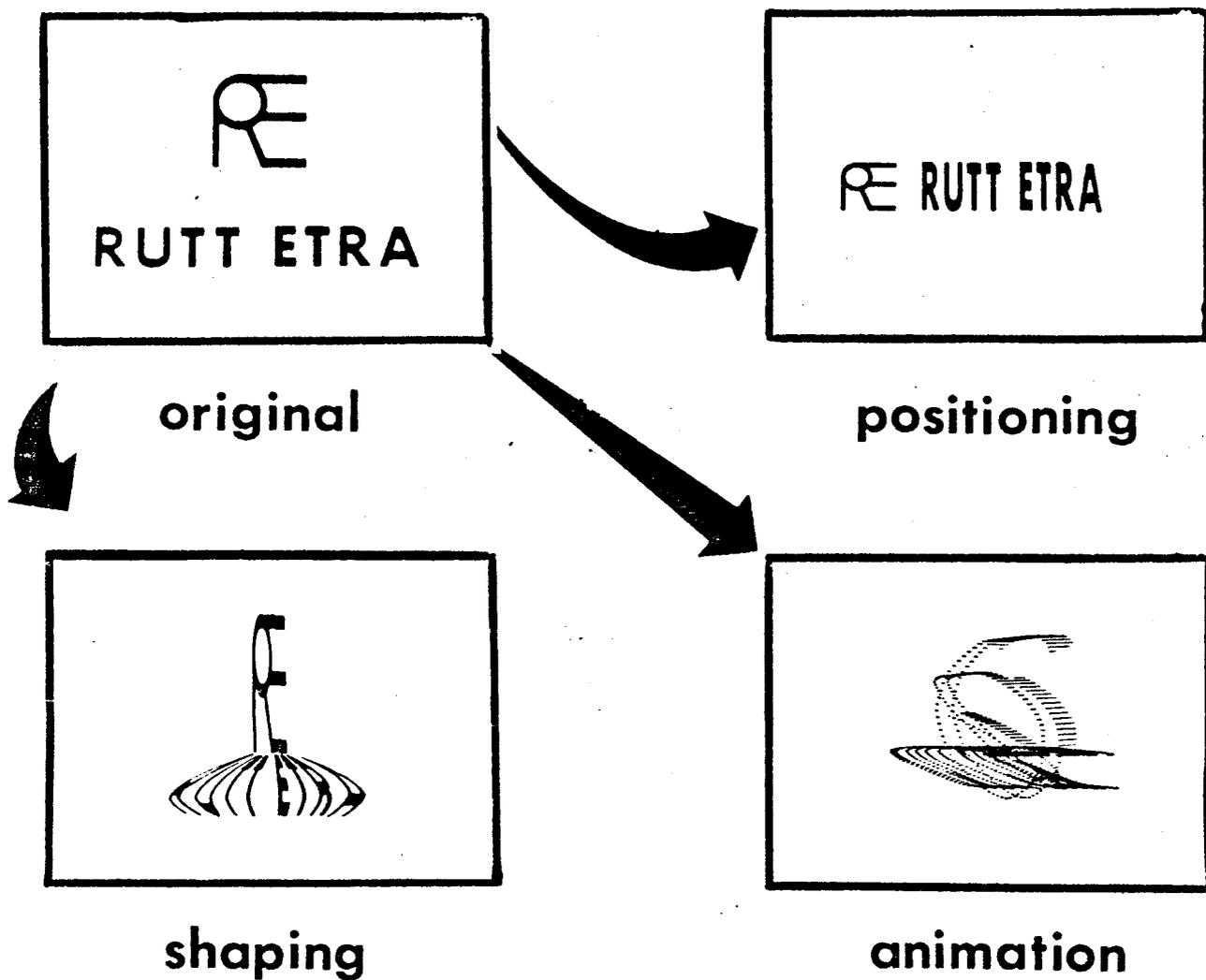


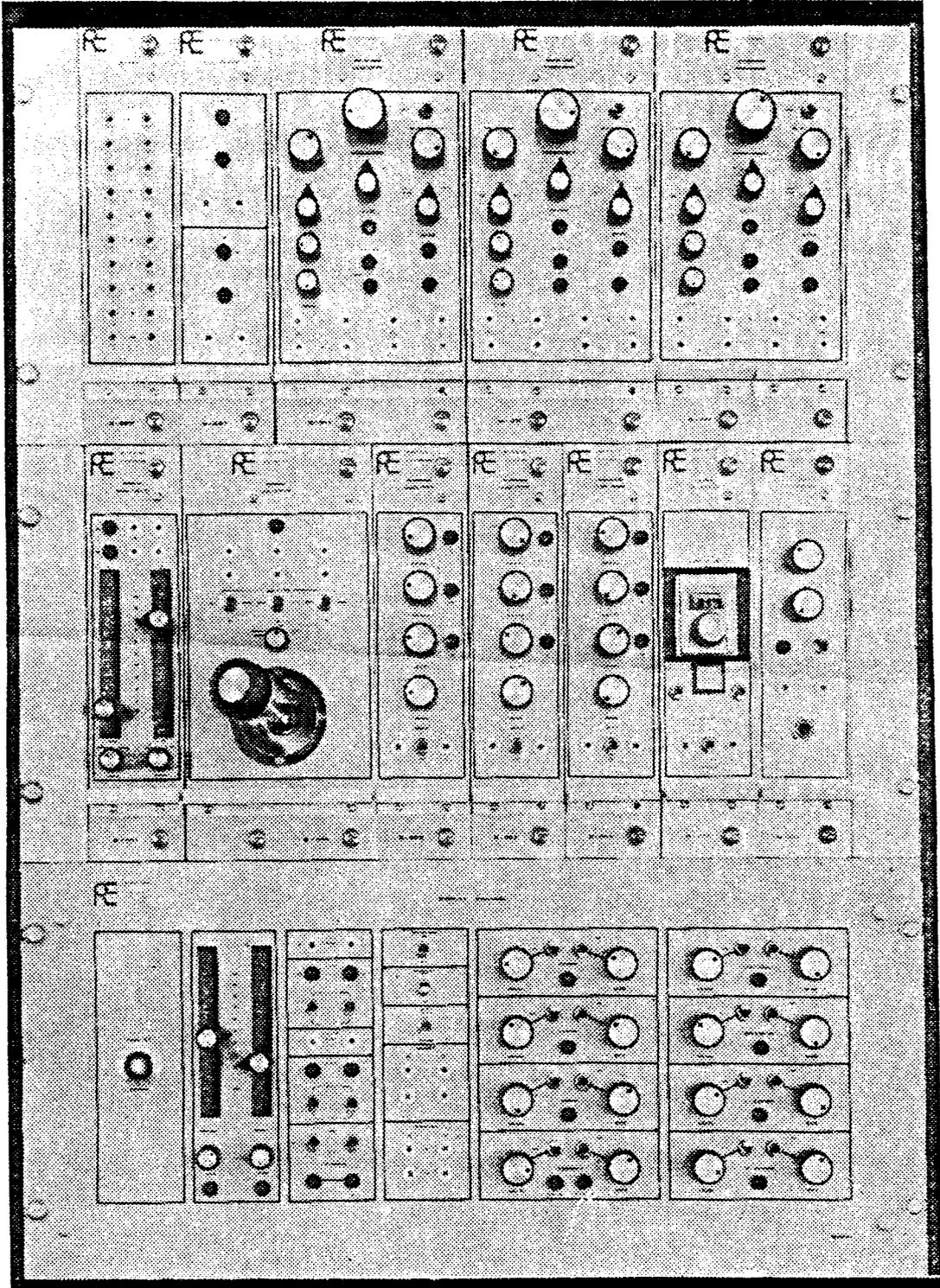
# instant animation



**RUTT ELECTROPHYSICS**

21-29 West Fourth Street, New York, N.Y. 10012  
Telephone 212-982-8300

# RUTTETRA VIDEO SYNTHESIZER





## RUTT/ETRA VIDEO SYNTHESIZER

Video synthesis is electronic animation. The video synthesizer accepts standard video signals from a camera, film chain, video-tape or graphics generator. The synthesizer then processes the signal and applies a combination of effects to change position, size and aspect ratios; to re-shape and add motion to fixed graphics or live scenes. It can generate chroma keys in any desired shape and then re-shape, blend or animate the key inserts on a real time basis.

