

## "Electronic Reproduction for the 90's"

by Dr.-Ing. Uwe Gast\*

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### Introduction

The growth of the TAGA-organization over the last 40 years clearly indicates its technical contribution to the graphic arts industry. In this regard, I am proud to be among the speakers here this morning.

TAGA was founded at nearly the same time that the transistor was invented here in the U.S.; and 10 years before the introduction of the laser. Both inventions have strongly influenced reproduction and prepress technology.

Chemical etching of cliches was succeeded by electromechanical engraving. Laser beam exposure of color separations came into its own in the 1970's and page-make-up with computers was unexpected successful during the 1980's.

To better understand where this technology will lead TAGA and the graphic arts industry as a whole, it is as important to listen to the past as it is to speculate on the future. So let's take a look in both directions.

### The 50's: Etching and Engraving of Cliches

During the 1950's, etching was the production process to prepare cliches. This was done in a multiple, time consuming process. Many repeat steps were necessary to avoid under-etching printing dots and to guarantee good dot quality.

Dr. Rudolf Hell started the engraving of plastic material foils with steel or hard metal stylii. Subsequently, processes were developed to engrave magnesium, aluminum, zink and copper in order to produce finer screens.

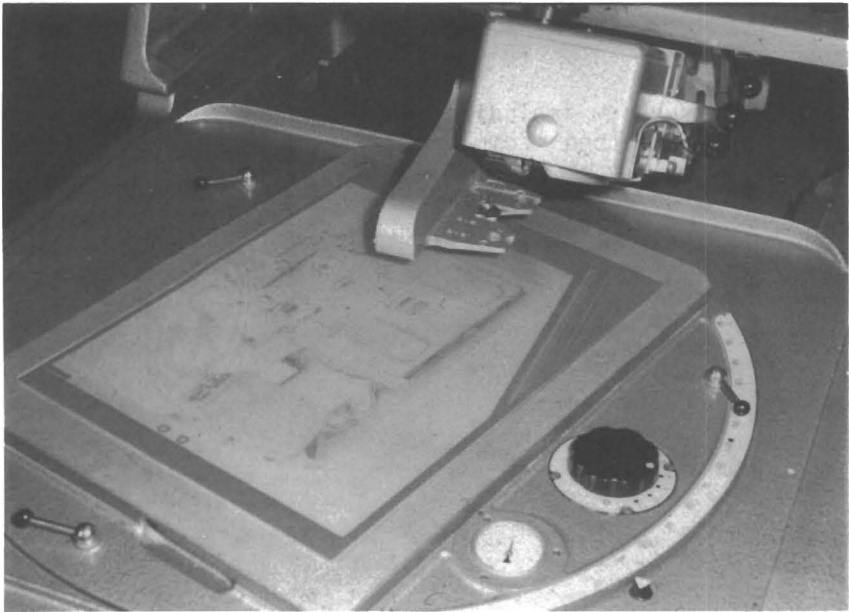
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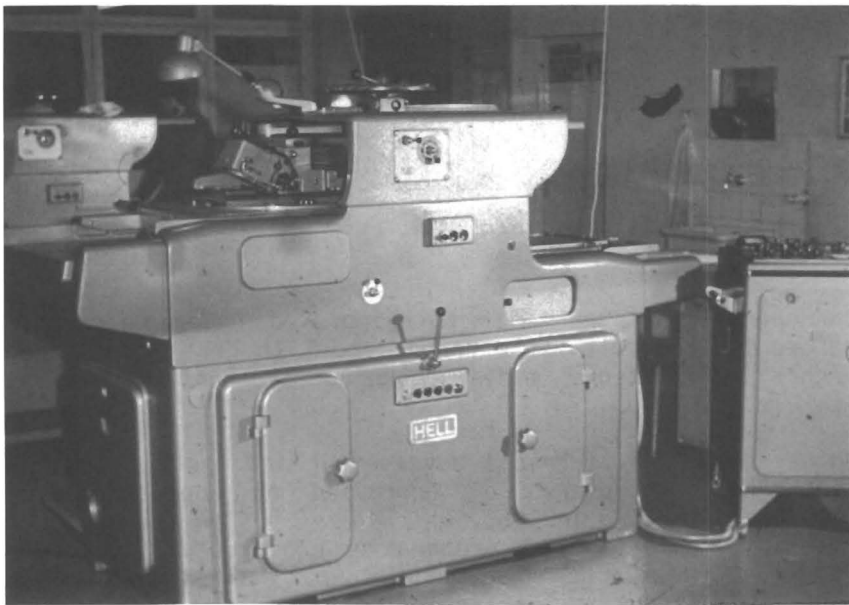
Picture 1: Klischograph, 1955

