408/224-1678 (home)

**N.B. To be returned to "Estate of Bob Watts" contact Sara Seagull

ARS ELECTRONICA EXHIBITION/JUNE 1992
Packing list
Dimensions, Weight & Insurance Replacement Values

N.B. All measurements in inches and pounds.
IRV* = Insurance Replacement Value of fully functional equipment in US$.

	Model #	Height	Width	Depth	Weight	IRV*
****CLOUD MUSIC INSTALLATION**						**35,000**
Music Synthesizer	none	23.0	11.0	19.0	22	
Video Analyzer	none	21.0	15.0	19.0	35	
Audio Mixer		30.0	18.0	10.0	33	
(+ Misc. cables & adaptors)					90 lbs	

ESTIMATED PACKED DIMENSIONS = 24.25 CUBIC FEET

(7)

THE VASULKAS, INC./100 ROUTE 6/SANTA FE, NEW MEXICO 87501
TEL. (505) 471-7181/FAX. (505) 473-0619

Owner:
Bill Hearn, on extended loan to Sonoma State, Rohnert Park, California

**N.B. To be returned to Sonoma State, contact Steve Anderson

Bill Hearn
2940 Martin Luther King Way
Berkeley, CA 94703
510/848-6121 (home)
510/486-5043

c/o Steve Anderson
Sonoma State University
1801 East Cotati
Rohnert Park, CA 94928
707/664-2330 (office)
707/795-3508 (home)

ARS ELECTRONICA EXHIBITION/JUNE 1992
Packing list
Dimensions, Weight & Insurance Replacement Values

N.B. All measurements in inches and pounds.
IRV* = Insurance Replacement Value of fully functional equipment in US$.

	Model #	Height	Width	Depth	Weight	IRV*
****Hearn VIDIUM**	**none**	**21.0**	**72.0**	**10.0**	**80**	**12,000**
Interface Control Panel					**2**	
					82 lbs	

ESTIMATED PACKED DIMENSIONS = 20 CUBIC FEET

N.B. As per 4/23/92 the necessary display equipment has not been located yet. The number of "XY" displays is optional, with three being the most desirable but one or two will be workable.

		Height	Width	Depth	Weight
3 (Three) "XY" Displays/ Each		12.0	12.0	14.0 3.75	~~27~~ 45 each
		12.0	12.0	14.0	~~27~~
		12.0	12.0	14.0	~~27~~
					~~81~~ lbs

ESTIMATED PACKED DIMENSIONS = ? CUBIC FEET 11.25 cu ft

82
135
219

(8)

THE VASULKAS, INC./100 ROUTE 6/SANTA FE, NEW MEXICO 87501
TEL. (505) 471-7181/FAX. (505) 473-0614

Owner, instrument to be returned to:
Gary Hill
911 Western Ave.
Seattle WA 98104
206/789-5949 (home)
206/623-8858 (studio)
206/623-1421 (fax)

ARS ELECTRONICA EXHIBITION/JUNE 1992
Packing list
Dimensions, Weight & Insurance Replacement Values

N.B. All measurements in inches and pounds.
IRV* = Insurance Replacement Value of fully functional equipment in US$.

	Model #	Height	Width	Depth	Weight	IRV*
JONES FRAME BUFFER	**none**	**7.0**	**19.0**	**8.0**	**5**	**800**
Interface Control Panel					2	
					7 lbs	

ESTIMATED PACKED DIMENSIONS = 3 CUBIC FEET

SAN

TELEPHONE: 505/471-7181

RECEIVER:

Attention I

Company Name

Fax Number

SENDER:

Individual's Na

Number of Pages (including this sheet) 8

4/1/92

Dear David,

As you know we are in agreement with the Invoices you presented to us during your weekend visit. The payment will be sent immediately upon receiving the funds from Austria. We spoke with Peter Weibel yesterday and he said he would urge the functionaries to transfer the funds today. Who knows?