The RUTT/ETRA Synthesizer is a video analogue computer. In operation the incoming video signal is separated into its vertical, horizontal and intensity components. These components are processed through a series of multipliers, summing amplifiers and function generators to modify both the raster format and the intensity of the processed video. The Synthesizer can lighten or darken specific portions of the picture and can control the raster which causes the image to be reshaped. The components of the processed video are fed into a specially designed kinescope display where they are re-assembled into a standard image. This image is picked up by a monochrome camera, colorized, and fed into a switcher or video tape recorder.

Complex graphics that would require days to animate can be video synthesized in minutes. The synthesizer may be used to add motion to titles and logos and to instantly alter size and position of electronically generated graphics. As a tool in video art it can modify existing patterns or generate completely new ones. Patterns may be controlled by a combination of pre-set programming and manual control. The system may be interfaced with audio equipment enabling the visuals to be synchronized with music or speech.

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## Rutt/Etra Video-Synthesizer

### OPERATIONAL COMPONENTS

The control system of the R/E video synthesizer consists of one or more each, of the following components:

1. DCU (display control unit).
2. Ramp Generator.
3. Waveform Generator.
4. Summing amplifier.
5. Multiplier array.
6. Diode Array.
7. Joystick module.
8. Level control module.
9. Audio interface module.

Expanded and highly versatile versions of the synthesizer may be assembled by installing additional types of modules. These include:

1. Full programming.
2. Sectioning.
3. Rotation.
4. Colorizing.

### DISPLAY CONTROL UNIT (DCU).

The DCU controls the graphic in the following respects:

1. Vertical position.
2. Horizontal position.
3. Depth (size).
4. Intensity.
5. Aspect ratio.

The DCU may be adjusted to position the artwork in any location on the screen, and determine its size, brightness and aspect ratio. During the course of the production, any of the above conditions can be caused to change "on camera" in one of two ways:

1. The ramp generator is patched into any combination of the five functions. With the ramp switched to  $\pm 10V$ , conditions are set as desired at the end of the sequence. Then with the ramp switched to zero output, conditions are set as desired at the beginning of the sequence. Next, ramp time is set for the desired length of the sequence. When the ramp is switched on, the graphic will then move through the desired sequence, on cue, in the precise time allotted.
2. The joystick control may be patched to any combination of three of the above functions. The three selected functions then become totally controlled by manual operation. This permits the operator to perform zooms, pans, fades etc. by "feel", and to synchronize with, or to follow live action.

In addition to those effects described, the DCU also provides for reversing or spinning of the graphic on either a vertical or horizontal axis. Vertical and Horizontal centering controls are provided to define the point on the graphic at which the axis of rotation is centered.

All the effects controlled by the DCU may be used in any combination, simultaneously or sequentially. As can be seen, an extremely wide variety of precisely controlled positioning effects may be performed by the DCU.

#### RAMP GENERATOR

The ramp generator delivers a linear D.C. ramp with a range of 0 to 10V (+) (up ramp) and (+) 10V to 0 (down ramp). Outputs are provided for obtaining negative going or positive going voltages.

Ramp time may be varied from several minutes, down to a few frames in length. The ramp may also be switched instantly from maximum to minimum, or minimum to maximum, to preview the beginning and end of a sequence. A hold switch is also provided which has the effect of stopping the ramp at any desired point. When the hold switch is returned to normal position, the ramp continues to the end of its sequence.

#### WAVEFORM GENERATOR

The waveform generator is essentially an extremely stable oscillator with a wide variety of signal outputs. A switch is provided to select one of three ranges of frequencies. A single control is then used to vary the frequency within that range.

Three waveforms are available at output jacks; sine wave, triangle wave, and square wave. Duty cycle function further permits shaping of the outputs to pulses, sawtooth etc.

In addition, the various waveforms may be amplitude or frequency modulated. These various signal outputs may be ramp controlled enabling effects to be increased or decreased in intensity at the discretion of the operator.

The waveform generator may be operated in "locked" or "Free Running" mode. In the locked mode, the output is locked to the display unit. In this mode, the generator is used for the shaping of art work. In the free running mode, the generator is used for animating the art work.

#### SUMMING AMPLIFIER

The summing amplifier is nothing more than a three channel mixer, enabling voltage signals from a combination of sources to be mixed into one output. Three such summing amplifiers are provided in the basic R/E unit, greatly increasing its versatility.

## JOYSTICK CONTROL

The joystick is a manual substitution for the ramp generator. It provides for the control of three voltage signals, two with stick position, and a third through stick rotation. Normally, these controls are assigned to vertical and horizontal position and size. They may however, be assigned to control a wide variety of other functions, such as animation intensity, video level, etc.

A two position switch is located on the joystick module providing for "light damping" and "heavy damping" of the joystick. In the light damping mode, the graphic follows each motion of the joystick precisely, but rounds off the rough edges of the operator's control into a smoothly flowing motion. In the Heavy damping mode, the graphic follows the control of the joystick, with increased smoothing of the joystick motion, and with a slight delay in translating control motion into graphic motion.

## AUDIO INTERFACE

Audio interface provides a means for introducing an external audio signal for the purpose of driving various functions of the synthesizer.

The module contains a damping control for varying the response time of the module. It may therefore be adjusted to follow the heavy beat of the rhythm, or to follow the minor excursions of the melody line of music.

The module makes possible the movement or modulation of graphics, and synthesized backgrounds as a visual component of the audio portion of the production.

Extremely interesting, unusual and effective visuals may be generated by connecting the audio interface with various bio-feedback devices, and monitoring instruments. These permit the activating of visual effects through the muscular activity of musicians and dancers.

## SECTIONING

Sectioning permits the simultaneous animation or positioning of up to five graphics or pieces of art work. This is accomplished by slicing the display raster horizontally in groups of video lines. Each group of lines may be adjusted to accommodate a graphic which appears in that section of the original video signal.

The addition of the necessary modules for sectioning permits treatment of each section independently, or the treatment of all sections as a group. For multiple effects, the alternative to sectioning would be the layering of videotape or multiple printing of film. Sectioning offers obvious advantages in terms of registration of effects, reduced video degradation due to dubbing, and the ability to see the end result in real time.

## COLORIZING

The basic single section R/E system has no need for colorizing module. The background colorizing function of the users existing video switcher is used for this purpose. When sectioning is added to the basic system, it becomes highly desirable, if not essential, to have the ability to assign separate colors to each of the treated sections.

For this purpose, Rutt Electrophysics has developed a multi-level colorizer. Each section of the display is assigned an intensity. The colorizer is designed to recognize five separate video levels, and colorize each level independently. In addition, the background may also be colorized, making a total of six colors possible.

## ROTATION

Addition of rotation modules permit precise rotation of the graphic on the viewing axis. The position of the graphic may be defined for the beginning and the end of the rotation, to within one degree of rotation. The rate of spin may be set or made variable through the application of ramp control.

