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Widestock exposure modification

Kurt D. Roberts

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WIDESTOCK EXPOSURE MODIFICATION

by

Kurt D. Roberts

A thesis submitted in partial fulfillment of the
requirements for the degree of
Bachelor of Science in the School of
Photographic Arts and Sciences in the
College of Graphic Arts and Photography
of the Rochester Institute of Technology

April 25, 1980

Kurt D Roberts

Signature of the Author _____

Photographic Science
and Instrumentation

Al Casinelli

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Thesis Adviser

5/2/80

John F. Carson

Accepted by _____

Supervisor, Undergraduate Research

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Kurt D. Roberts

Submitted to the Photographic Science and Instrumentation Division in partial fulfillment of the requirements for the Bachelor of Science degree at the Rochester Institute of Technology

ABSTRACT

A system exists for the exposure of large pieces of sensitized material. The strips are exposed, processed, and viewed by transmitted light. This procedure is used to gauge the quality of the film coating process. There are three problems with the existing system: uneven illumination, the timers do not take into account light decay, and finally, the operators, on occasion, set up the wrong conditions for an exposure.

The purpose of this thesis is to modify an existing process for the automated exposure of widestock strips. These modifications are to replace the system's components with state of the art, commercially available equipment. The equipment was modified to perform the desired output as necessary. The equipment is then to be interfaced with a suitable computer and software generated to automate the system.

Existing lights and timing circuits have been replaced with lighting arrangements that approximate actual end use of the products tested. Exposure control is provided by an "off the shelf" light integrator. An existing computer, (DEC 11/34), adapted for automation purposes was then interfaced with the new equipment to operate the system. Software is planned which will take over partial responsibility for operating the system.

I would like to dedicate this paper to my parents , Jesse D. and Ruth P. Roberts . Their determination and foresight have put me through college and inspired me to go onto greater things .

ACKNOWLEDGMENTS

I would like to thank E. I. du Pont de Nemours & Co., Inc., Rochester Photo Products, for making my thesis possible. I would also like to thank a few people, other than my advisors, whose interest beyond an average curiosity lead to some insight into my thesis work. Two such people are: M. S. Hanby and R. J. Winslow.

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INTRODUCTION

The primary purpose of any film production facility is to produce sensitized film. The films that we are interested in are of three specific types: Industrial films, used for data recording; Engineering films, used for design recording; and Graphic Arts films, used for image reproduction onto printed material.

The light sensitive emulsion is applied to the moving base in a number of ways. In all cases a pattern exists after coating which is a characteristic of the emulsion application process. The pattern imparted upon the coated product governs the physical quality of the sensitized material.

The problem of identifying these patterns is taken care of by the quality control section of the plant. Other work related to the production of film is the maintenance of sensitometric controls and standards for the products produced. This thesis will deal with the quality assurance of the testing procedure for the coating patterns.

As the film is produced, samples are taken. The samples are then uniformly exposed and processed. The flashed samples are viewed by transmitted light, and the coating quality is gauged subjectively by an operator. The operator scans the sample and looks for obvious coating defects and takes action accordingly if the quality is questionable.

The criteria for subjective analysis is dependent upon the level of the flashed light given to the sample. As the density increases, the threshold defects become indiscernible and blend into the background density. The severity of the defect increases accordingly. Therefore, it is safe to assume that a great deal rests upon the accuracy of the overall exposure given to the sample.

The scope of this type of quality assurance can only be appreciated when one recognizes film is coated at high speeds and in large quantities. It is easy to determine that a great deal of film could be erroneously coated due to a lack of quality control in the production process.

As stated above, three types of product are handled with this system: Graphic Arts, Engineering, and Industrial films. The speed range is phenomenal and covers six log unit decades. The system therefore uses two sets of lights to accommodate the differences in speed.

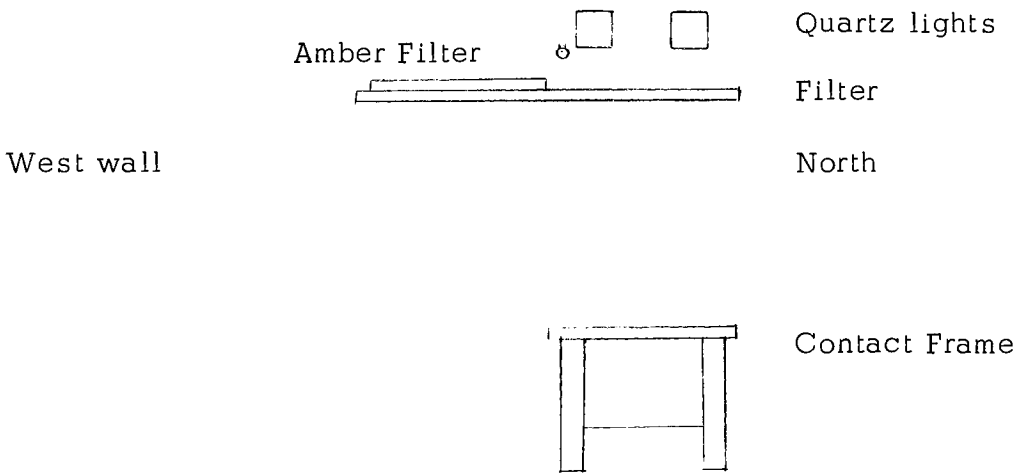


Figure 1

Existing Exposure Room

The Graphic Arts films presently utilize an array of four Quartz-Iodide spot lamps to illuminate a sixty by forty inch vacuum frame. The array is divided in half along the long axis. All four lights or just one-half at a time can be used depending upon the area of the vacuum frame being used. The Industrial, Engineering, and higher speed films utilize an ordinary one hundred watt light bulb with variable transformer to control the voltage. For some of the Graphic Arts films a yellow filter is put into the light path to absorb the ultra violet light. In all cases, enlarger type timing devices are used to regulate the exposures. It should be noted that the lamps differ not only in intensity but also in spectral response. These lamps also were representative of end use exposure sources when they were originally installed.

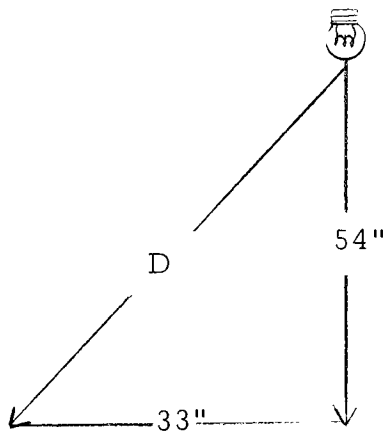
The operator sets the conditions for a specific product utilizing data from a wall chart. The procedure is: identify the sample, look up its exposure time, lights, and light voltage settings. The operator then places the film into the contact frame or on top of it, depending upon the exposure type, and finally starts the exposure.

Two types of exposure can be generated. One type is an overall grey flash. The grey flash would not necessarily utilize the contact frame. The other type exposure which utilizes the contact frame is the line print. The line exposure consists of a half tone and topographical map contact exposure.

There are three problems with the existing system: uneven illumination, the timers do not take into account light decay, and finally, the operators on occasion set up the wrong conditions for an exposure.

The unevenness in illumination is the only factor that could be significantly quantized. Two methods were used to measure the light fall-off of the current system. The first method was to measure the light intensity at the film plane using a spectra Lumicon Series II light meter. The other method was to measure the density difference in a large piece of film.

The problem of fall off exists with both light sources. Since the distance between the light source is greater than ten times the light bulb filament width, the inverse square law can be used to calculate the fall-off.