I am also enclosing a list of deadlines we have anticipated. The main dates for you are the shipping date of May 4th, and the Linz installation/exhibition period of June 9 to July 9. Re the packing: Woody is planning to come to Iowa for on May 1st. Re the installation, maintenance and breakdown of the exhibition: the Austrians claim your and the Vasulkas' presence from the month beginning June 9.

Woody would like you to estimate the power needs of the equipment, i.e. a list follows.

It was good to see you. Greg sends his regards also. Hopefully the next visit we can go for a walk in the mountains.

Melissa

P.S. Woody's working on the travel plans to Frankfurt.

SCHEDULE DRAFT, 3/13/92

ARS ELECTRONICA Deadlines/ VASULKA Deadlines:

March 16 - Sizes, weights and values for shipping to Linz
Complete list for Fadi of all equipment & technical needs

Between March 18 thru 24 - Woody to San Francisco - Beck & Hearn

March 27 to 30 - David Muller in Santa Fe
- Bailey to develop packing system on Santa Fe machines

April 1 - ETC equipment to Iowa

April 5 - Deliver period documents to Peter for exhibition catalogue

April 15 - ARS ELECTRONICA catalogue, 10 pages of text and photos

April 30 - Judson Rosebush essay & David Dunn essay

April 28 thru May 1 - Final packing in Iowa for shipment

May 4 - All equipment ready for shipment from Iowa to Linz

May 15 - All final catalogue materials

May 22 - Master tapes ready to be tranferred to discs

May 30 - All original documents returned

June 1 to 5 - Receive Buchla from Michael Czajkovsky in Aspen

June 9 to 21 - Installatio begins with Woody & David Muller

June 14 - Morton & Beck arrive with their machines in Linz

June 21 - Exhibition Opening

June 22 to 27 - Festival symposium with Woody, Beck & Morton

July 7 - Exhibition Closing

July 8 & 9 - Equipment packed for return to owners in the US

received
April 1, 1992

Artist: Woody & Steina Vasulka

Fax number: 001 (505) 473-0614

message from Wolfgang Dorninger, ARS ELECTRONICA
tech dept.
my fax-number is LIVA/ARS E. 0043-732-783745

TECHchecklist for power supply

Power-supply LANDESMUSEUM - Francisco Carolinum

The power supply at the LANDESMUSEUM is very limited and therefore it is really necessary to inform me about your maximum use of electrical power in watts.
Each room at the Landesmuseum has two circuits of 10 Ampere/2000 Watts. There is a third with 10 Ampere/2000 Watts they don't like to use, but we have to.
Because of the very limited power supply I have to make sure that you have enough for your installation/s.
So send me a fax as soon as possible to have time to install new circuits of power supplies at the museum.

Note: 110 Voltage or 220 Voltage !

Thats it for first, greetings - Wolfgang Dorninger aka Fadi

Wolfgang

011-43-

Business 695-8800

permit 1-800-755-5444

Dave Muller, RR 7 Box 6, Iowa City, IA 52240
phone (319)-335-2076 days, (319)-337-4962 evenings
FAX Monday through Friday, days (319)-335-1753
FAX evenings, call me at (319)-337-4962 and I will set it up.

Saturday, April 25, 1992

Woody Vasulka
The Vasulka's Inc.
Fax Number (505)-473-0614

Dear Woody, MaLin:

1. No banana cords came with the vidium. I have not been able to locate any of those good X-Y monitors, but I have one Tektronics storage scope with green 6.5"w x 8"h viewing area that works with a glitch I'm sure I can solve.

2. The Paik Scan Processor (Wobbulator) is great. What impedence outputs of the amplifiers do I use? or who do I call?

3. Do we get the extra week?

4. My brother told me who to get to crate the machines. They are a trucking firm that specializes in hauling computers. I will call them Monday to come out for an estimate. My brother says the going rate is $4 per cubic foot, but for friends it can go as low as $1.50, and they can do it on site. They would also haul it to the airport for us, if you want that service.