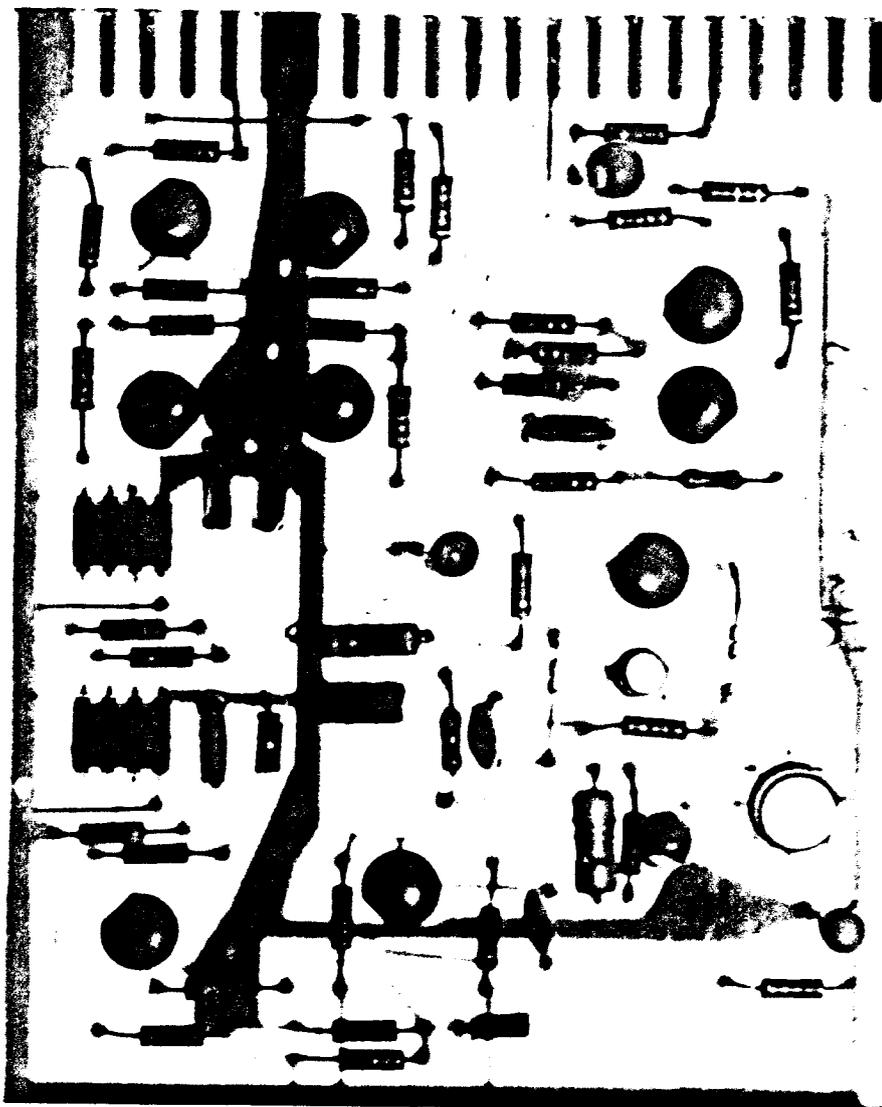
## FULL PROGRAMMING

Extremely complex sequences of animation and positioning effects may be pre-set and run in sequence with the addition of full programming.

Full programming consists of one Master Ramp Generator and a group of Controlled Ramp modules. The number of controlled ramp modules required depend on individual requirements, and might be as few as two, or as many as ten. Additional controlled ramps may be added at any time on a "plug-in" basis.

The master ramp generator delivers a 0 to 10V ( $\pm$ ) and defines the overall time for a complete sequence of events. Provision is also made for stopping and starting the master ramp on cue, reversing the ramp on cue, and cycling of the ramp. In addition, a pushbutton is provided for holding the ramp at any desired point.

The controlled ramp modules also deliver a 0 to 10V ( $\pm$ ) ramp, taking their cues from the master ramp. Each controlled ramp module begins its ramp at a predetermined point on the master ramp. Another pre-determined point on the master ramp defines the end of the controlled ramp. The controlled ramp module then adjusts its own ramp rate to conform to this time frame.



Summary of all that I saw:

Rutt/Etra Video Systems is located at 21-29 West 4th Street in New York. The Telephone Number is 982-8300. Their facility seems to be in one large room, about 35' x 50'. It is a warehouse type building, very junky with wooden floors. The office equipment is just an old desk and chair at one end of the room.

While I was there I saw only one employee - a girl that helped set up the artwork. The artwork was a white on black, high contrast print on photographic paper about 8 x 10. The machine that was demonstrated to me was not able to section by counting horizontal lines but I was told that they have done that on some of their later machines and would do that on a machine for me. It had one internal ramp that was used for the timing of their sequences. He used the term master ramp. I think that this must be a digitally-controlled ramp because he can stop it at any point and return it to either end instantly. Using this one ramp he would set up two sets of conditions as to depth, horizontal and vertical position and aspect ratio. This ramp would cause the image to move from one to the other of these positions in a time that can be controlled by this master ramp. I was told that if we had a multiple section machine we would have control of each section by this master ramp, or by an auxiliary ramp that could be purchased with the machine. He did not use the term "initial and final" even though he is doing exactly the same thing we are. He is also able to move from this first position and turn on some animation and then turn it back off as he gets to final.

To program more complex sequences you need more ramps. I think he suggested five. These ramps also go from 0 volts to either + 10 volts at the rate that you can determine and are programmed to start off the master ramp. I don't know if these ramps are digital or not because the demo machine didn't have any.

I was told that the rotation unit was not available yet but that they would be able to do that soon.

They had a great deal of control of the oscillators. They can run in either a free-running mode or phase locked to the vertical timing. He called the free-running mode the animation mode and locked mode the distortion mode. He had external control of amplitude and frequency. They can also operate in some sort of a triggered mode and vary the time on a horizontal line that the oscillator triggers and get an effect that is very hard for us to produce.

Talking with Mark, he said that Steve Rutt was having trouble getting his oscillator to phase-lock and Mark suggested that Ingersol made a chip with a triggerable oscillator. Later, Walter Wright told Mark that Steve was doing this.

We also talked about a full color film machine and said that he could deliver and would send me a price list to Vogel Productions in California.

He said he can set up a real time animation and film at one frame per second revolving a color wheel between the CRT and the film camera turning on the amount of red, blue and green needed for each frame, then advancing the ramp one frame and repeating this step over and over. He said that he would modify a Cohu camera to run at 2500 lines to use as a pick up camera in this film mode.

I asked if I could do a job on the machine he had. He said the basic cost of the machine would be about \$500/day plus VTR time. He would rather see a storyboard and bid the job according to the amount of animation. He would need a few days notice to arrange for VTR time. He told me that they had two jobs coming up in December, one in Buffalo, New York about December 12 to 14 and then in Phoenix, December 20-22. Their machine is small enough that they can pack it up and take it to the job.

I asked if he had sold any of his machines and he said that Channel 13, WNET in New York had one. The studio that has the unit is at 345 E. 46th - a John Godfrey. I called him and said I was interested and asked if I could see a demonstration. When I got there he was very enthusiastic about the Rutt/Etra synthesizer and showed a demonstration of movements of one section. His is only a one section machine also - and they were all exactly the same things we do.

I said I was leery about getting such a new machine and worried about reliability. I thought that I would be getting only the third machine that they had built but he said, "Oh, no. Rutt/Etra had sold four others." But he didn't know where. When I asked about service, he said it would be on a modular swap system. He got a board out of the machine and showed it to me. It was a PC board, not at all crowded, pins on only one side, the size of our small boards. It looked like very neat work.

He was very enthusiastic about the machine - more like a salesman than a user or buyer. Later he mentioned that Channel 13 had paid some of the development costs of the synthesizer. I almost think that he personally might have some money in it. He mentioned many times what a good engineer Steve Rutt was and if there was something special that I needed he was sure that they could do it for me. It sounded like he would be part of the development of accomplishing this special effect. Channel 13 also has a Nam June Paik synthesizer and I sort of got the impression that June had done some work with Steve Rutt. June has been fooling around with

Answers to Specific Questions from John Howell

1. Can they establish an initial and final condition?

Answer: Yes. They do exactly the same thing but they don't use the words "initial and final".

2. Can they animate the size of the display?

Answer: Yes.

3. Can they rotate the display?

Answer: They say they can but I haven't seen it.

4. Can they vary the number of sections to be animated?

Answer: They assure me that they can and that it would be on the machine they want to sell me but I haven't seen it.

5. Do they blank the beam between sections?

Answer: I haven't seen their sectioning so I can't tell.

6. Can they vary over time the degree to which the animation is combined with the display?

Answer: Yes.

7. Can they regulate the segments in which animation is displayed and the degree to which it is animated?

Answer: They say they can but the demonstration I saw was only a one section machine. The machine he was to sell me was to have six sections and supposed to be able to do that.

February 12, 1974

Computer Image - Notes on visit to Rutt/Ettra (per JTR):

Arrived at Rutt/Ettra about noon.

Steve Rutt was cordial. Showed me around briefly. Introduced me to secretary who walked in later and to technician who does the wiring.

Company has sold four machines. Been in this business less than one year. Started in New Jersey, now moved to New York. Not operating in New Jersey. Is New Jersey corporation, wholly owned by Steve Rutt.

"Ettra" comes from Bill Ettra who came in later. Ettra describes himself as arty type who got Rutt to make these machines for him. Ettra learned about all this from Paik of channel 13 in New York. Paik developed synthesizer many years ago. Simply did not go as far as to animate with it. I am unclear on this.

I told Rutt I assume he has literature on Computer Image. He said yes, he had collected some including patents. I asked if he could bring it out and he brought out three Harrison patents and XRX of original underwriting prospectus dated 1969. The Scanimate patent was not among those he brought out. I told him there are other patents and he asked me to list them. He said, I was no longer practicing. I told him I did not have list with me but had copy of one patent. I got out and showed him copy of patent 3,700,792. He skimmed it, said he could not read it all now but would read the claims.

He read claim 1 and 2 or 3 other claims. Also said circuits shown in patent were different from his, that CIC has some digital counters, etc. and he is all analog (I think he was thinking about the original Harrison patent of which he had a copy). I retained my patent copy. He noted the number. /

*He knew I was a patent lawyer and so on*

He said what they are doing is old, that any conventional analog computer is capable of animation. Also said Hughes Scan Converter is capable of the basic animation they are doing. I made no comment and made no comment about the Scanimate patent.

