DIRECT PAGE ASSEMBLY

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Abstract: This presentation covers Hell's Combiscan and Combimask techniques and their relationship to the page assembly possibilities that exist within today's standalone Chromagraph color scanners.

Standalone Scanners

For many years it has been possible for Hell scanners to control the vertical and horizontal crop positions of individual separations. Recently Hell has greatly expanded this capability so that each color separation can be exposed in relation to page format and be masked, if necessary, on a stacking basis -- from the bottom to the top and outside to the center.

There are subtle differences between the Combimask and Combiscan methods. The Combimask technique is available only via the more elaborate LP-307 offline layout programmer station. Combiscan can be handled either through direct input at the scanner control panel or the less expensive offline Scan Program unit SP-3435.

This article will be covering existing and planned page makeup features as well as the necessary steps that should be taken in job preparation to ensure their success.

Background

Before covering in detail the possibilities that exist with today's Chromagraph color scanners for direct page assembly, I think a slight review of the subject is in order. It must be stated that at no time is a central processor employed for the storage of actual picture data. Combiscan and Combimask are therefore not true pagination in the classical sense because at no time will a computer combine all individual picture elements into one single element through the use of a final page data process linkage. All the following examples presuppose the use of electronic dot generating scanners, digital control of the raster output data being a necessity. The only exceptions being the use of mask electronics on the DC-300 or 350.

With the advent of the Chromagraph DC-300 it became possible to specify the distance from the upper edge of the film to the beginning of the scan line, and the actual

distance to the end of the line, through the use of an operator control panel on the newly introduced electronics cabinet. Picture location within the film for the scanning crossfeed direction was controlled and activated by a trip signal from a tabulator and is in direct relationship to the exposing head position in the film plane. A stepping motor drives the spindle for the scanning head and transparency illumination arm via a worm reduction gear. A worm wheel fixed to the lower part of the lamp house and normally free to rotate engages with the spindle. If this worm wheel is locked by an electromagnetic brake, the scanning crossfeed starts immediately. The application of the brake is controlled by the tab signal from the exposing side. Vertical picture location with the film plane is basically a communication and translation of distance into a clock equivalent. As soon as the scanner detects the pulse of an RS flag, it starts counting down the amount of clocks for the RS (raster start) and ZE (line end). This is repeated with each pulse from the flag. All the subdivisions are based off the main frequency disk which generates the TW-UR clock pulses (the main heartbeat of the scanner). This main frequency generation and its subdivisions, such as frequency multipliers, line number dividers and dividers for control of the stepping motors, gear, spindle, etc., all help conspire to deliver accurate image placement at the operator's indicated location. A format switch, positioned according to film size, allowed the film to be split into two fields, necessary for a second exposure in the duplo mode. Having achieved control over the initialization and completion of scan line data in both the vertical and horizontal directions, Hell used these key ingredients in the first known attempt at direct page assembly with the use of mask electronics.

This masking section is comprised of the masking drum for the mounting of control masks, a scanning device for the reading of the control masks and the control mask electronics with patch panel. By employing the use of a second scanning head it is possible to align the signals from two photo multipliers so that a distinction can be made between four mask colors, each received as reflected light. These alignment procedures are accomplished prior to scanning and deal with the optimization of threshold values.

The photomultipliers can be aligned to "see" a type of quasi white, black, red and blue. When a ruby mask is used in place of the supplied orange-red paint or a different

blue paint is employed, it is possible to optimize the mask switching alignments through the manipulation of the threshold values. The decoding of the four mask colors "black," "white," "red" and "blue" by the two multiplier channels (red and blue), is carried out with the aid of four comparators, which work on a crossbar threshold principle. A coordinate point is allocated to each combination of the two multiplier output signals. In combination with gate logic circuitry, a changeover of the silhouetting (clear film) to another signal (programmed tints, picture, or local correction -- coarse detail) only takes place if this point moves from one non-hatched area into another non-hatched area.

The exact positions for inserted image and/or tint areas are specified on the control mask by filling in each mask with one of the four colors allowed. When the mask scanning head samples the control mask, a change from one color to another gives rise to electronic control commands which effect the desired exposing signals. Pictures that are to be inserted require the further specification of scan line commencement, discussed earlier.