5. All Woody's test equipment (monitor, waveform monitor, sync generator, oscilloscope) weighs 60 lbs. The Tektronics X-Y monitor weighs 45 lbs.

6. How many pages did you fax me? I count 34, but the last page has a number 8 in the upper right hand corner, and page 26 says 9 pages, although it isn't numbered so there are 9 pages. The last page I got says to send the Jones Frame Buffer to Gary Hill in Seattle.

7. Progress report: So far I have repaired the Muse, Siegel Dual Colorizer, and Brown Field Flip/Flop Switcher, and designed the public control boxes for them. I have not yet looked at the Multikeyer. I have operated the Moog, Wobbulator, Vidium, CVI Data Camera, Rutt/Etra, McArthur S.A.I.D. I will get everything else going tomorrow (Sunday).

8. What else needs control boxes besides your three pieces and the Moog? What about the Rutt/Etra, McArthur & Schier, Vidium and Putney? I need to order the boxes early next week to give me a long, leisurely time to build them before we fly to Austria. I plan to have the plugs installed on the instruments and the circuits verified before the instruments are shipped.

9. For the architects: The cables that came with ETC's public control boxes are 11.5 feet long. They will need pedestals to sit on.

Dave Muller

Following is a copy of the FAX I am trying to send to Fadi, but his machine doesn't answer. Am I dialing the right way?

Dave Muller, RR 7 Box 6, Iowa City, IA 52240

phone (319)-335-2076 days, (319)-337-4962 evenings
FAX Monday through Friday, days (319)-335-1753
FAX evenings, call me at (319)-337-4962 and I will set it up.

Saturday, April 25, 1992

Wolfgang Dorninger aka Fadi
ARS Electronica tech. dept.
Fax Number 01143732783745

Dear Fadi,

Here are estimates of 110 Volt power requirements. Woody Vasulka asked me to send them to you.

PAIK SCAN MODULATOR (a.k.a. the "Wobulator")		500 Watts
MOOG SYNTHESIZER		75 Watts
	plus audio amplifier	50 Watts
PUTNEY SYNTHESIZER		75 Watts
	plus audio amplifier	50 Watts
CVI QUANTIZER		75 Watts
	plus video monitor	150 Watts
CVI DATA CAMERA		150 Watts
	plus video monitor	150 Watts
PAIK/ABE SYNTHESIZER		75 Watts
	plus video monitor	150 Watts
BROWN FIELD FLIP/FLOP SWITCHER		25 Watts
	plus video monitor	150 Watts
SIEGEL DUAL COLORIZER		25 Watts
	plus 2 video monitors	300 Watts
BROWN MULTIKEYER		50 Watts
	plus video monitor	150 Watts
RUTT/ETRA SCAN PROCESSOR		200 Watts
	plus video monitor	150 Watts
	plus audio amplifier	50 Watts
JONES 64 x 64 REAL TIME BUFFER		50 Watts
	plus video monitor	150 Watts
MCARTHUR SAID (Spatial and Intensity Digitizer)		50 Watts
	plus video monitor	150 Watts
20 Cameras @ 10 Watts		200 Watts
4 Laser Disc Players @ 75 Watts		300 Watts
	plus 4 video monitors	600 Watts
Feedback Installation		120 Watts
Buchla Synthesizer		125 Watts
	plus audio amplifier	50 Watts
Hearn Vidium		200 Watts
	plus 3 XY displays @80	240 Watts

IP		160 Watts
	plus 3 video monitors	450 Watts
	plus audio amplifier	50 Watts
Beck Video Weaver		80 Watts
	plus 3 video monitors	450 Watts
McArthur & Schier		240 Watts
	plus video monitor	150 Watts
		6390 Watts

I estimated video monitors at 150 Watts each, which is probably high.
Also remember lights, which can be 220 Volt types.

Thank you,
Dave Muller

-----------End of Message---

→