Illuminance = $\frac{\text{light intensity}}{\text{square of the distance from the source}}$

$$D = (54)^2 + (33)^2 = 63$$

Figure 2

Inverse Square Law Light Fall-Off

Taking the intensity of the light to be an arbitrary value of one hundred, the percent difference between the center of the frame and the corner, fall off, is 27%. This, however, can be tolerated because the higher speed products are of a low contrast. This phenomenon will be explained below.

The quartz flood lamps are designed for even illumination of large areas at a distance of ten feet. The units are presently being used at approximately half that distance. This intuitively leads you to believe that there would be some serious problems in the uniformity of the quartz flood lamp illumination. Since the lamps contain reflectors whose specifications are not known, the fall off will not be calculated.

However, from practical measurements with a light meter, the fall off is fifty percent. The delta density difference is on the order of one hundred percent.

The error that is tolerable is arrived at by seeing what density variation is acceptable. By taking that back through the characteristic curve for the highest contrast film to be exposed you can find out what the exposure tolerance is. Since exposure is equal to the intensity of the illumination multiplied by the time of exposure, it can readily be seen taking into account the direct relationship between exposure and intensity, if the allowable tolerance matches the actual.

This has been calculated. It turns out that the allowable error is $\pm 11\%$. The present system exceeds the desired exposure by a total of 20%.

The higher contrast material is used to set the limits. The diagram below shows that the higher contrast material demands more stringent controls on exposure.

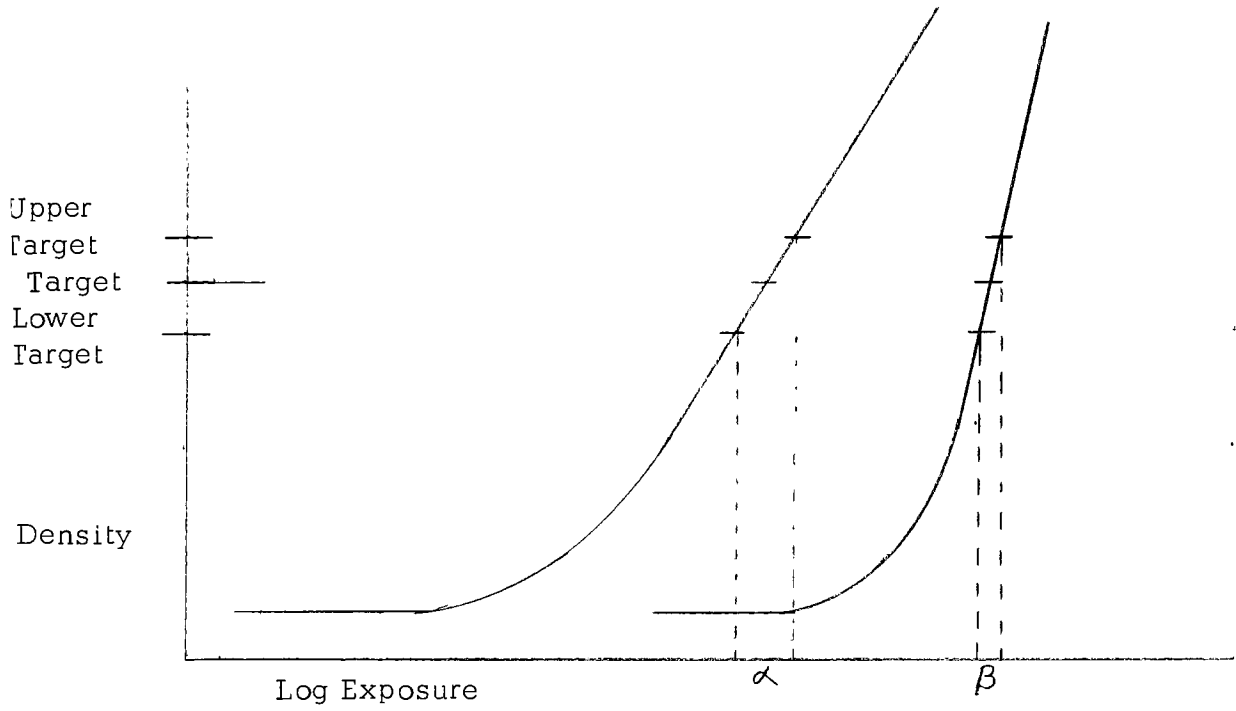


Figure 3

Exposure Tolerance Calculations

AIM

The immediate aim of the work to be done will be to replace the out-of-date equipment with commercially available, state-of-the-art equipment. The Quartz-Iodide lights will be replaced with units designed for Graphic Arts use, and the single light bulb will be modified to produce more uniform illumination. Many light integrators exist which could easily be adapted for our purposes. The design work necessary for automation will be more or less a research of existing off-the-shelf items with possible interface options.

Since the aim of this thesis is to design and implement the modifications, it is essential that the work be carried on in accordance with the rules and procedures of the production facility. This fact made it possible for the design work, engineering scheduling, and programming to be accomplished by the researcher.

The immediate objective above and beyond automation is to decrease the illumination unevenness from 100% density down to $\pm 15\%$ density.

BODY

This thesis is primarily an engineering problem. Therefore, no real experimentation was accomplished. However, an objective was set, and through deliberation over a number of points, certain pieces of equipment were chosen to complete the aim of the thesis work.

LIGHTS

Berky Quartz-King Dual 1000 lights, mentioned above, were used for Graphic Arts films. This light was manufactured for motion picture and theatrical considerations. Berky also markets Graphic Arts exposing sources of various halides and intensities. Sales and technical people were consulted at Berky in New York City, and several lamps were discussed.

The lamp chosen had to be compatible with what our customers were using in the field. The widestock testing which we are doing must, as closely as possible, simulate end usage of the product. Another consideration was the physical limitations of our facilities. The height of the ceiling to contact frame measurement is six feet, two inches, and the new source must be uniform over a forty by sixty inch area. Two lighting schemes seemed possible. One was a system used for board illumination and is comprised of two banks of lights. Each bank contains two long pulsed xenon flash tubes. These lights were ruled out due to the size limitations of the room.

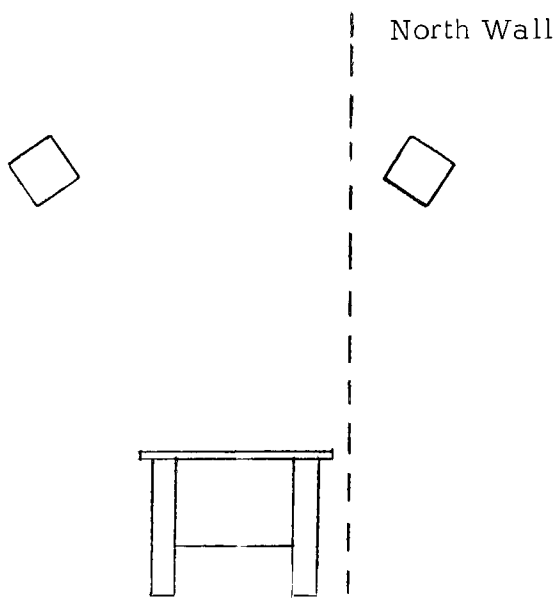


Figure 4

Copy board type of illumination required separation of the lights that exceeded our size limitations.

The second light that we selected was a Berky 8KW Pulsed Xenon lamp. This source was successfully in use in our facility and seemed most promising. The light was purchased and evaluated using practical film trials and an EG & G Photometer/Radiometer with an 8.0 neutral density filter. It was found that the delta density values were 50% or less. This is one-half of the error with the current system.

The delta density difference was originally 200%, but with the use of stainless steel, course mesh screen, aluminum, fine mesh screen, and a stainless steel plate, the density error was dropped to 50%.