Practical applications for the utilization of the masking system were somewhat limited in actual field operation, with approximate percentage of DC-300 users employing this method at about two percent.

Yearbook and Gravure catalog houses that dealt with constantly recurring simple page formats or standard logo and coupon designs which required few variations, were the main applicants. Some trade shops used this masking system for local tone color correction and coarse detail switchover, but never stripping.

The major retarding factor was the time it took to prepare the scanner for this method. Masks had to be made by hand, dummy positioning scans were generated and pinned with the masks, and precise measurements for the coordinates for scan line starts horizontal and vertical had to be calculated. Added to these problems were the difficulties associated with image crop and thickness variations of the mask overlays. All these factors worked against the practical application of this method. Obviously a better system was needed.

Combiscan

Software directed, microprocessor controlled scanners were the next generation of Hell Chromagraph scanners that opened the possibility of image assembly without the use of hand masks. The Combiscan system allows the operator to specify a page format and merge images with the scanner directly into one another. Combiscan coordinates and dimensions are determined by ruler measurements. These values are stored for each page element in a job file on floppy disk. The creation of these job files can either be handled through direct input at the scanner function panel or on an inexpensive offline scan programmer unit SP3435.

The Combiscan technique allows the operator to define through the use of a special six function index key:

1. Activation.

2. The start coordinate for the page left.

3. The start coordinate for the page top.

4. The page repeat length horizontal (double duplo mode).

5. The page repeat length vertical (double duplo, quadro).

6. Image inside, border density outside- image outside border density inside.

These first five parameters remain unchanged throughout the page exposure; only index 6. will be altered according to each separate page element. This allows a reference to be established for the overall page in relationship to the film plane and eliminating the need to redefine this for each individual page element.

All individual page elements are defined in regards to their location and size within the page format and not the film plane. Through the programming of another set of function keys, the operator defines the distance from the top left and top of the page to the element -- border areas left, top, right and bottom -- density values and element size. Index 6. will switch a picture into a previously defined border density area and a border density into a picture area! Through the use of this method it is possible to accomplish a zero density value in areas where one picture underlaps another picture or one picture will

position within another. By allocating the common area of the bottom picture to density zero, we reserve this space for the exposure of the top picture.

Combiscan allows up to two page elements to be exposed in one scan pass. A picture with a frame around the outside or a density block within a picture can be handled as such. Individual tinted areas require a separate exposure, as do the portions of an overall background tint that must be dissected into discrete parts.

The applications for such a system have to be carefully weighed. Although thirteen separate job elements can be defined and exposed within a page format, scanner time must be the overriding consideration. The implementation of a page that uses the full complexity of the system, such as background tints, frames, tint blocks and combined image elements, may not be cost effective for the company that relies on the rapid generation of individual color separations as its source of income.

Picture elements that fall very close to one another or combine with other picture images that may include a frame, in conventional process would normally require checkerboarding (staggering). Such a case requires at least three separate flats, one to carry each picture mask and a frame. The handling of a few such images by Combiscan may be desirable if the coordinates are calculated and delivered to the scanner operator with a job sheet.

Jobs that require a separate scan pass for tint blocks or portions of background tints should be avoided. The exposure of a full page format for the recording of one tinted area cannot be warranted. With proper job planning and careful work selection, the overall functionability of the scanner increases, pointing the way to the next upgrade technique.

Combimask

With the introduction of the Combimask technique, we enter a level of direct page assembly for Chromagraph "Standalone Scanners" that in many ways offers some of the capabilities of a true color pagination system. This method employes the use of a completely offline programming station, the Layout Programmer LP-307.

It is only with the addition of the LP-307 that a user may employ Combimask. The LP-307 components consist of a video data terminal with alphanumeric keyboard, a color monitor for layout display, three floppy disc drives and a digitizer tablet. Actually the only difference between the LP-307 and the Chromacom substation LP-307s is a function panel and software.

The operator of the LP-307 mounts the page layout to the digitizer tablet, indicating upper and lower corner points; the layout does not have to be squared to the tablet. Every coordinate within the page is referenced to these first two points. The page dimensions are entered via the keyboard which then activates a white page display on the monitor. Mask locations within the page no longer have to be measured and entered by keyboard; just indicate two diagonal corner points with the mouse and the X, Y coordinates are immediately stored in a file.