I believe Rutt's entry was triggered by knowledge of Dolphin. He seems very aware of what Dolphin is doing. Has heard Alan Stanley speak.

Rutt and Ettra said they are going after the "arty", creative business. In response to my question, they said this was primarily the education and non-profit institutions. He said they have the low priced machine to meet that market and Computer Image is much more sophisticated and priced way out of that market.

Fairly early in the conversation, Rutt made it clear that since I am an attorney, he did not want to talk without his own attorney. I told him I was no longer practicing, but in any event did not want him to discuss anything he was uncomfortable about. I told him I did not intend to discuss patents at all but was there to gather any information I could.

He said Computer Image patent is invalid. I made no comment.

I said assuming Computer Image and he had honest opinions about patent position, was there any area outside of a court decision that could be discussed. He said he did not think so because he knows people have been shaping waves, etc. since long before Lee Harrison got out of high school, but what was my proposition. I said I had no proposition but wanted to find out whether he was open to discussion. He said he is open but confident his machine is taken from old technology. He said Computer Image has not learned what Universities like SMU have been doing.

He said the next move is up to Computer Image. If they want to sue and wind up with an invalid patent, that is up to them. He said Rutt/Ettra is self-financed and overhead is very low. Said rent is less than he pays for his apartment.

*He said there are no corporate relationships to Rutt/Ettra other than Camera Mart which is merely a distributor. Impact is his uncle's company & has no ties to Rutt/Ettra*

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RS 11/19/74

SECOND DRAFT OF TEXT for Section One (of 3 sections) of the

"R/E VIDEO SYNTHESIZER - OPERATING MANUAL"

Introduction

Once installed as part of a video tape recording system, the R/E Video Synthesizer opens the door to new realms of visual beauty, viewer interest and dynamically reinforced meaning.

Simple adjustments and interconnections of its manual and automatic controls transform the size, shape, position, movement and other characteristics of static and moving images. These images may originate from such video sources as studio or film chain cameras, video tape playback, video character generators and the key outlining shapes produced by special effects generators.

Through the synthesizer's audio interface, external signals such as audio, bio-feedback and instrument monitoring can drive other synthesizer functions. This synchronizes image changes with external events such as musical rhythms, sound effects and the outputs of audio synthesizers, computers and other sources.

How the Synthesizer Alters Video Images

All video sending and receiving devices operate - for faithful reproduction - on identical space-time patterns for generating scan line rasters upon which picture information is arrayed.

The synthesizer takes in picture information intended for standard raster reproduction...but alters the raster patterns upon which it is to be displayed. This is what happens, in a simple way, when you turn the vertical or horizontal sweep controls on the back of a TV set. The raster is squeezed or stretched thereby, and picture information on it is contracted or expanded.

This is what the synthesizer does, too, though in much more complex and sophisticated ways. These alterations of raster (and picture) information are often drastic. They call for a CRT beam to be deflected, and its intensity altered, in non-standard ways. This occurs at incredible speeds and frequencies, using voltages far in excess of conventional TV systems.

In order to cope with these unusual demands, the synthesizer must "read out" its non-standard video information as a real image on the face of its own high resolution CRT display.

## Rescanning the Synthesizer Display

The synthesizer display images are rescanned by a regular TV camera operating with a standard raster pattern. This rephotographs the altered images - products of distorted raster information - in conventional standards compatible with a video tape recorder.

This camera may be dedicated to the synthesizer display in a rack mount. Or the synthesizer display screen may be arranged so that a studio camera may be rolled into position to pick up its image.

## Picture Inputs for the Synthesizer

Continuous tone images, from still photos, slides, film chain or studio cameras are well reproduced in monochrome, through the synthesizer.

Titles, line cartoons, graphics and designs - intended to be keyed over other pictures or backgrounds - are best prepared as high contrast copy material. Such artwork is best prepared for pickup in negative form: white lines and areas against a black background.

When they are to be front-lit, they are easily rendered as negative photostats. It is even better, however, to rear-light high contrast material as transparencies in front of a transparency illuminator. Kodalith negatives, such as are employed in making photo-offset plates, are ideal.

## The Graphics Camera should be a Vidicon

Graphics material, intended for synthesis, should be photographed by a TV camera employing a vidicon tube. Best results will be obtained by using a monochrome vidicon camera. If a color camera is to be used, the chrominance circuit should be turned off.

To improve the contrast of graphics images, the camera output should be processed through a white clipper. This feature is standard equipment on many cameras.

The use of a keyer, at this point in the system, will provide a more uniform image for the synthesizer to process.

## Synthesizing Images for Color Video Production

Two radically different sets of information are transmitted and received for color video. Picture structure and shading are conveyed by what is called the luminance information. This is all that is required for full video reproduction by monochrome receivers.

A second set of information, carried by the color sub-carrier, determines what color the electron beam's impact will produce on the color CRT screen.

The synthesizer functions as a monochrome system. It deals only with the structure, shading and movement of images. Most often its white monochrome image is superimposed by keying over another picture or background in color. However, color may be added to the synthesized image by a colorizer, later in the video processing system.

Limited colorizing equipment, such as may be associated with low-cost switchers and special effects generator, may only enable colorization of a single keyed foreground or background image. Other more sophisticated colorizers (such as COLORADO VIDEO) can selectively introduce several colors into different parts of a synthesized picture. They differentiate between areas of the image which lie within predetermined ranges of brightness, such as 0-20%, 20-40%, 40-60%, etc.

Graphics to be multi-colored after synthesis should be prepared in well-differentiated shades of black, grays and white. Continuous tone images, such as from film, slide, still photo or live subjects, will, when synthesized for subsequent colorization, yield interesting effects called posterization or solarization.

#### A Typical Procedure with the Synthesizer

1. One state of an image is created by adjusting the various knobs under HEIGHT, WIDTH, DEPTH and so on in the upper tier (marked BIAS) of its respective Control Group (1 or 2, as the case may be). Other modules may be patched to the Control Group input for more complex effects.
2. The ramp generator, with its switch in the UP position, is then patched into the input of the same Control Group. A second image state is now created by adjusting knobs on the lower tier (marked LEVEL) of that Group.
3. Now, when the ramp switch is shifted to the DOWN position, the movements and effects that were operative when the ramp was UP are progressively turned off by ramp action. When the ramp has terminated its action, the image will have reverted to the state it assumed (1) before the ramp was attached.
4. The time duration of ramp action can be preadjusted to take from several minutes to as short a period as a few TV frames.
5. When the ramp is in action during rehearsal, the SET button may be pushed. The image will instantly jump forward to the position it would assume when the ramp action is completed.
6. When ready to record, the ramp switch is shifted to RUN. The image will animate from whatever position the up-down switch is in...to the other end of the ramp action. Shifting the RUN switch to HOLD will stop ramp action until the switch is reinstated to the RUN position.
7. Through use of the diode module it is possible to have the effect of additional control circuits to "cut in" automatically at a predetermined point in the ramp action. This causes image transformation to progress in an altered way.

Extended sequences may call for image transformations to proceed from one ramp-controlled effect to another requiring readjustment of the display controls or modules. In this case, each set of transformations is recorded in a separate pass of the recorder...and then edited together for the final, continuously flowing animation of the whole sequence.

### Animating Two Images at a Time

The synthesizer has dual sets of basic controls permitting the manipulation of two images in different ways at the same time.

This is accomplished by positioning, in the original image picked up by the initial TV camera, one image above the other. An adjustment of the dual-trace POSITION slider control, establishes at which horizontal scan line, of the incoming image, will be the dividing line between two image segments.

In operation, the synthesizer will scan the top part of the image and feed this to GROUP ONE controls. At the segment dividing line, however, the synthesizer will instantly switch all the subsequent horizontal lines of information to the GROUP TWO controls.

Provision is made for switching the incoming image to 90° rotated position, for convenience in segmenting or other reasons.

The synthesizer can also duplicate an incoming image. By switching on the ALTERNATE LINE control, every other horizontal scan line will be fed, alternately, to the GROUP ONE and GROUP TWO controls. These duplicate images, therefore, can be manipulated differently at the same time.

### Why the Synthesizer Has Only Two Sets of Controls

At higher cost, it would be quite possible to provide the synthesizer with more sets for the independent-simultaneous manipulation of more than two images.

However, when the incoming image is segmented, the number of scan lines devoted to the definition of any one image is reduced. This affects image resolution.