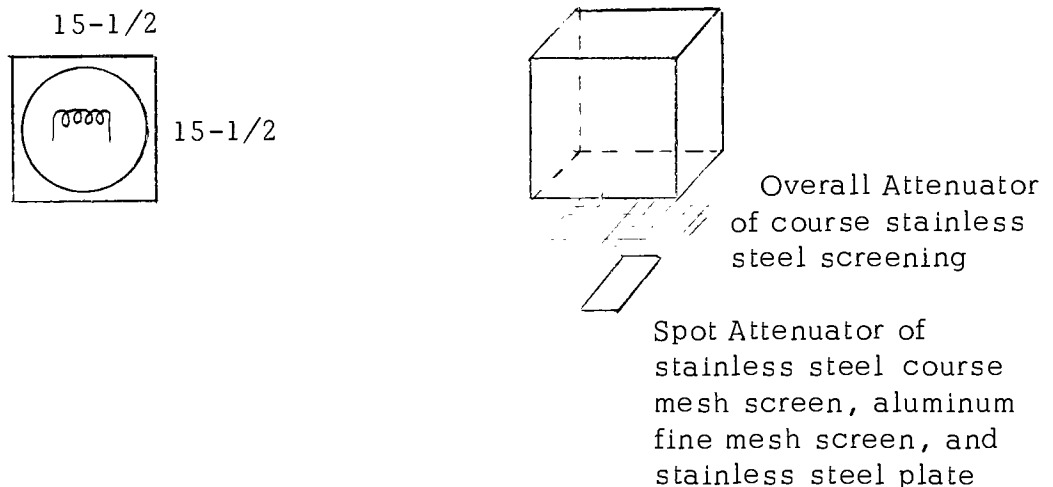


Figure 5

Pulsed Xenon Light and Attenuators

Neutral density filters of gelatin or glass would not have been able to withstand the heat of the pulsed xenon flash tube. Gelatin filters are prone to planar distortion and ignition while glass filters shatter due to expansion caused by heat. The expansion is greater in the area nearest the light source. Consequently, the fringes of the filter remain cooler. This difference in expansion is what causes the shattering of glass filters.

The one hundred watt incandescent light's voltage is controlled by a variable transformer. The single light is to be replaced with an array of 4 twenty-five watt lights. The power for the lights will be supplied by a programmable power supply.

INTEGRATOR

An integrator was considered after coming up with an experimental model of our own. The programming needed, as well as problems in the electrical intricacies with the probe output, were deciding factors in going with an off-the-shelf light integrator.

A suitable unit was already functioning in conjunction with the 8 KW lamp on the plant and in the R & D facility. An electrical schematic supplied with the unit showed that a multiple memory option could be run remotely with a Transistor Transistor Logic, "TTL," compatible power source.

The unit, Digital Light Integrator, is manufactured by Graphic Arts Technology. The unit is programmed in Binary Coded Decimal. The DLI was purchased with the multiple memory option and two light probes.

PROBES

The spectral response of the film was not a contributing factor to the light selection. However, the spectral output of the two light sources do differ dramatically. The spectral emission of the pulsed xenon light is primarily in the blue region of the spectrum whereas the output of the incandescent lights is in the red region. With this being the case, two probes were selected to sense the light reaching the film plane. Graphic Arts Technology offers a selection of probes. One probe can be supplied with the DLI. We selected two probes: an ultra violet and a visible. This allows us to select either probe depending on which light is in use. An outstanding feature of this unit is that it can be operated either in the manual mode or the multiple memory mode, "Automatic," just by engaging a single switch.

The Digital Light Integrator has provisions for internally switching a relay to time an exposure or it can output the line current used to operate the unit for the proper amount of time. This option fits in very well with our application. The pulsed xenon light's power supply is triggered by 110 volts max, 3 amps, and the four bulb array of incandescent lights power can be regulated by the internal relay. All that has to be done is to determine with relays which option is in use.

FILTER

The filter, Kodak Yellow, is presently mounted in a housing above the contact frame and below the lights. The filter is quite large, forty by sixty inches. (See Figure 1.) In trying to design a way to move the massive filter, two schemes were pursued. The original plan was to use an AC reversible motor to drive a threaded shaft. This would be attached to the filter in such a fashion that the revolution of the threaded shaft would move the filter in and out of the light path. It turned out that the electric motor, threaded rods, and bearings were too expensive. An alternate method, an air operated cylinder, was much cheaper. Hansen Manufacturing Company, Ohio, supplied us with an air track of the proper dimensions. The total length of the filter track is eight inches. The air track is half of this dimension and attaches to the frame in a way the light is not blocked when the filter is in place.

COMPUTER HARDWARE

The computer in use is a PDP11/34 manufactured by Digital. It is already employed to automate other functions of the plant. The choice of controlling hardware, however, was left up to the researcher. For our application it was necessary to order an ICR-II. The ICR stands for Industrial Control Remote.

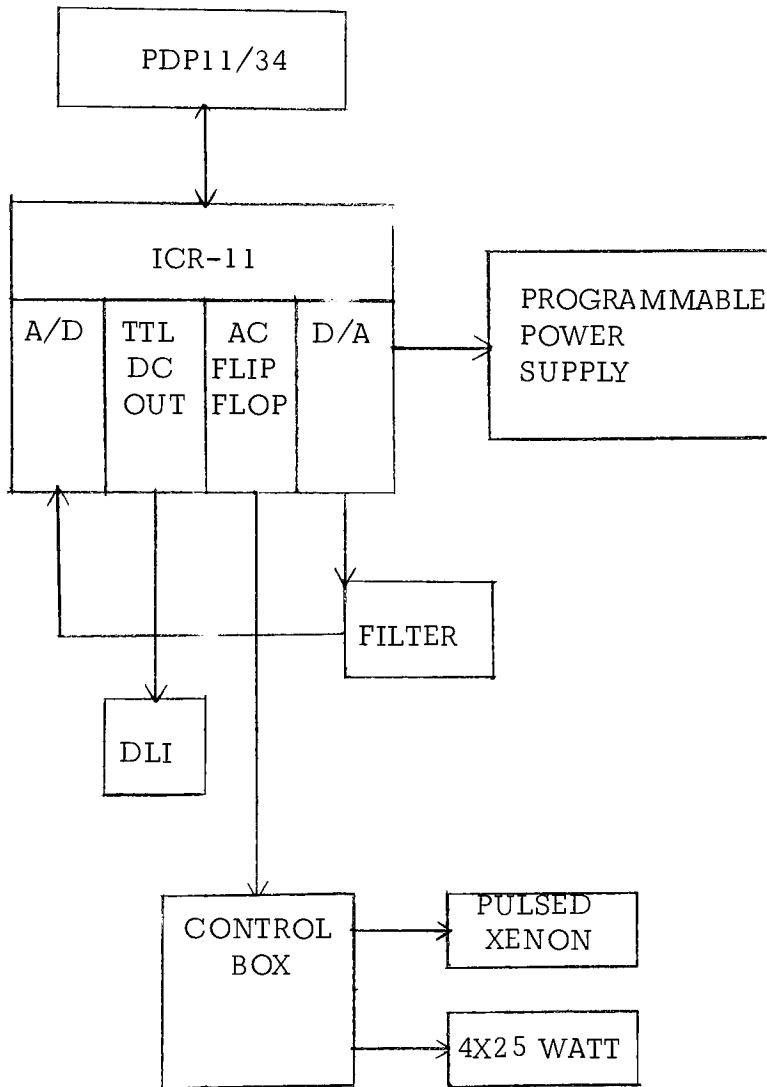


Figure 6

Block Diagram of System

The ICR is a unit that allows the computer to access or impart information to plug-in modules. For our purposes, four modules were chosen. They are: an analog to digital converter, a digital to analog converter, TTL compatible DC output board, and an AC flip flop board. The A/D board takes a direct current signal and converts it to a digital signal. The D/A board does the exact opposite. These two boards function together to take on two tasks: that of programming the Hewlett-Packard DC programmable power supply and operating in conjunction with limit switches to tell us where the filter is located.