Page elements are visually checked for accuracy and any errors are immediately recognized as they appear against the white page display on the monitor. This is an important feature and a large advantage over the Combiscan technique, where coordinate and dimensional errors are not detected until after film exposure. Each page can consist of up to 8 picture elements and 16 tinted areas. Seven discrete colors are available for mask display. When page construction exceeds the seven mask colors, these memories can be written to disk and a black outline generated to indicate their presence and location. This procedure frees the mask memories for reuse in the completion of the page. A color file is available with 1000 stored colortones which also can be customized to match PMS or color chart values. These are then called up and used to tint masked areas. Frames can be placed in any width either externally, internally, or centrically against a mask at an exactness of up to 1/10 millimeters. Combimask offers the possibility of utilizing complete or partial background tints, color tint blocks for text insertion, color frames, keylines and color lines both vertical and horizontal. The only prerequisite is that the elements be assembled from bottom to top in a sandwiched technique. This is a necessity in order to allow the software to establish a priority in element merge areas. It should also be noted that Combimask, like Combiscan, restricts geometric shapes to square and rectangular forms due to the need for high resolution contouring that at present can only be calculated by special software routines available to the Chromacom color pagination

system. Without this high resolution, staircasing effects will occur at the contours.

Scan parameters for each picture element can be defined and stored in a job file that will be merged later with the geometric information at the scanner. If the LP-307 is part of a general job preparation and production department, such information should be readily available, if not it should be supplied in written form.

The scan file can predefine:

The page line ruling
Dot shape and screen system
Enlargement/Reduction
Positive/Negative
Right reading/Wrong reading
Tone curve

PCR equipped: CCR
UCR/UCA

The scan and geometric information is then recopied from floppy drive "B" where it is in a format compatible with the Intell 8085 microprocessor of the LP-307 to floppy drive "C" which is compatible with the 8080 micro system of the scanner. It is possible to transfer up to four separate and complete job files to the scanner via one floppy disk. The operator simply loads the floppy disk into the scanner electronic cabinet and recalls job "20." This loads all the scan parameters into the microprocessor for the page in general and the first scan image. It also loads all the parameters for the geometric, dimensional and coordinate locations of not only this image but all tints and borders.

The operator merely sets the highlight and shadow range, USM, editorial color correction (if necessary) and scans. With the recording of the first scanned image, all tints, frames, rules, keylines and background areas are exposed. It is therefore possible to record 16 different tints with 8 separate pictures in 8 scans.

When the recording of the first picture image is complete, the scanning head ramps back to the starting block automatically recalling from memory all the parameters necessary for the second image.

The partial or full application range of such a system seems quite extensive, if one considers the wealth of 5-3/8 x 8-3/8 and 8-1/2 x 11-1/4 catalogue and other work that is comprised of square and rectangular mask elements. Even pages that need other geometric or silhouette masks can be started under Combimask and finished "on the table."

Applications extend into the Newspaper Industry where not only the page construction can be handled offline but also the actual page design. Editorial departments utilizing a special blue grid line technique can design and construct the color pages and send that information via floppy disc to scanner production.

Page layouts in some operations arrive before the copy. With Combimask all the tint information can be exposed on the scanner and combined with the individual separations "on the table." Some users will approach Combimask this way all the time, depending on their own production situations and commitment to job preparation.

Job Planning

The adoption of the Combimask technique, either partially or fully, will depend in a large part on the commitment of any given litho company to the concept of job planning. The most crucial part of job planning, as far as Combimask is concerned, is copy preparation.

The scanner requires that one indication on the copy be made for the X, Y start location of the scan line. A point in either the upper left or upper right hand corner of the copy will be selected, depending on the scanning direction which in turn is dependent upon the right reading/wrong reading principal. This point is responsible for indicating both the horizontal and vertical commencement of the scan data and is also stored in the job file.

With the Combimask it is not enough to establish enlargement or reduction size and then scan the whole image, with that portion of the image desired being floated into the mask window under the guidance of an image monitor. Nor are any of the point to point positioning techniques employed in Color Pagination system available. The point that is indicated at the scanner should be as close as possible to the actual picture area required in the layout.