It has been felt by the designers of the R/E Video Synthesizer that any more than two segments per image field would reduce resolution below that possible by recording and combining multiple passes of no more than two images at a time in tape recording.

## VARIABLE FUNCTIONS OF THE RE4 DISPLAY CONTROL UNIT

Two sets of the first eight controls listed below are provided to manipulate two image elements independently at the same time. For each of the GROUP ONE and GROUP TWO controls, there is a BIAS knob for setting the starting state of the image, and a LEVEL knob for setting the ending position to which the image is to be animated by the ramp generator.

HEIGHT Varies the amplitude of the vertical sweep. Similar in function to the height control on a standard TV receiver. The image may be reduced from normal size, through zero (appears as a line), to a fully inverted image, causing it to appear to rotate along a horizontal axis.

WIDTH Varies the amplitude of the horizontal sweep, producing a rotation effect similar to above, though on a vertical axis.

DEPTH Varies the height and width simultaneously, causing image to appear to advance or recede.

INTENSITY Controls the brightness of the image.

VERTICAL POSITION Rolls the image up and down to points on or off screen.

HORIZONTAL POSITION Pans image side to side to points on or off screen. Used with Vertical Position, it generates angular movements.

HORIZONTAL CENTER Controls horizontal phase of the synthesizer in relation to incoming video. Allows graphics to be moved through preset patterns. Example: words moving around two visible sides of a theatre marquee.

VERTICAL CENTER Determines vertical center of original graphic.

Also:

DUAL TRACE Provides logic to control switching between control groups ONE and TWO. Switching may be set to occur at any preset point in the vertical sweep - or on alternate lines. Thus, simultaneously, two parts of the original image input may be manipulated in different ways. Or a single image, duplicated by the use of alternate lines of the scan, can be distributed to Group ONE and TWO controls for independent manipulation.

SCAN RATE Allows instant conversion between two preset sweep rate circuits (Only one comes as standard equipment; other sweep rates optional) This is useful, for instance, in switching between the 945-line rate of a graphics camera and the standard 525-line rate of film chains or tape players.

DISPLAY 0°/90° Rotates image 90° for horizontal sectioning.

BLACK LEVEL Adjusts black level of the incoming video.

## FUNCTIONS of the CONTROL MODULES

Q7 MULTIPLIER Multiplies analog voltages to generate complex shapes and effects. Also is a voltage-controlled amplifier to fade effects in or out and to generate envelopes.

Q8 SUMMING AMPLIFIER This is a three-channel mixer, enabling voltage signals from a combination of sources to be mixed into one output.

Q9 DIODE MODULE The diode array is used to separate parts of waveforms to generate complex patterns and to divide timing ramps.

Q10 RAMP GENERATOR Delivers a linear change of voltage to manipulate synthesizer functions within a preset time span. Moving through a range of 0 to 10V(+/-) as an "up" ramp, or (+/-)10V to 0 as a "down ramp", the ramp time may be varied from several minutes to a few frames in duration. It may be switched instantly from one extreme to the other to permit previewing and adjustment of the beginning and end of an animated sequence. A hold switch halts the progress of the ramp at any point until the switch is turned off and the ramp continues to the end of its preset limits.

Q11 MANUAL BIAS/LEVEL Operates as a manual ramp generator, or can be switched to function as an attenuator.

Q12 JOYSTICK Provides control for three voltage signals, two with stick location and a third with stick rotation. Normally assigned to vertical and horizontal position and size, it may be used to control a wide variety of other functions such as animation intensity, video level, etc.

A switch selects light or heavy damping. In the light damping mode, the graphic follows each motion of the joystick precisely, but rounds off the rough edges of the operator's control to produce a smoothly flowing motion. With heavy damping, the graphic follows the joystick with a slight delay, increasing the smoothness of motion displayed.

Q16 AUDIO INTERFACE For introducing external signals -- such as audio, bio-feedback and instrument monitoring -- to drive various other functions.

Q17 WAVEFORM GENERATOR Generates and shapes waveforms which produce graphic patterns without external input. These waveforms are also used to reshape and animate external images being processed in the synthesizer.

When used in combination with other waveform generators or ramp generators, it produces waveforms that are constantly moving, or ones that change from one state to another upon command.

It also controls the following parameters: frequency, waveshape, duty cycle, amplitude modulation, frequency modulation and synchronization.

Q18 ANGULAR ROTATION MODULE Permits images to be rotated angularly around a preset center. Rotates one image, both of two images...each in the same or in opposite direction. Rotation starts and stops may be set.

## PERIPHERAL EQUIPMENT

We assume you already have the equipment, or information about it, to operate your vtr production setup. These recommendations refer to the requirements of equipment immediately surrounding the synthesizer.

Graphics Camera Best results will be obtained from a monochrome camera. For the RE4-A (525-line scan) model, it should have a center resolution of 600 lines. And better contrast will be obtained by having a white clipper - or, even better, a keyer - between the graphics camera and the synthesizer.

Modest Budget: SANYO VC-1150 Int/Ext Drive - List \$ 370.00  
Suitable for helical recording. Does not have a white clipper. Use only with RE4-A synthesizer.

Full Quality: SIERRA SCIENTIFIC CORPORATION  
MINICON M201 V Model (Vidicon 1-inch)  
This camera has all the features you might want, plus operation at 525 and 945-line scan. The latter high scan rate is necessary to take full advantage of the RE4-B model sythesizer which can operate at 525 and 945-line scan (60 cycles). It lists for \$1875. less tube.

You can, of course, use a studio color camera, with acceptable but not the most ideal results. Be sure to turn of the chroma, if you use it.

Rescan Camera Here, also, best results will come from a monochrome camera. In this case, you'll do much better if it has a plumbicon tube, since this will eliminate image lag during movement of the image.

# RUTT ELECTROPHYSICS

21-29 West 4th Street, New York, N.Y., 10012

(212) 982-8300

## RUTT/ETRA VIDEO SYNTHESIZER

### Systems

RE4-A Model VIDEO SYNTHESIZER....(525-line scan) Package Price

- Includes:
- Q8 Summing Amplifier....
  - Q9 Diode Module.....
  - Q10 Ramp Generator.....
  - Q16 Audio Interface....
  - Q17 Waveform Generators
  - RE4 Display Control Unit
  - Type A Display Unit....

RE4-B Model VIDEO SYNTHESIZER..... Package Price

Includes Display Control Unit and Modules as above, with a Type B Display. Supplied with plug-in circuit board for operating at one speed: 525, 650, 945, 1050. Added scan speeds, optional equipment (see below).

### Components

RE4 DISPLAY CONTROL UNIT See "Variable Functions sheet.....

Optional: INTENSITY COMPENSATION (Automatic).....  
Additional SWEEP RATES (525,625,945,1050) each

#### CONTROL MODULES:

- Q7 MULTIPLIER.....
- Q8 SUMMING AMPLIFIER.....
- Q9 DIODE MODULE.....
- Q10 RAMP GENERATOR.....
- Q11 MANUAL BIAS/LEVEL.....
- Q12 JOYSTICK.....
- Q16 AUDIO INTERFACE.....
- Q17 WAVEFORM GENERATOR.....
- Q18 ANGULAR ROTATION MODULE.....

TYPE A DISPLAY 525-line scan high resolution kinescope display with deflection circuitry.....

TYPE B DISPLAY 945/525 line scan, custom manufactured high resolution CRT; sharper image; smaller dot size.....



June 11, 1973.

*To Steve Rutt  
for your file*

Reference: Your phone call to Mr. William Etra  
Ordering the VIDEO SYNTHESIZER.

Dear,

Please refer to your phone conversation with Mr. William Etra of several days ago during which you ordered one video synthesizer.

Enclosed please find a proforma invoice covering your order. Will you please

Please note carefully that the equipment meets our standards of 110 volts 60 Hz. If there is an variation of the voltage and frequency, please let us know at once giving the exact frequency and voltage required. If the frequency is 50 Hz. it will take an additional two to three weeks to effect delivery and in such a case, please until the second week of September. Naturally, we will do all we can to expedite.

It is essential that you let us know the exact to show on our invoices. We will prepare according to the information you give.

The price shown on the proforma is

We await your airmail reply.

Very truly yours,  
RUTT INSTRUMENTS CORP.

Export Manager.

H/nm  
enc. proforma  
via airmail.