Dr. Hell's first engraving system was the "Klischograph". The "Klisch" worked for black and white images in the size range of 1-to-1 for reproduction copies only. The screen range was up to 80 dots/inch. Hell's K 150 was the first engraving device sold in the U.S. Later, we introduced devices for finer screens up to 120 dots/ inch.

In 1955, the Color-Klischograph was brought to market. At first, only reflective copy could be scanned - and the input/output ratio remained 1-to-1. However, the improved K 181 soon expanded system capabilities to include transparency-scanning and size ratio changes. The first customer in the U.S. was the "Washington Post".



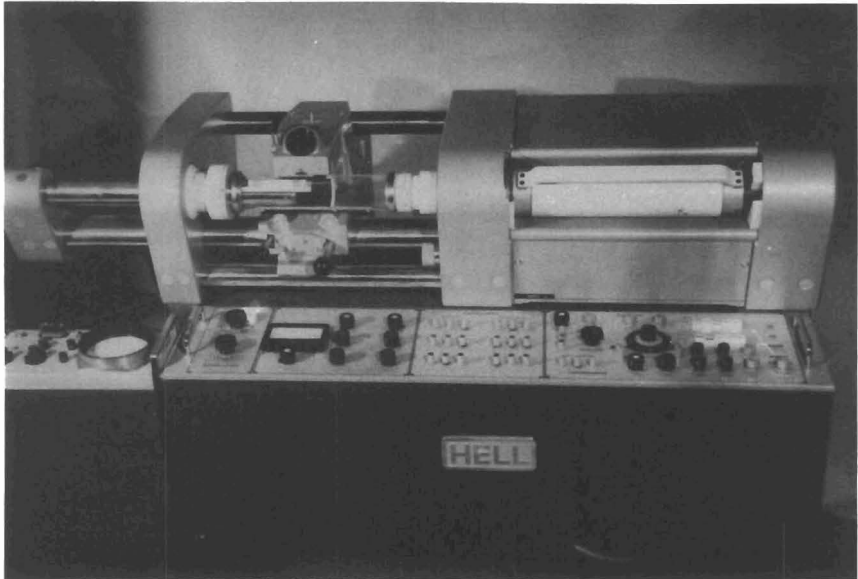
Picture 2: Engraving unit



Picture 3: Vario-Klischograph, 1959

## The 60's: Drum Scanners and the Preparation of Contone Separations

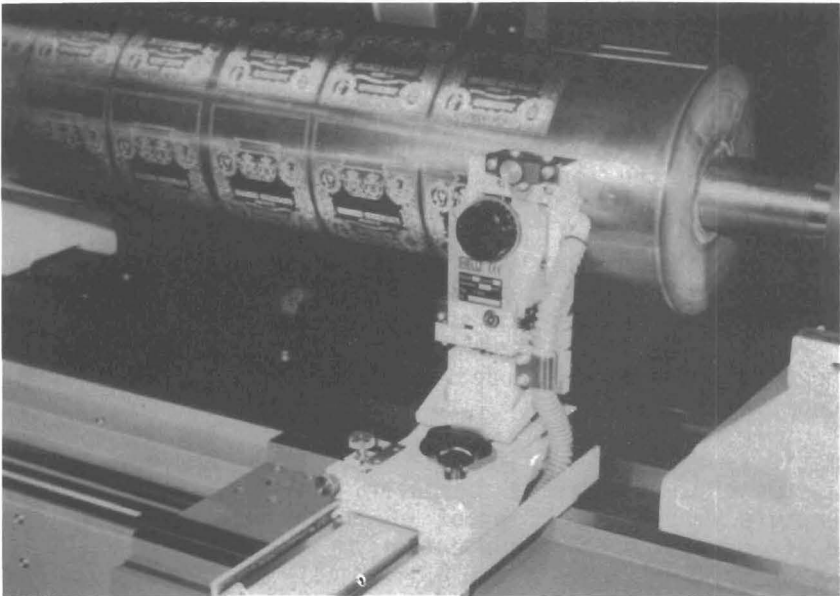
After a few years - including limited success with electron tube driven flatbed computer systems - drum scanners appeared on the market in 1965. The Hell entry was a two channel color correction system without UCR, working 1-to-1; and recording continuous tone separations.