The Hewlett-Packard programmable power supply can be either programmed with a resistance, in which case the power remains the constant and the voltage varies, or for our use it can be programmed with a 0 - 10 volt signal from the D/A board to vary the power and keep the voltage constant. To sense the filter location, one channel of the D/A board is connected to a microswitch which in turn makes a contact to complete the circuit with the A/D board which indicates the filter location.

The TTL compatible DC output board either puts out 0 or 5 volts. This board, as you might have surmised, is responsible for programming the Digital Light Integrator in its multiple memory mode (Automatic). To accomplish this the DLI must be isolated from the computer board. In the event of a power surge in either direction, at least one of the two will be protected from a voltage overload or grounding. If the terminals

The isolation is accomplished by utilization of a buffer. The buffer was designed and built for this project. It utilizes Potter and Brumfield reed relays.

The DLI multiple memory package consists of two connectors: a twenty-five pin connection for remote programming and a Cinch Jones 10 pin connector for starting and cancelling the programmed exposure. One of the twenty-five pins has a five volt output which can be connected in series with the wipers on the reed relays to supply the programmed input. This makes the unit easier to assemble since a power supply is not needed. The 0 or 5 volt signal from the computer is connected across the coil of the reed relays, and the current from the computer board pulls in the proper relays to form a BCD exposure. The start and cancel relays' wipers are connected to the twenty-fifth pin of the twenty-five pin connector. This pin is connected to the DLI's ground. The start button, which operates in manual mode, is hooked up to a capacitor which does not allow the exposure to recycle. Since this is a totally automated system, the switch can not be employed. The relays hooked to ground can be pulsed for a brief moment accomplishing the exposure without remaining grounded to initiate another exposure.

This leaves us with one board to set the conditions for the exposure. The variables are in Table 1.

PROBE		LIGHTS		FILTER	
UV	Visible	Pulsed Xenon	4 x 25 watt incandescent	None	EK Yellow

Table 1

Table of Conditions

The 16 channel AC flip flop board has the ability to switch 95-135 volts at a maximum of 3 amps. These relays are able to select the proper conditions by supplying voltage to other relays in a control box. A schematic for the control box is included in the appendix.

SOFTWARE

The PDPII/34 is a multiuser multilanguage system. Currently we are operating with the fortran four plus language option. The system contains subroutines for each option that can be purchased with the ICR. Our programming needs are fulfilled by five subroutines. Three subroutines are used to control the process. The other two are used as follows: one suspends program execution for a specific amount of time, and the other sets up a logical unit "Lun" default. This just means that if there is more than one ICR in operation the subroutine included in our program assumes that a specific ICR is to be used by means of a default. The table on the next page contains the subroutine mnemonic and a brief description.

SUBROUTINE	DESCRIPTION
DOLW	Enables or dissables all points specified for either the TTL compatible DC output board or the AC flip flop board.
AOW	D/A from 0 - 10 volts
AIRW	A/D Random sequence input
Wait	A task can relinquish control of the system for a specified amount of time
ASICLN	Sets up a default Lun for those fortran calls that allow the Lun to be optional

Table 2

Table of Subroutines and Description

A more detailed description of all of these subroutines and the specific applications are in the Process I/O Software Handbook , Digital Industrial Products Division. For anyone considering the more detailed account of how the system operates, a series of manuals exists which are vital to the understanding of the programming. These are, RSX11 Utilities Procedure Manual and Beginners Guide, by the company mentioned directly above. For our purposes, it will be recognized that these subroutines do exist and can be utilized in a variety of manners. What is important here is the tasks that we are trying to accomplish.

The software to control this system is not at all complicated. The program consists of the subroutines linked together to form a function. The modules have multiple fields with points within each field. This

merely means that each board has more than one channel. These channels are specified by points. The subroutines selectively alter these points to operate the system.

The general program which operates the system is flow charted below, and a sample program is attached in the appendix.

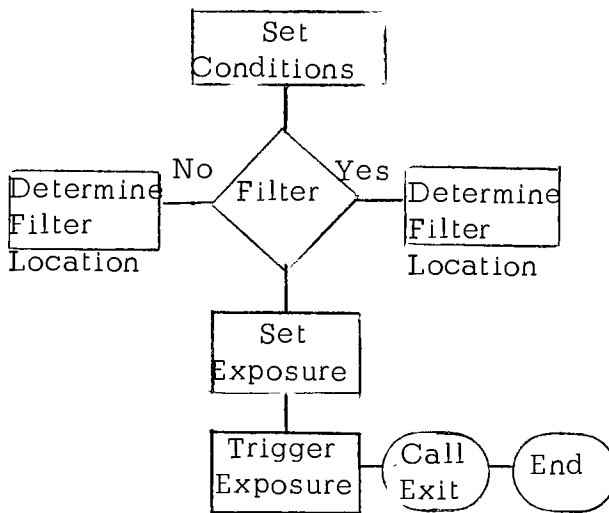


Figure 7

Flow Chart of Computer Program

This program operates with arrayed data assumed consistent. However, in production, occurrences alter the characteristics of the photographic sensitivity of the film. These speed changes do have limits which could be correlated with the widestock exposures. These limits could be incorporated into another program which would eliminate another variable.

The operator does not always concern himself with the sign of the product, and therefore, could conceivably alter an exposure to give a positive film more exposure to hopefully produce a darker print, obviously a mistake.

The flow chart looks like this:

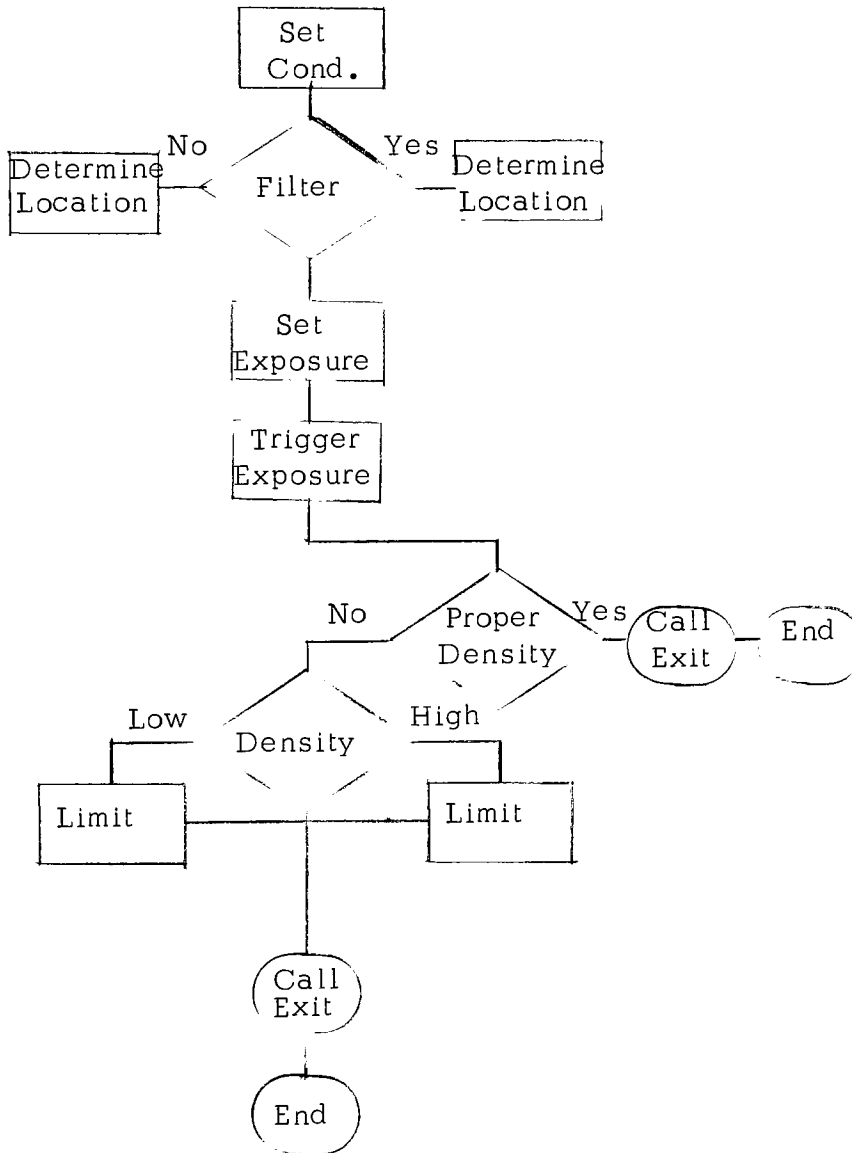


Figure 8

Flow Chart for System Operation in Automatic
with Added Capability of Limit Usage

The next logical conclusion would be to use the properties of the characteristic curve in order to calculate the correct exposure. Since all target densities are located on the straight line portion of the characteristic curves, the equation of a line $y = mx + b$ can be used to generate the correct exposures. The speed changes can be handled by realizing that the variable corresponding to the speed change is the x - intercept. The equation of the line with 3 knowns and 1 unknown can be used to calculate the new x - intercept, and the new formula can be used to calculate the corrected exposure.

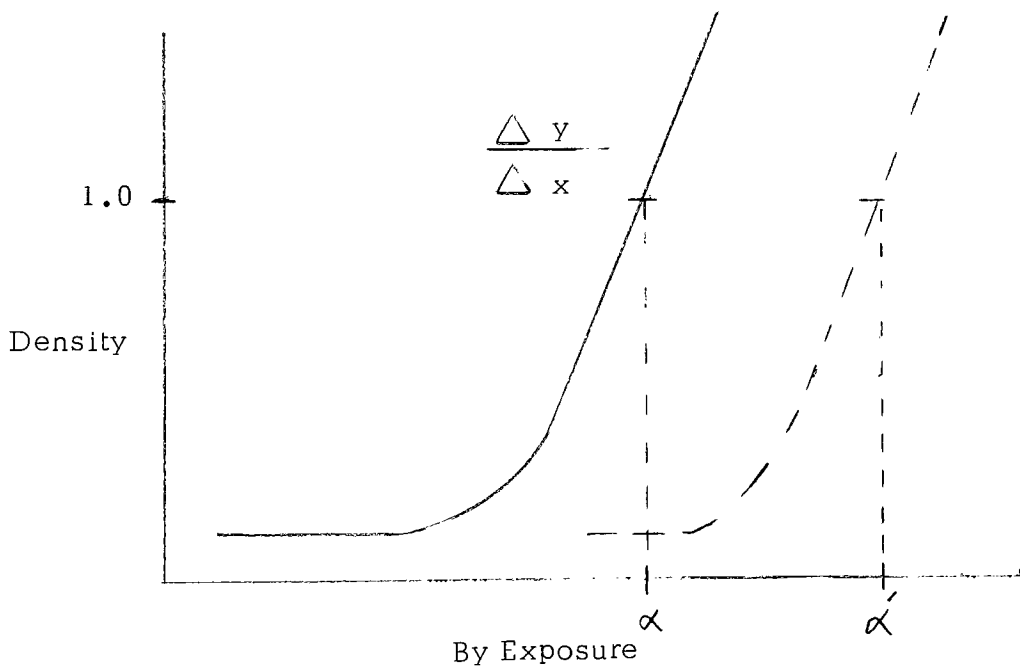


Figure 9

Figure to Illustrate Exposure Calculations

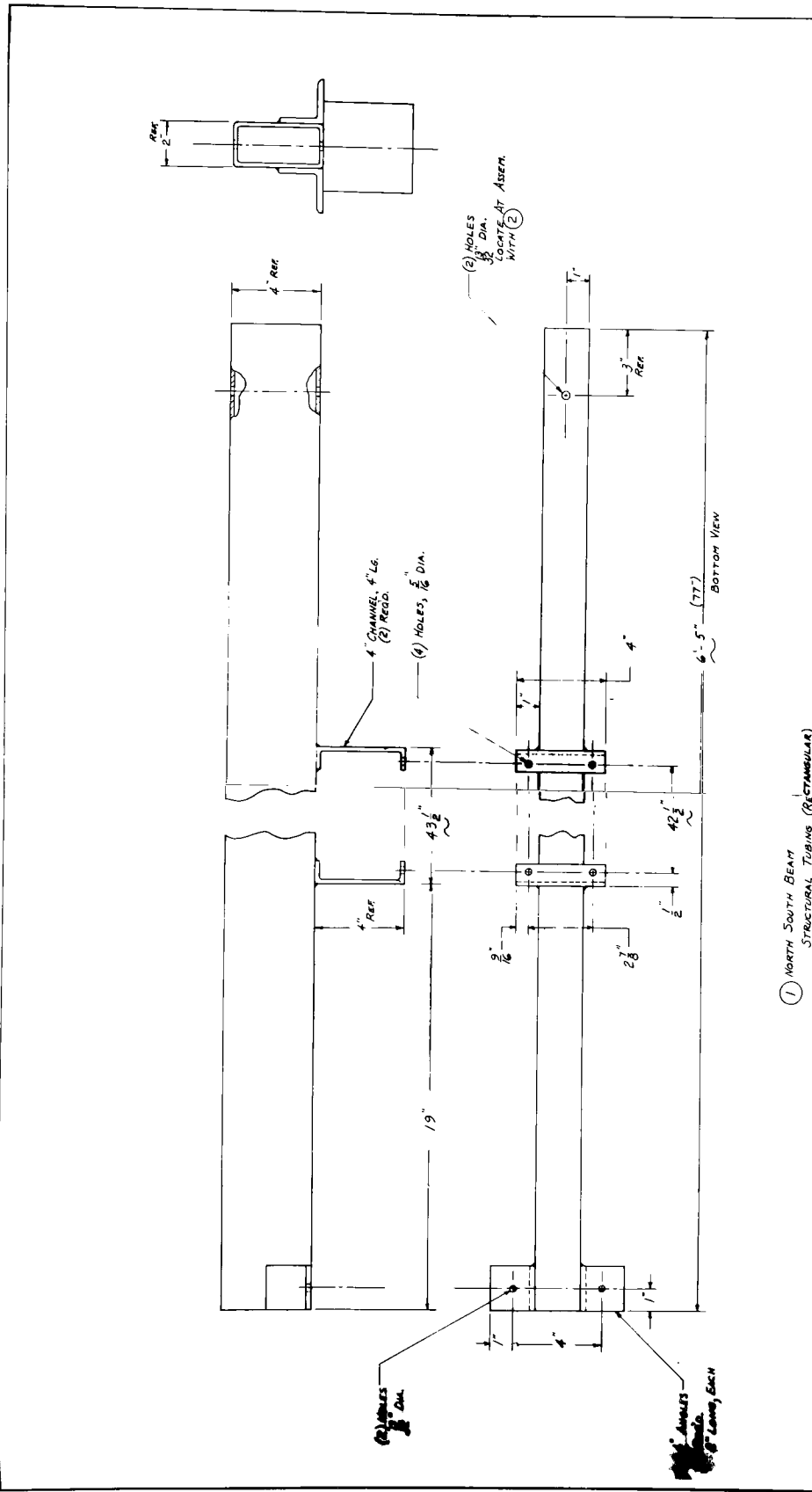
The last step in this process would be to record the data for exposure correction and apply statistics and come up with some conclusions as to the development of trends and possible predictions.