*Question*

**INVOICE**

Same

SOLD TO

Invoice Number <b>PRCFORMA</b>
Order Number Phone to Mr. W. Ebra
Invoice Date <b>June 11, 1973</b>
Terms

Sales Credit	N.J. Tax Cert. No	Shipped Via <b>Airfreight</b>	Shipping Date	IF.O.B.
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Ordered	Shipped	Description	Price	Total
1		VIDEO SYNTHESIZER 110 VOLTS 60HZ.  Note: Any variation in the frequency or voltage from above requires an additional two to three weeks for delivery.		
			SHIPPING	
			INVOICE TOTAL	

3  
RUTT ELECTROPHYSICS INC.



21-29 W. FOURTH STREET  
NEW YORK, N.Y. 10012  
PHONE : (212) 982-8300

12-19-73

Mr. Red Daniels  
Bob Vogel Productions  
San Marino, California

Dear Mr. Daniels:

Along with the enclosed literature describing the Rutt/Etra Video Synthesizer, I have included a copy of a page from ArtsCanada Magazine, Oct. 1973. The article concerns video synthesis.

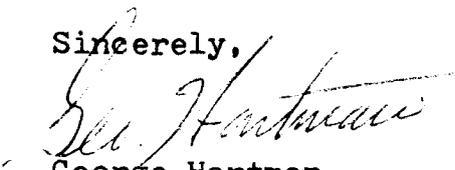
At the same time, I am sending a demonstration tape which will illustrate just a few of the basic effects possible with the synthesizer.

After you have examined the literature, and viewed the tape, I am sure you will agree that the R/E Synthesizer is a most useful, and thoroughly practical piece of apparatus.

The unit is available in a wide range of configurations. Modular construction permits the design of a system which will meet your maximum needs, and keep your cost to a minimum. Any such design may later be expanded as needs dictate.

If you will write or call us, we will be happy to consult with you and advise you regarding the best system for your production needs. We will then work out a price schedule for that system for you to consider.

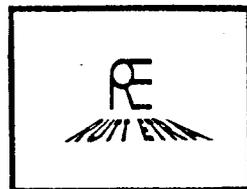
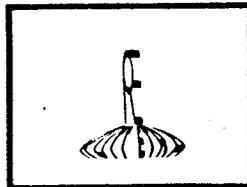
Sincerely,

  
George Hartman

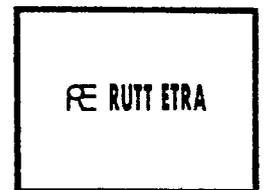
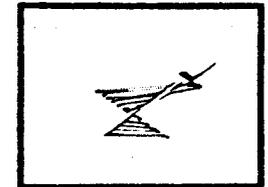
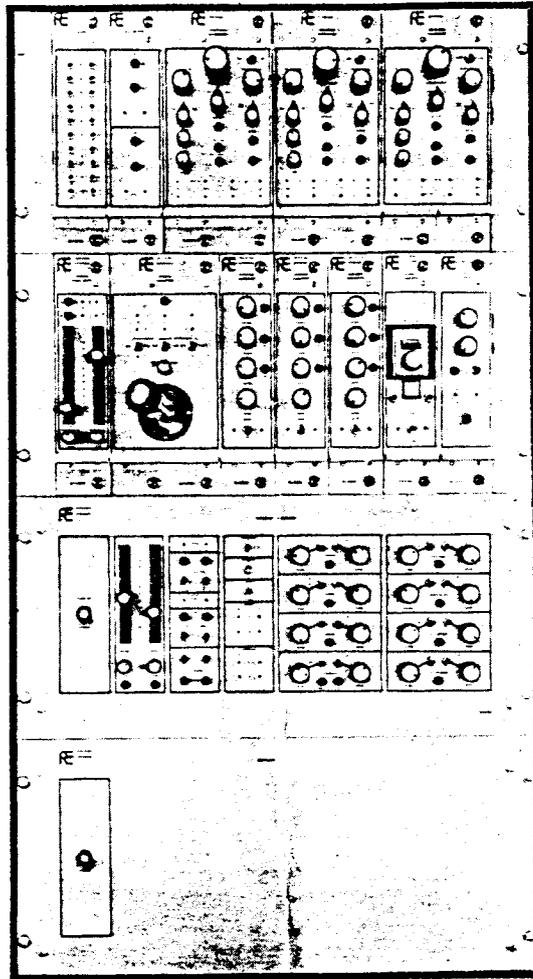
# RUTT/ETRA VIDEO SYNTHESIZER



ORIGINAL GRAPHIC



15,000



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**IMPASSANT ANIMATION • DYNAMIC LOGOS AND TITLES • NEWS, SPORTS, WEATHER, COMMERCIALS • VISUAL AIDS • SPECIAL EFFECTS**



## RUTT/ETRA VIDEO SYNTHESIZER

Video synthesis is electronic animation. The video synthesizer accepts standard video signals from a camera, film chain, video-tape or graphics generator. The synthesizer then processes the signal and applies a combination of effects to change position, size and aspect ratios; to re-shape and add motion to fixed graphics or live scenes. It can generate chroma keys in any desired shape and then re-shape, blend or animate the key inserts on a real time basis.

The RUTT/ETRA Synthesizer is a video analogue computer. In operation the incoming video signal is separated into its vertical, horizontal and intensity components. These components are processed through a series of multipliers, summing amplifiers and function generators to modify both the raster format and the intensity of the processed video. The Synthesizer can lighten or darken specific portions of the picture and can control the raster which causes the image to be reshaped. The components of the processed video are fed into a specially designed kinescope display where they are re-assembled into a standard image. This image is picked up by a monochrome camera, colorized, and fed into a switcher or video tape recorder.

Complex graphics that would require days to animate can be video synthesized in minutes. The synthesizer may be used to add motion to titles and logos and to instantly alter size and position of electronically generated graphics. As a tool in video art it can modify existing patterns or generate completely new ones. Patterns may be controlled by a combination of pre-set programming and manual control. The system may be interfaced with audio equipment enabling the visuals to be synchronized with music or speech.

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## Rutt/Etra Video-Synthesizer

### OPERATIONAL COMPONENTS

The control system of the R/E video synthesizer consists of one or more each, of the following components:

1. DCU (display control unit).
2. Ramp Generator.
3. Waveform Generator.
4. Summing amplifier.
5. Multiplier array.
6. Diode Array.
7. Joystick module.
8. Level control module.
9. Audio interface module.

Expanded and highly versatile versions of the synthesizer may be assembled by installing additional types of modules. These include:

1. Full programming.
2. Sectioning.
3. Rotation.
4. Colorizing.

### DISPLAY CONTROL UNIT (DCU).

The DCU controls the graphic in the following respects:

1. Vertical position.
2. Horizontal position.
3. Depth (size).
4. Intensity.
5. Aspect ratio.

The DCU may be adjusted to position the artwork in any location on the screen, and determine its' size, brightness and aspect ratio. During the course of the production, any of the above conditions can be caused to change "on camera" in one of two ways:

1. The ramp generator is patched into any combination of the five functions. With the ramp switched to  $\pm 10V$ , conditions are set as desired at the end of the sequence. Then with the ramp switched to zero output, conditions are set as desired at the beginning of the sequence. Next, ramp time is set for the desired length of the sequence. When the ramp is switched on, the graphic will then move through the desired sequence, on cue, in the precise time allotted.
2. The joystick control may be patched to any combination of three of the above functions. The three selected functions then become totally controlled by manual operation. This permits the operator to perform zooms, pans, fades etc. by "feel", and to synchronize with, or to follow live action.

In addition to those effects described, the DCU also provides for reversing or spinning of the graphic on either a vertical or horizontal axis. Vertical and Horizontal centering controls are provided to define the point on the graphic at which the axis of rotation is centered.

All the effects controlled by the DCU may be used in any combination, simultaneously or sequentially. As can be seen, an extremely wide variety of precisely controlled positioning effects may be performed by the DCU.

#### RAMP GENERATOR

The ramp generator delivers a linear D.C. ramp with a range of 0 to 10V (+-)(up ramp) and (+-) 10V to 0 (down ramp). Outputs are provided for obtaining negative going or positive going voltages.

Ramp time may be varied from several minutes, down to a few frames in length. The ramp may also be switched instantly from maximum to minimum, or minimum to maximum, to preview the beginning and end of a sequence. A hold switch is also provided which has the effect of stopping the ramp at any desired point. When the hold switch is returned to normal position, the ramp continues to the end of its' sequence.

#### WAVEFORM GENERATOR

The waveform generator is essentially an extremely stable oscillator with a wide variety of signal outputs. A switch is provided to select one of three ranges of frequencies. A single control is then used to vary the frequency within that range.

Three waveforms are available at output jacks; sine wave, triangle wave, and square wave. Duty cycle function further permits shaping of the outputs to pulses, sawtooth etc.