Picture 4: Chromagraph, 1965

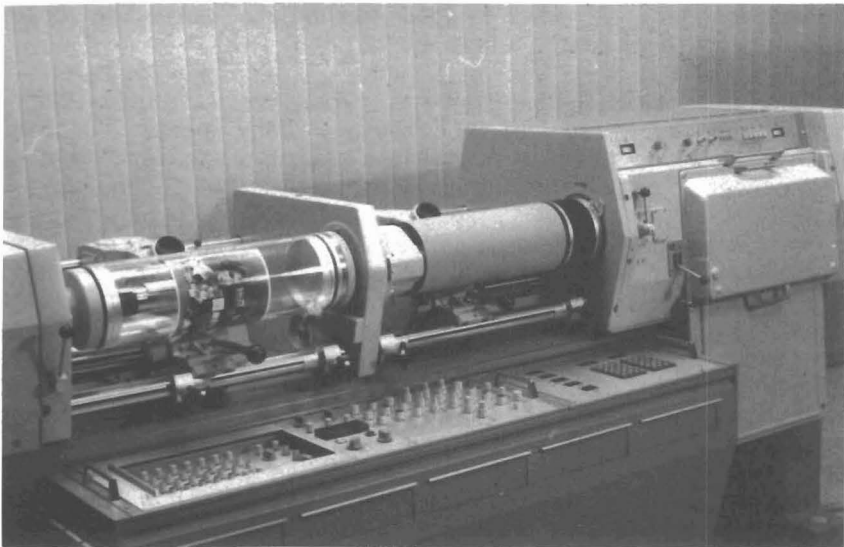
Four-channel-equipment with much-improved color correction started in 1967, with size range 1-to-1 in continuous tone. Further developments made screening by contact screens possible.

Another branch of technical development led the Hell Helio-Klischograph equipment for engraving of copper gravure cylinders. Starting in 1965, we had a very slow introduction of this new printing form preparation equipment. It was very unusual and unexpected for people who had always etched copper cylinders with ferro-chloride.



Picture 5: Helio-Klischograph, 1965

The first equipment to prepare final-size color separations was introduced in 1969. A short time later we introduced an electronic enlargement system in form of the Colorscanner Chromagraph DC 300.



Picture 6: Chromagraph DC 300

## The 1970's Laser Screening and Color Monitor Work Stations

The color scanner DC 300 - offering electronic size variation in steps of less than 1 %; along with improved color correction - was the successor to all previous scanner and color separation equipment. The DC 300 was very successful on the world market; and was the leading system for color separation 1970's.

The main reasons for this were an electronic computer screening system; and the laser exposure of high resolution dots onto film material of most any sensitivity. The ability to record all four separations onto one drum in one sequential operation - added in 1976 - made for additional economical success.

Sometimes, it was difficult to input a very clever adjustment to the color computer. To make this easier, operators wanted a soft proof of these adjustments to see the effect on the color content of an image.

For that purpose, in 1978 Hell introduced the "Chromaskop". It contained a TV camera for image scanning, a videofast color computer, and a high quality studio color monitor. It simulated the impact of the color computer on the color scanner.

I think this was the very first work station equipment we ever developed. It was a good method to make the color changes within an image visible.

At that time this technology was expensive, and required a special, high-priced color computer. Many people doubted whether it would even be possible to adjust a color image on a TV screen. Today, though, this is well-known technology.

For printing on textiles, porcelain and other materials - which involves constant colors and color shifts - Hell developed a special color scanner called the "Textile Scanner CTX 330". It was used by textile industry as well as for cartographic and porcelain printing applications. This scanner - which, in addition, was able to screen electronically - was the most versatile equipment produced for the reproduction technology industry up to that point. Today's version, the Hell TDP system, is now being introduced in this country with the first unit now operating in North Carolina.