BIBLIOGRAPHY

1. Alan Stimson, *Photometry and Radiometry for Engineers*, Wiley, New York, 1974, p. 189.
2. Digital Equipment Corporation, *Process I/O Software Handbook*, 1975.

APPENDIX A

Mechanical Drawings of Fabricated
Metal Work and Room Lay Out

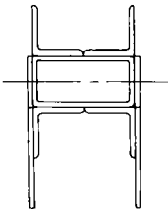


(1) NORTH SOUTH BEAM
 STRUCTURAL TUBING (RECTANGULAR)
 4 x 2 x 3/8" WALLS
 6.86 #/FT.
 (1) REQ.
 WELDMENT

UNLESS OTHERWISE SPECIFIED		FRACTIONS 1/16		ANGLES 45°	
REVISION	DATE	REVISION			

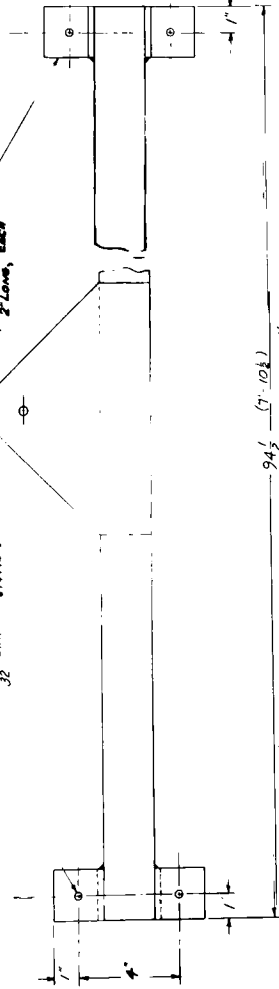
COMMON SYMBOLS
 AUTOMATIC MADE
 STENCIL EXPOSURE
 OF STEEL
 DRAWN BY C.A. HUL
 DATE 4-2-70
 SCALE 3/4" = 1'-0" (3/8" = 1'-0")
 DRAWING NO. 67444-1
 SHEET NO. 1 OF 1

PHOTO PRODUCTS DEPARTMENT
 INCIDENT FILE NO. 67444-1



(4) HOLES
3/32 DIA.
(5) SEE NOTE
674444-3

2" 27/32 ANGLES
(4) REGD.
2 LINES, EACH

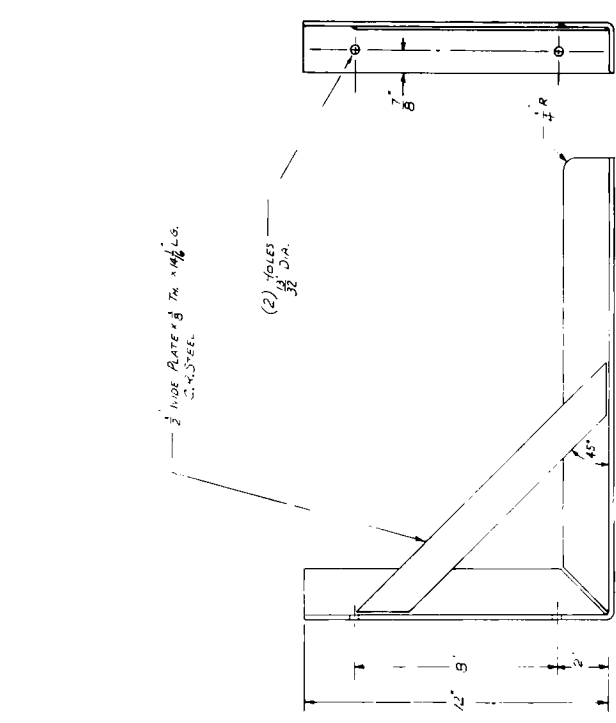


94 1/2 (7'-10 1/2)
BOTTOM VIEW

10 (2) EAST WEST BEAM
STRUCTURAL TUBING (RECTANGULAR)
4 x 2 x 1/8 WALLS
6.06 #/Ft
(2) REGD.
WELDMENT

NOTE:
BOTH PARTS (5) TO BE USED ONLY ON (2)

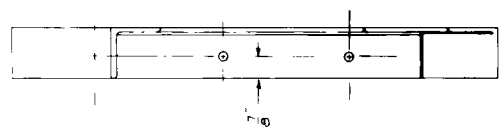
UNLESS OTHERWISE SPECIFIED DIMENSIONS : 005 TOLERANCES : 1/16 ANGLES		GENERAL TITLE: BASE 31		DATE: 6-2-60		DRAWN: E. J. G.		CHECKED: E. J. G.		APPROVED: E. J. G.		PHOTO PRODUCTS DEPARTMENT INSTRUMENT PLAN	
AUTOMATIC WIDESTON EXPOSURE		PROJECT NO. 674444		SCALE: 6" = 1'-0"		SHEET: 2-3		TOTAL SHEETS: 2		OWNER: 674444-2		DATE: 6-2-60	



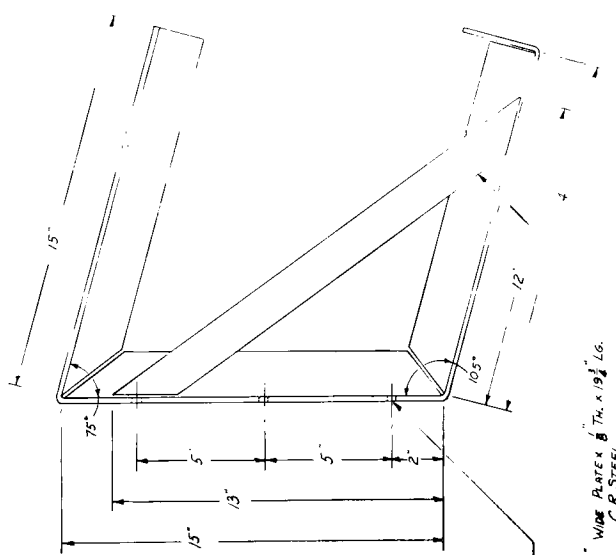
1/2" WIDE PLATE 8 TH. x 19 1/2 LG.
C.R. STEEL

(2) HOLES
1/8" DIA.

(4) KEYBOARD BRACKET
- 2 x 2 1/2 TH. WALK, 2.44 FT. C.R. STEEL
(2) REQ'D, (1) L.H. & (1) R.H.
WELDMENT
LENGTH BEFORE
BENDING = 30 1/2

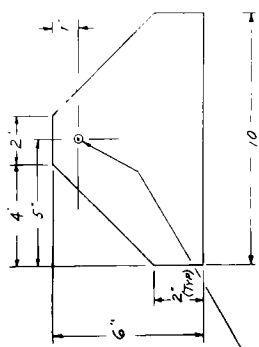


(3) LEVER BRACKET
- 2 x 2 1/2 TH. WALK, 2.44 FT. C.R. STEEL
(2) REQ'D, (1) L.H. & (1) R.H.
WELDMENT
LENGTH BEFORE
BENDING = 40 1/2



1/2" WIDE PLATE 8 TH. x 19 1/2 LG.
C.R. STEEL

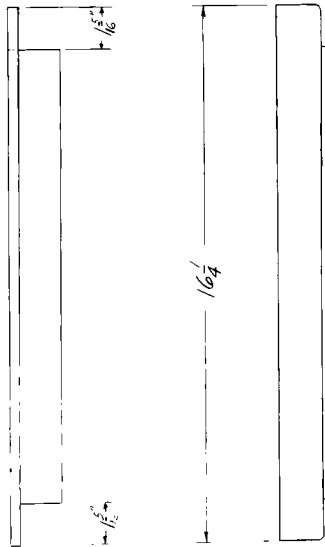
(4) HOLES
1/8" DIA.