In addition, the various waveforms may be amplitude or frequency modulated. These various signal outputs may be ramp controlled enabling effects to be increased or decreased in intensity at the discretion of the operator.

The waveform generator may be operated in "locked" or "Free Running" mode. In the locked mode, the output is locked to the display unit. In this mode, the generator is used for the shaping of art work. In the free running mode, the generator is used for animating the art work.

#### SUMMING AMPLIFIER

The summing amplifier is nothing more than a three channel mixer, enabling voltage signals from a combination of sources to be mixed into one output. Three such summing amplifiers are provided in the basic R/E unit, greatly increasing its' versatility.

## JOYSTICK CONTROL

The joystick is a manual substitution for the ramp generator. It provides for the control of three voltage signals, two with stick position, and a third through stick rotation. Normally, these controls are assigned to vertical and horizontal position and size. They may however, be assigned to control a wide variety of other functions, such as animation intensity, video level, etc.

A two position switch is located on the joystick module providing for "light damping" and "heavy damping" of the joystick. In the light damping mode, the graphic follows each motion of the joystick precisely, but rounds off the rough edges of the operator's control into a smoothly flowing motion. In the Heavy damping mode, the graphic follows the control of the joystick, with increased smoothing of the joystick motion, and with a slight delay in translating control motion into graphic motion.

## AUDIO INTERFACE

Audio interface provides a means for introducing an external audio signal for the purpose of driving various functions of the synthesizer.

The module contains a damping control for varying the response time of the module. It may therefore be adjusted to follow the heavy beat of the rhythm, or to follow the minor excursions of the melody line of music.

The module makes possible the movement or modulation of graphics, and synthesized backgrounds as a visual component of the audio portion of the production.

Extremely interesting, unusual and effective visuals may be generated by connecting the audio interface with various bio-feedback devices, and monitoring instruments. These permit the activating of visual effects through the muscular activity of musicians and dancers.

## SECTIONING

Sectioning permits the simultaneous animation or positioning of up to five graphics or pieces of art work. This is accomplished by slicing the display raster horizontally in groups of video lines. Each group of lines may be adjusted to accommodate a graphic which appears in that section of the original video signal.

The addition of the necessary modules for sectioning permits treatment of each section independently, or the treatment of all sections as a group. For multiple effects, the alternative to sectioning would be the layering of videotape or multiple printing of film. Sectioning offers obvious advantages in terms of registration of effects, reduced video degradation due to dubbing, and the ability to see the end result in real time.

## COLORIZING

The basic single section R/E system has no need for colorizing module. The background colorizing function of the users existing video switcher is used for this purpose. When sectioning is added to the basic system, it becomes highly desirable, if not essential, to have the ability to assign separate colors to each of the treated sections.

For this purpose, Rutt Electrophysics has developed a multi-level colorizer. Each section of the display is assigned an intensity. The colorizer is designed to recognize five separate video levels, and colorize each level independently. In addition, the background may also be colorized, making a total of six colors possible.

## ROTATION

Addition of rotation modules permit precise rotation of the graphic on the viewing axis. The position of the graphic may be defined for the beginning and the end of the rotation, to within one degree of rotation. The rate of spin may be set or made variable through the application of ramp control.

## FULL PROGRAMMING

Extremely complex sequences of animation and positioning effects may be pre-set and run in sequence with the addition of full programming.

Full programming consists of one Master Ramp Generator and a group of Controlled Ramp modules. The number of controlled ramp modules required depend on individual requirements, and might be as few as two, or as many as ten. Additional controlled ramps may be added at any time on a "plug-in" basis.

The master ramp generator delivers a 0 to 10V (+-) and defines the overall time for a complete sequence of events. Provision is also made for stopping and starting the master ramp on cue, reversing the ramp on cue, and cycling of the ramp. In addition, a pushbutton is provided for holding the ramp at any desired point.

The controlled ramp modules also deliver a 0 to 10V (+-) ramp, taking their cues from the master ramp. Each controlled ramp module begins its' ramp at a predetermined point on the master ramp. Another pre-determined point on the master ramp defines the end of the controlled ramp. The controlled ramp module then adjusts its' own ramp rate to conform to this time frame.

February 12, 1974

Computer Image - Notes on visit to Rutt/Ettra (per JTR):

Arrived at Rutt/Ettra about noon.

Steve Rutt was cordial. Showed me around briefly. Introduced me to secretary who walked in later and to technician who does the wiring.

Company has sold four machines. Been in this business less than one year. Started in New Jersey, now moved to New York. Not operating in New Jersey. Is New Jersey corporation, wholly owned by Steve Rutt.

"Ettra" comes from Bill Ettra who came in later. Ettra describes himself as arty type who got Rutt to make these machines for him. Ettra learned about all this from Paik of channel 13 in New York. Paik developed synthesizer many years ago. Simply did not go as far as to animate with it. I am unclear on this.

I told Rutt I assume he has literature on Computer Image. He said yes, he had collected some including patents. I asked if he could bring it out and he brought out three Harrison patents and XRX of original underwriting prospectus dated 1969. The Scanimate patent was not among those he brought out. I told him there are other patents and he asked me to list them. He said, I was no longer practicing. I told him I did not have list with me but had copy of one patent. I got out and showed him copy of patent 3,700,792. He skimmed it, said he could not read it all now but would read the claims.

He read claim 1 and 2 or 3 other claims. Also said circuits shown in patent were different from his, that CIC has some digital counters, etc. and he is all analog (I think he was thinking about the original Harrison patent of which he had a copy). I retained my patent copy. He noted the number.

*He knew I was a patent lawyer and said*

He said what they are doing is old, that any conventional analog computer is capable of animation. Also said Hughes Scan Converter is capable of the basic animation they are doing. I made no comment and made no comment about the Scanimate patent.

I believe Rutt's entry was triggered by knowledge of Dolphin. He seems very aware of what Dolphin is doing. Has heard Alan Stanley speak.

Rutt and Ettra said they are going after the "arty", creative business. In response to my question, they said this was primarily the education and non-profit institutions. He said they have the low priced machine to meet that market and Computer Image is much more sophisticated and priced way out of that market.