## The 1980's: Page make-up using Mini- and Microprocessors

The introduction in the early 1980's of page make up-systems for montage assembly and color corrections began a new stage of reproduction technology. This was followed by steadily improved software packages; and additional computers for higher-speed image handling (BSP 11 in 1984/85).

Also developed were special array processors, and a much faster miniprocessor, which we call the M-computer, with a speed-gain of factor "two". In 1986, a high resolution monitor - "1024 x 1024" lines - with a new image memory unit was introduced.

Nobody in 1980 expected we would have more than 2000 page make up-systems in the world market today with relatively expensive technology.

Looking back over this technical development, I see we have expanded the application of our equipment to many process steps of reproduction technology.

These includes:

1. preparation of color separations
2. color corrections
3. size change
4. screening
5. visualisation
6. montage
7. color retouching
8. gravure cylinder engraving, to include Helio Data Processing; and
9. facsimile transmission of completed pages.

## The 1990's Continued Transition Challenge

Graphic Arts reproduction technology has undergone substantial changes in the last four decades. What I can see looking back is a trend toward higher quality, more color and higher specialization of labor and work flow.

I believe this will continue; that more change will come. All the advances in computer technology and image handling by computer hardware and software are pushing innovations in the reproduction and prepress area. And I think we have good reasons to believe this will continue.

From an art in the beginning, reproduction technology changed to craft in later years. And, in many cases, the adjustment of a color computer or a color scanner is still somewhat craftsmanship. It's not, or not yet anyway, an industrial process.

But the change into an information society requires the printing industry to incorporate many industrial process approaches. The making of color separations and printing forms should be industrialized. This means integration, automation, standardization, process control, structuring, productivity tuning, specialization and work preparation.

But it means more as well. Required are, for example, open systems architecture, higher bandwidth wide area networks (WAN's) via long distance, and local area networks. We can expect relational databases, workflow optimization and knowledge engineering at the end.

### The DC 3000 Repro-Process

The emphasis in the future will be increasingly on performance, productivity and process-automation. To meet this challenge, we at Hell carefully analyzed each single step in the total repro-process. The result is the automated "DC 3000 modular family of products" for stand-alone scanners and systems input. This family of systems was demonstrated at IMPRINTA in Düsseldorf last February.

The ChromaGraph 3000 meets the needs of today's highly specialized trade shops. Primary features of this new product line are automation, standardization, modularity, and the segregation of the working process into different steps.

The DC 3000-family consists of 5 components:

- ChromaGraph S 3010, which is a scanning automat,
- ChromaGraph R 3020, the standard recorder automat or the ChromaGraph R 3030, as a large format recorder automat,
- the ChromaPlan P 300 for job planning,
- the ChromaMount P 320 for mounting the originals onto the scanning drum; and
- the ChromaSet P 330 for all adjustments concerning the original and its color correction.



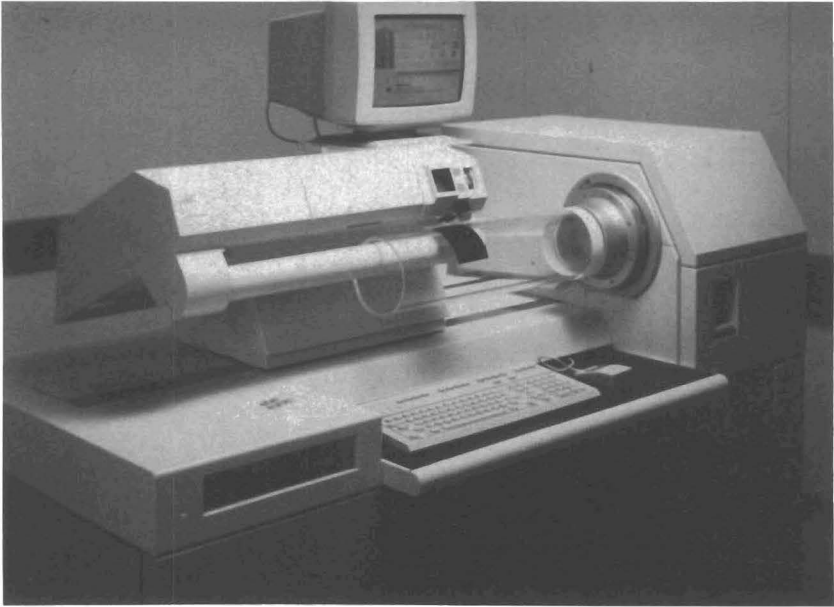
Picture 7: Workpreparation DC 3000

The modular character of the new family allows higher flexibility because the customer can select an individual configuration. Modularity means, in addition, that there is no central work place.