(5) GUSSET PLATE
10 LG x 6 WIDE x 1/2 TH. CR STEEL
(2) REQ'D.

UNLESS OTHERWISE SPECIFIED		GENERAL TOLERANCES
DECIMALS	±.015	±.015
FRACTIONS	±.005	±.005
ANGLES	±.1°	±.1°
KEY DIMENSIONS		
DR		
DATE		
BY		
CHKD		
APP'D		
DESIGNED BY		
CHECKED BY		
DATE		
SCALE	AS SHOWN	
MATERIAL	AS SPECIFIED	
PHOTO PRODUCTS DEPARTMENT		
REGISTERED PLANT		
NO.	674444-3	

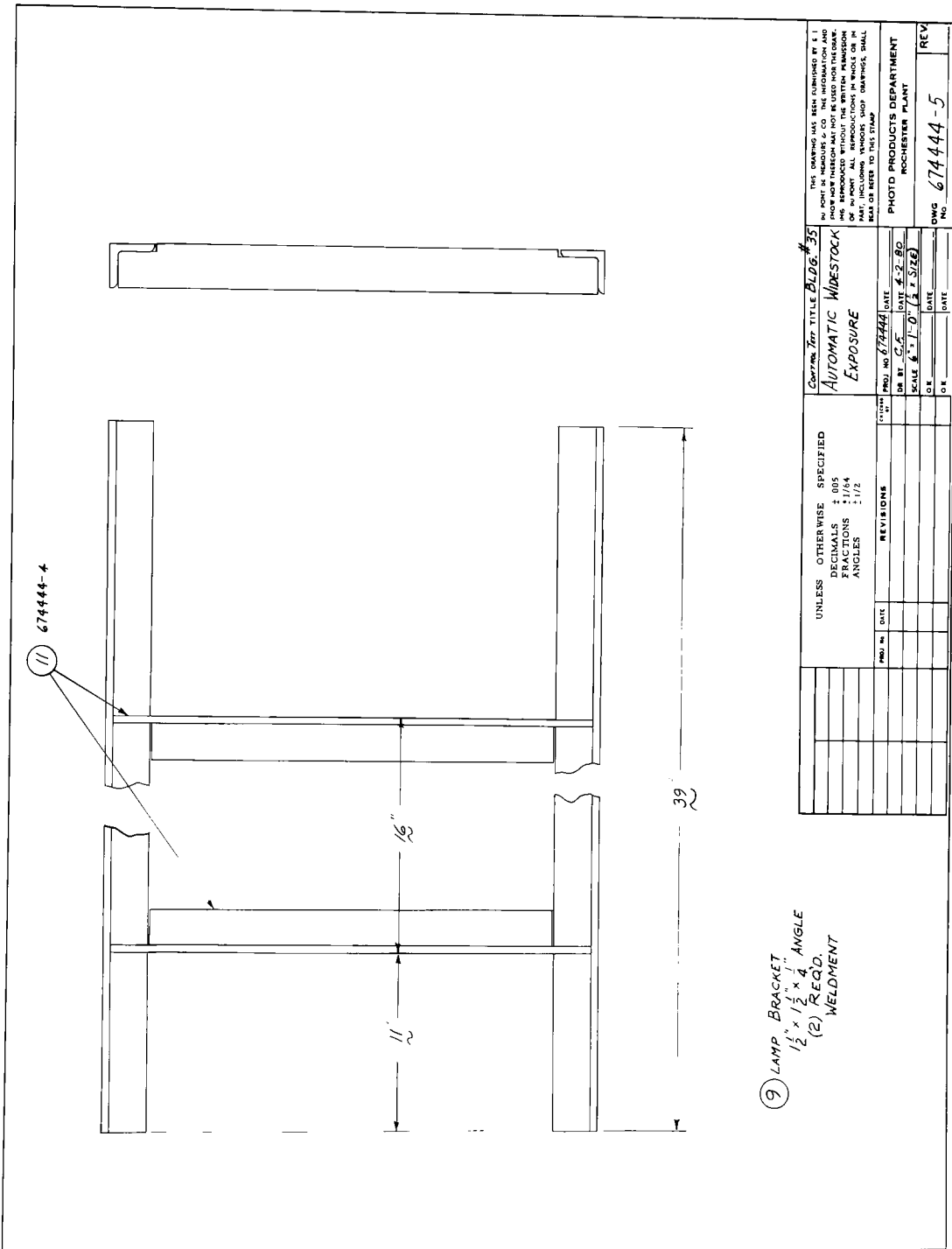
7-4-40



ROUND CORNERS $\frac{1}{8}'' R.$

(1) LAMP CROSS BAR
 $1\frac{1}{2}'' \times 1\frac{1}{2}'' \times \frac{1}{2}''$ ANGLE
 (2) REQ'D.

UNLESS OTHERWISE SPECIFIED DECIMALS 1/1000 FRACTIONS 1/16 ANGLES 1/2		CONTRACT TITLE <i>B.L.D.S. 35</i> AUTOMATIC WIDESTOCK EXPOSURE DETAIL		THE DRAWING HAS BEEN FURNISHED BY E. I. DUPRE & COMPANY, INC. AND IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT THE WRITTEN PERMISSION OF E. I. DUPRE & COMPANY, INC. ALL RIGHTS RESERVED. THIS DRAWING SHALL BEAT OR REFER TO THE STAMP.	
PROJ. NO.	DATE	PROJ. NO.	DATE	PHOTO PRODUCTS DEPARTMENT ROCHESTER PLANT	
BY <i>C.F.</i>	DATE <i>4-2-60</i>	BY <i>C.F.</i>	DATE <i>4-2-60</i>	DWG. NO.	REV.
SCALE $1/2'' = 1'-0''$ ($1/4'' = 3/16''$)		SCALE $1/2'' = 1'-0''$ ($1/4'' = 3/16''$)		674444-4	
DATE		DATE			