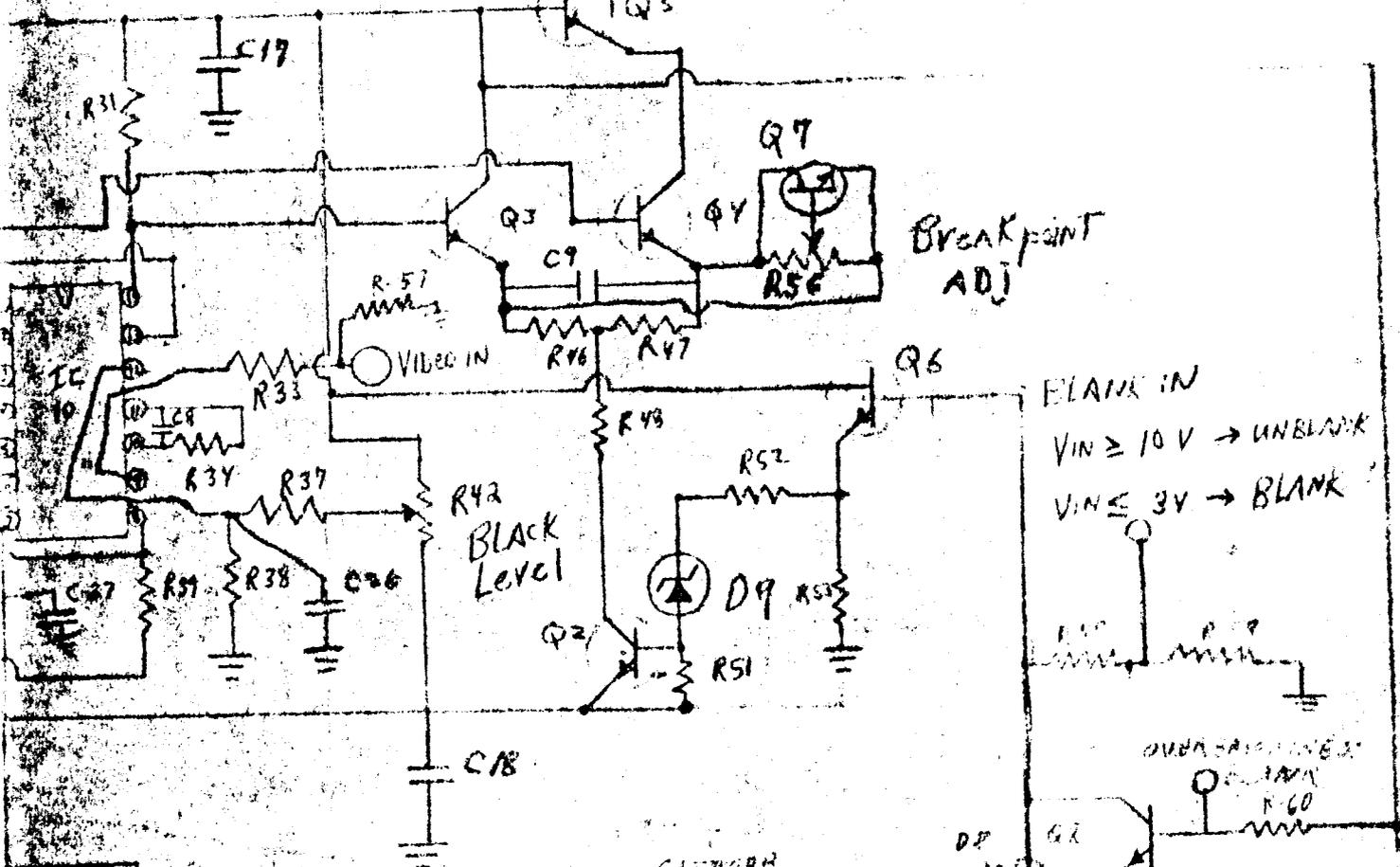
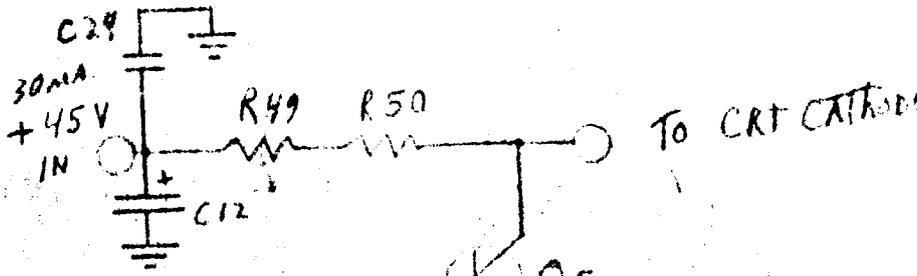
Fairly early in the conversation, Rutt made it clear that since I am an attorney, he did not want to talk without his own attorney. I told him I was no longer practicing, but in any event did not want him to discuss anything he was uncomfortable about. I told him I did not intend to discuss patents at all but was there to gather any information I could.

He said Computer Image patent is invalid. I made no comment.

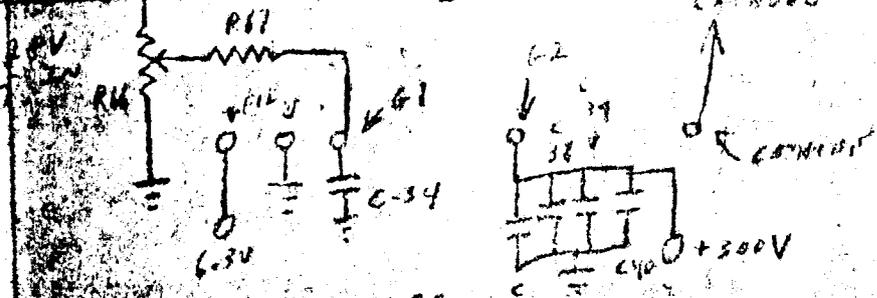
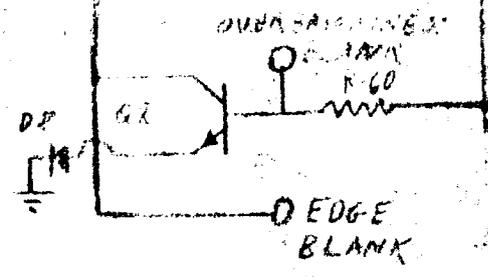
I said assuming Computer Image and he had honest opinions about patent position, was there any area outside of a court decision that could be discussed. He said he did not think so because he knows people have been shaping waves, etc. since long before Lee Harrison got out of high school, but what was my proposition. I said I had no proposition but wanted to find out whether he was open to discussion. He said he is open but confident his machine is taken from old technology. He said Computer Image has not learned what Universities like SMU have been doing.

He said the next move is up to Computer Image. If they want to sue and wind up with an invalid patent, that is up to them. He said Rutt/Ettra is self-financed and overhead is very low. Said rent is less than he pays for his apartment.

*He said there are no corporate relationships to Rutt/Ettra other than Cannon Motors which is merely a distributor. Impact is his uncle's company & has no ties to Rutt/Ettra*



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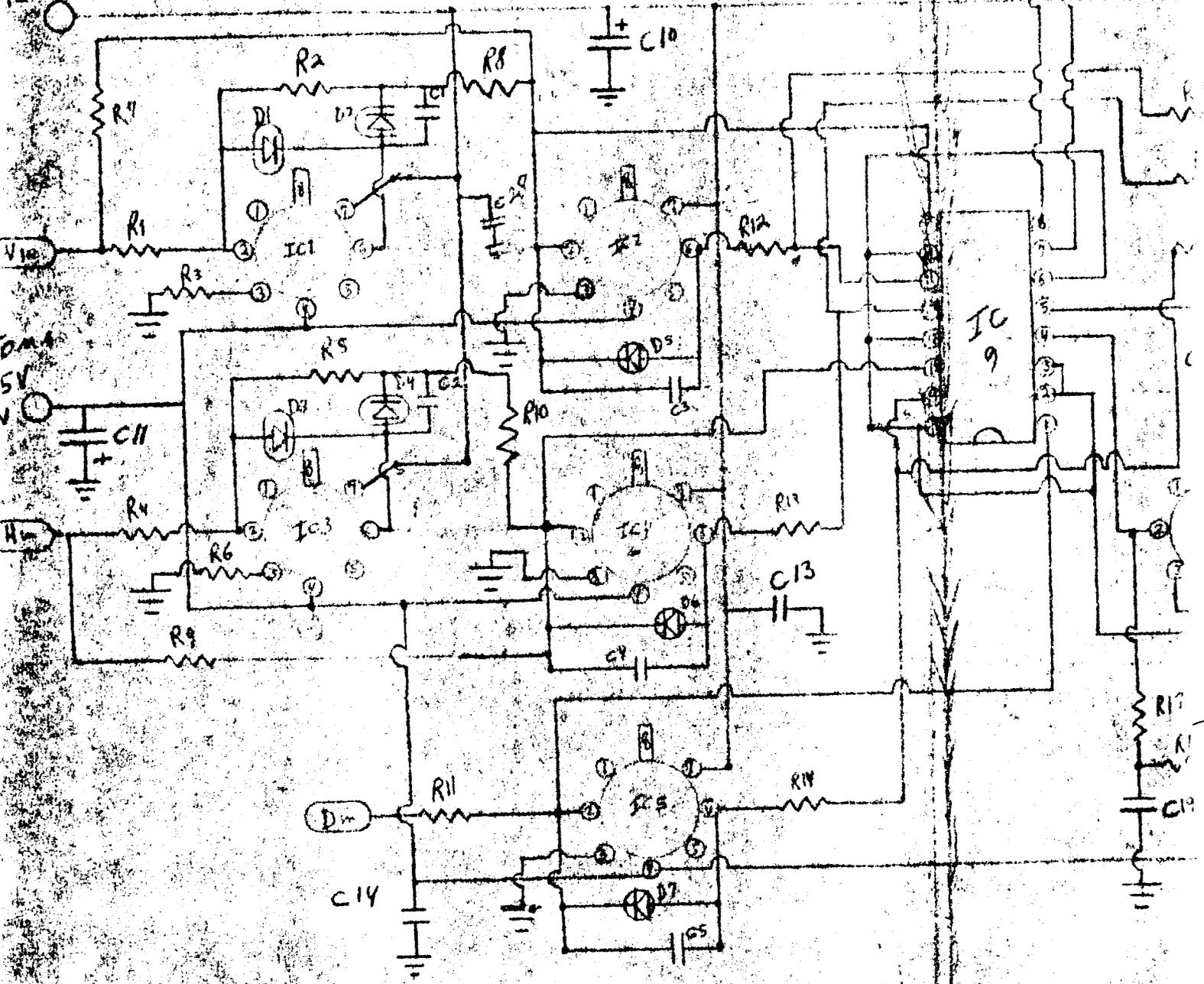
RESPONSE  
 15V DOWN 3DB @ 20MHz  
 10 VOLTS VIBED

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