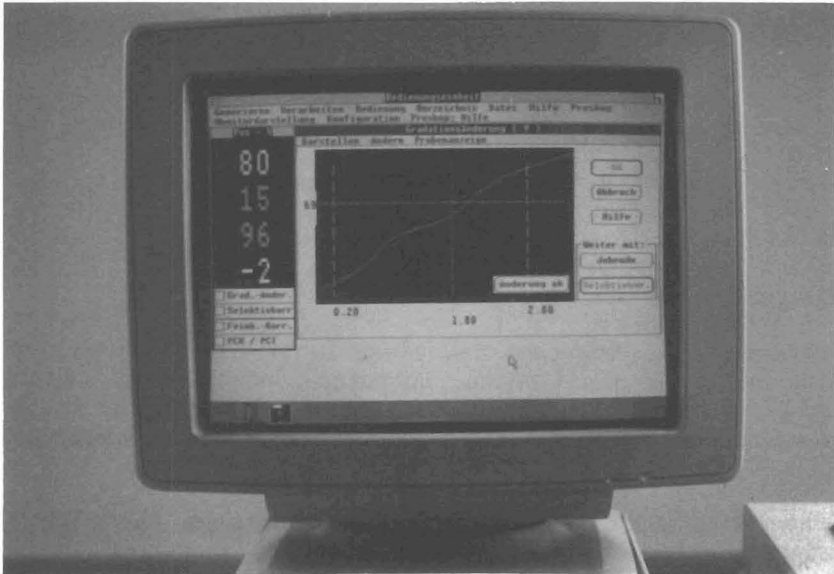
This new integrative concept fulfills the customer requirement to shift all the adjustment and montage processes into the prescan area - that means the scan-preparation steps. All data for automatic scanning and recording are delivered from the work preparation stations on the high-speed scanners and recorders via floppy disk. Set up can also be completed at the scanner itself.

One of the most important new elements of the Scanner 3010 is its automatic functioning. Computer-controlled automatic sequencing of jobs, and the 1.5 times higher recording speed of the recorder 3020 and 3030, increases the productivity of the reproduction process.

But higher productivity is only one condition for higher throughput. It's not right to believe that industrial mass production would not also ask for highest qualities and easy operation with modern user surface by a monitor.



Picture 8: Color-Scanner S 3010



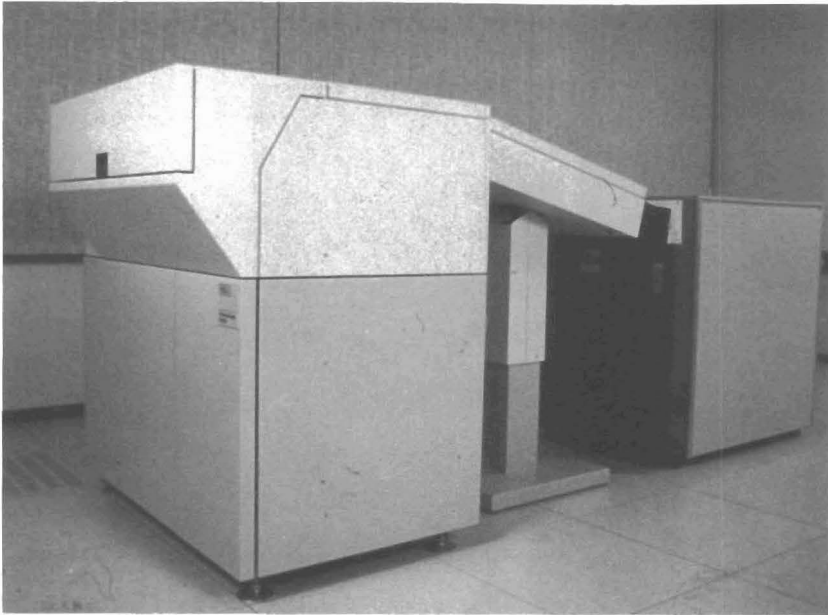
Picture 9: User Surface S 3010

## The ChromaGraph S 3010

All tasks and control commands for the S 3010 scanning process are taken from a diskette, written on at each workstation, and the scanning drum with originals in place.