The referencing of such a point in picture copy with a busy background is not difficult, the problem arises when substantial enlargement factors are applied to images with no discernible points of reference. An example would be a 600 percent enlargement of a 35 millimeter product shot against a white, grey or flat color background. The background offers no discernible reference point for the operator to mark for the commencement of the scan line according to the layout. Every millimeter off the true referencing point will be multiplied by the enlargement factor.

This obstacle to the complete fulfillment of the Combimask technique is the reason that Hell is developing the optical enlarger SC-2000. With the inclusion of this device it becomes possible for a prep worker to not only determine the reproduction size but also to rotate an image if it is shifted within its own borders and most importantly locate and mark the X, Y indication point needed by the scanner as required by the layout.

The SC-2000 like all enlarger type systems allows for an accurate determination of the reproduction size. Added features include a rotational disk for the squaring of the copy and adjustable framing arms that make it possible to mark lines on bleed areas around the copy that will allow the operator to quickly find the indication point. The framing arms used in conjunction with the rotational disk allows for another set of lines to be marked and used to mount the copy square to the scanning drum.

With accurate copy preparation, the Combimask technique will prove to be economical both in terms of materials and labor, considering the time involved in the laying down of tints that match the screen angles of the halftone picture images. The overall functionability of the scanner increases as its tasks are expanded in directions of page assembly as well as those of color reproduction or Achromatic structure.

Future Trends

It may not be unreasonable to expect that software routines available for the special calculation of hi-resolution contours in color pagination systems will be mimicked by special purpose hardware in Standalone scanners. This would open the door for the inclusion of geometric mask shapes such as ovals, elipses, free figures, etc.

Rapid positioning from the starting block to the point of image scan (recording side) will become more feasible as improvements are made in the raster output exposing systems, overcoming any limiting factors associated with uneven densities due to minimum modulator light leakage.

Expanded geometrics coupled with eight page formats will allow the scanner to serve double duty as the output plotter for an automask type operation.

Summary

We see that it presently is possible to combine up to 8 picture elements and 16 tints in one page, with all the tint information being exposed with the recording of the first scanned image.

Color images have to be scanned at some point whether they are to be included in direct Page Assembly or not. If scanned individually, there will obviously be less recording time involved because the recording head does not have to sweep the entire horizontal page format. At present we add an average of 40% to the recording time of each picture included in a direct page assembly. However, recording time is only a portion of the overall time it takes to produce a set of four color separations. Any estimation of reproduction time must include the calculation and entry of scan parameters, as well as copy and print modification setups.

With the Combimask technique many scan and setup parameters can be predefined before they ever come to the scanner, thus streamlining this whole procedure by at least 20%. Combimask at its present level, therefore, should slow the scan process down by only 20%. As the ability to evaluate and program more scan data offline grows, we will be offered further reductions in the setup time. Coupled with rapid scan positioning routines, due to improvements in the raster output devices, we may see a time when individual images are setup, scanned and exposed in a direct page layout at a faster rate than they are now handled individually.

Materials and stripping time are the real benefactors of the Combimask technique. On the Layout Programmer LP-307, it would take only 15 to 20 minutes for the crea-

tion of an average 8-1/2 x 11 page with four or five square and rectangular picture elements which requiring some image overlaps, set against a full background tint, color frames around all the pictures and perhaps one or two tint blocks for text insert. Another 20 to 30 minutes are all it takes for copy preparation (SC-2000). A conventional stripping job may take three hours or more, not to mention the use of consumable materials - flats and films. This time could be broken down to 15 or 20 minutes for each window cut, a half hour for the frames, and another half an hour for background and tint blocks (cutmasks). Another half an hour or more is required for the combining with bendays (tints), image spreads, and any hand work that might be necessary where angle clash may occur (one image merges or overlaps another - screen angle alignments). Copy requires 15 to 20 minutes for preparation in the conventional process (sizing, cleaning and mounting).

The rescan rate may be the major limiting factor, depending on the critical nature of the work. Advances in Prescan analysis devices, smarter scanners, or just better operators would alleviate this concern.