A bar code tells the computer which size scanning drum has been inserted into the machine and crosschecks the diskettes. The scanning head starts automatically with highest position precisely at the right pixel of the first original.

The "multiscan" function allows different jobs in a single stack and the number of jobs is nearly unlimited. Only the change of a diskette, the scanning drum or the roll film cassette interrupts scanning and recording.



Picture 10: Recorder R 3020

## The ChromaGraph R 3020/3030 Recorders

The recorders work automatically. Both R 3020 and R 3030 are equipped with roll film loading devices which feed film material onto the drum. After exposure, the film is automatically deloaded and carried by the operator via

cassette - or transported via a connection channel to the film processor. One improvement in these recorders is the new exposing unit. It works with an eight dot system to expose screen dots with higher quality than possible before. In the past, we recorded the screening dot with 12 lines/dot. With this new unit, we can prepare 16 line/screening dot with higher resolution; and we can increase this number to 24 if required. In addition, with a circumferential speed of 15 m/s, the exposing time is reduced 50 percent for this high resolution recording.

ChromaPlan P 300

At the P 300 planning station, the operator defines the scanning format and selects the part of the original to be scanned. He defines the recorded size, screen configuration, register marks, color marks and basic color corrections. The operator selects between transparency and reflective originals. All job parameters can be stored on a disk.



Picture 11:  
ChromaMount

### ChromaMount P 320

The P 320 preparation station can hold each of the three different scanning drums. Via an adjustable platform designed to hold each drum diameter, the operator can put the originals onto the drum. There's a light table integrated to facilitate viewing.

### ChromaSet P 330

The ChromaSet work preparation station has a special scanning head which takes all color measurements and color image adjustments previously specified. The operator preadjusts selective corrections, basic corrections, gradations and color shift compensation; and he defines special-area color corrections. The precise geometrical definition of the scanning-start and the adjustments for detail contrast and unsharp masking, as well as the focus, can be adjusted by means of this measurement head.

A floppy disk is used to store all job parameters. It is transported together with scanning drum, to the reproduction unit for automatic scanning.

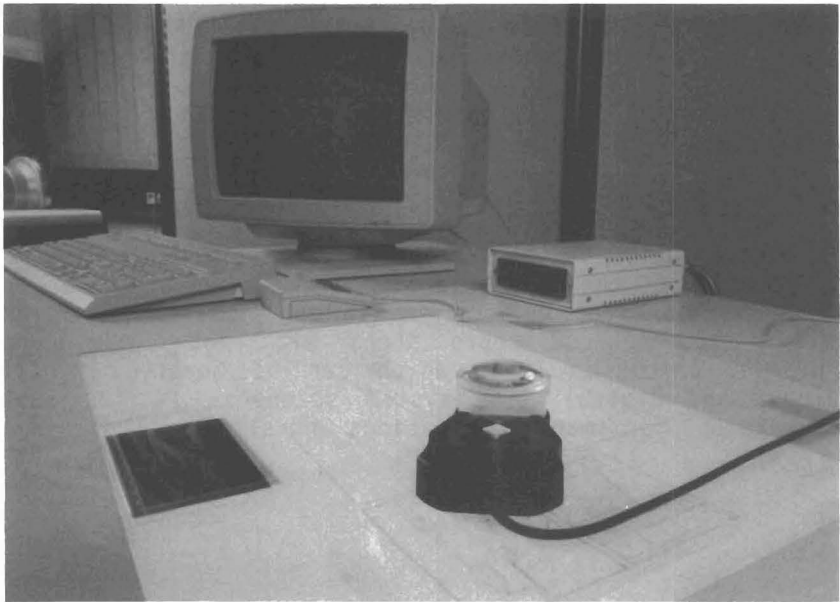
Of course, all the jobs done at the prep stations can also be done at the scanner 3010 itself. As a result, the customer is able to configurate his own production system. Depending on job volume, more than one set of work preparation stations - ChromaPlan, ChromaMount and ChromaSet can be used.

### ChromaCom 1000

In the past, universal workstations for page make-up systems met the needs of the marketplace. But the trend now goes to specialized workstations for entry level costumers, large printing plants, and repro shops with heavy stripping workloads. ChromaCom 1000, which can be adapted to all analogue and digital Hell system scanners, is for fast page-make up, for image combinations and silhouettings.



Picture 12: ChromaCom 1000



Picture 13: ChromaCom 1000

The main components of ChromaCom 1000 are:

- the Combiskop W 1000 workstation with high resolution monitor, AT compatible 32 bit PC, and a new software package.
- a digitizer
- a Sicomp M 26/Super/Micro computer (or as an alternative the M 70 mini-computer)
- a new disk periphery; and
- a magtape cassette device.

The new MS-Window/User-surface leads the operator in logical sequence through all functional layers. It allows him to learn the system easily and quickly. The workstation is equipped with a new display system, and works with a separate graphic memory in addition to the image memory with 1024 x 1024 pixels. Masks in "Windows" can be superimposed to the monitor image.

With the help of the digitizer, the operator activates the constructions, designs, positioning and silhouetting functions. Besides a PC-dialogue, the digitizer in ChromaCom 1000 can be used for coordinates and precise pixel positioning.

A new software package for page make-up allows all geometrical forms. In this way, design figures are to manipulate. They can be screened, shifted, turned, mirrored and duplicated.

The Combiskop W 1000 is connected to a Sicomp M 26 super micro computer. One of the four ports is used for the scanner/recorder interface, and the second for the Combiskop. The remaining two can be connected via SCSI-data bus linking it to the new disk periphery, with Winchester 5 1/4 in disk technology. These "Megafile" systems have a capacity of 310 MB.

ChromaCom 1000 uses the newest data storage technology. A maximum of 8 "Megafiles" and two additional tape cassette devices can be incorporated.

As an alternative, the customer can also connect the new Combiskop to an M 70 mini computer, which is able to serve more peripheral equipment with his 9 port. These include:

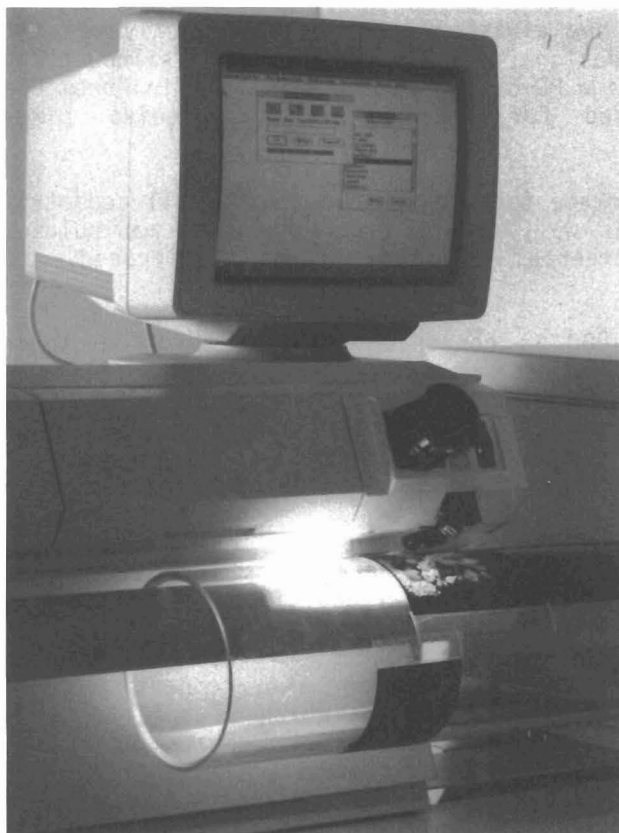
- 2 scanner or separate scanner/recorder units.
- the Combiskop W 1000 workstation.
- peripheral equipment like the tape unit MB 62 or an color plotter

- additional SCSI data busses for the connection of data storage units.

Via the SEAP-interface the Combiskop is also adaptable to the old R-30 computers.

ChromaGraph 3000 and ChromaCom 1000 are clearly two families of systems geared to electronic reproduction in the 1990's. The upcoming decade will demand increased specialization and productivity along with higher quality.

This is the first of our responses to this new era.



Picture 14: Scanning for the 1990's