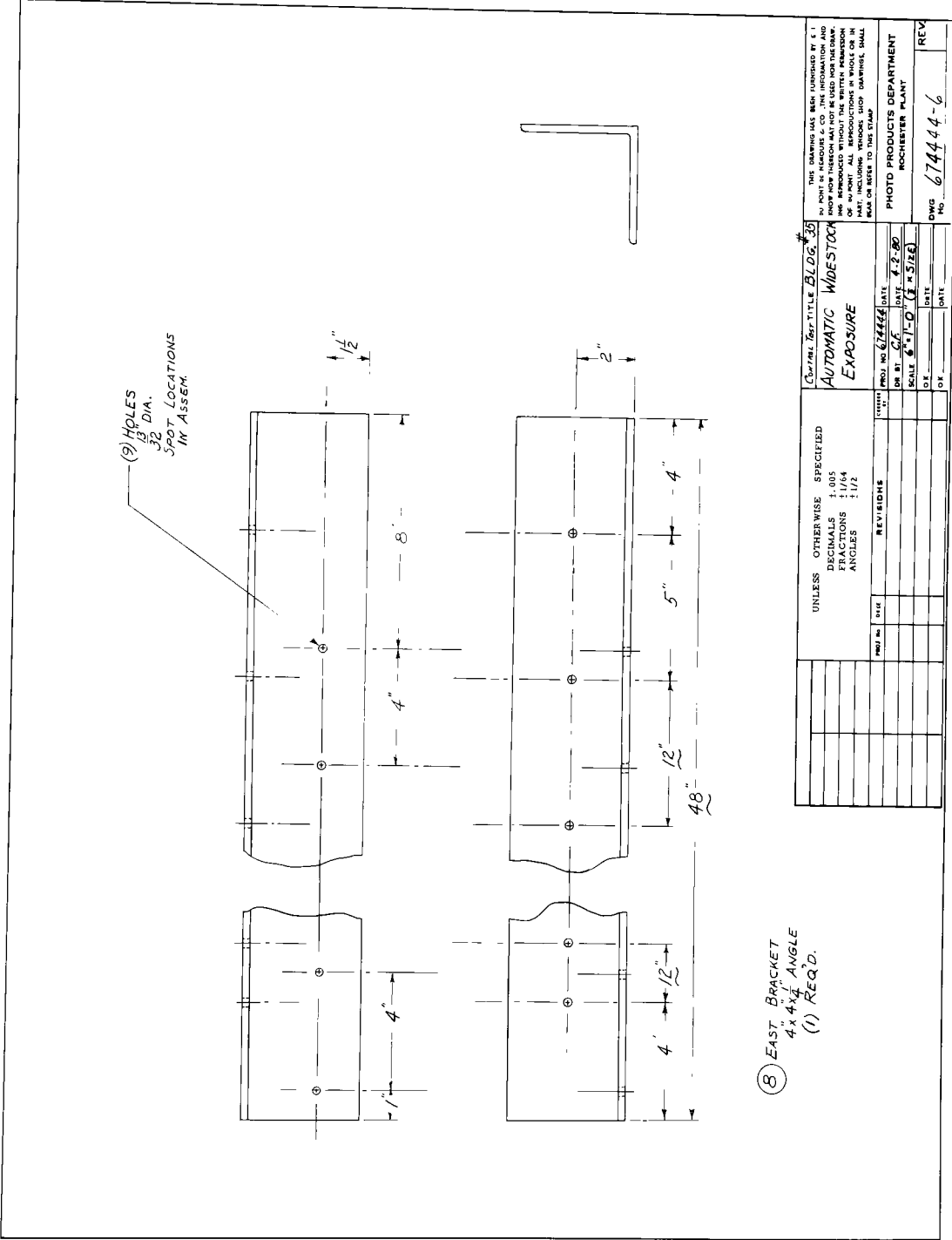
⑨ LAMP BRACKET
 $1\frac{1}{2} \times 1\frac{1}{2} \times \frac{1}{4}$ ANGLE
 (E) REQD.
 WELDMENT

UNLESS OTHERWISE SPECIFIED		OTHER		SPECIFIED	
DECIMALS	: 005	FRACCTIONS	: 1/64	ANGLES	: 1/2
PROJ IN	DATE	REVISIONS	DATE	PROJ NO	DATE
				67444	4-2-80
DR BY	C.F.	SCALE	1" = 1'-0"	DATE	4-2-80
CHK		BY		DATE	
DATE		DATE		DATE	
DATE		DATE		DATE	

Company File TITLE **67444-35**
AUTOMATIC WIDESTOCK EXPOSURE

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PHOTO PRODUCTS DEPARTMENT
 ROCHESTER PLANT
 DWG NO **67444-5**
 REV

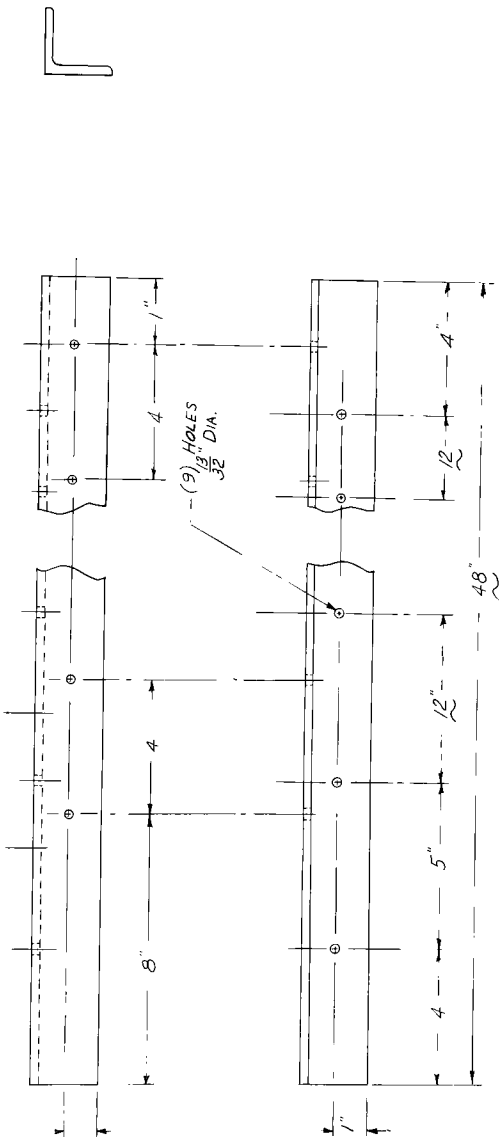


(8) EAST BRACKET
 4" x 4" x 1/2" ANGLE
 (1) REQ'D.

UNLESS OTHERWISE SPECIFIED		DECIMALS 1/100		FRACTIONS 1/16		ANGLES 1/2	
PROJ NO	DATE	REV	DATE	REV	DATE	REV	DATE
67444	4-2-50						
SCALE 1/1-D (A SIZE)		PHOTO PRODUCTS DEPARTMENT ROCHESTER PLANT					
DWG NO 67444-6		REV					

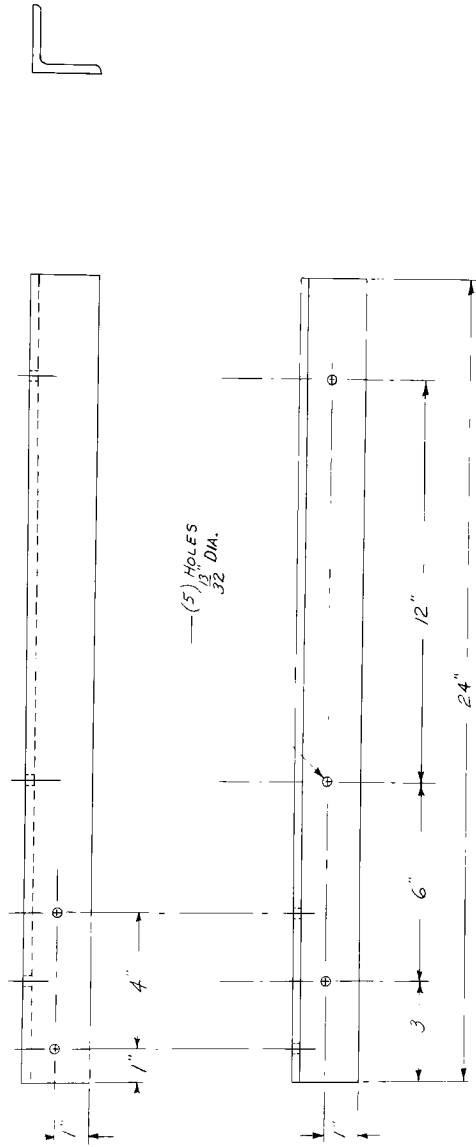
THIS DRAWING WAS MADE IN ACCORDANCE WITH THE POINT OF MEASURE & CO. THE INFORMATION AND DATA CONTAINED HEREON MAY NOT BE USED FOR THE DRAWING OF ANY PART OF ANY MACHINE OR EQUIPMENT WITHOUT THE WRITTEN PERMISSION OF THE COMPANY. ALL REPRODUCTIONS IN WHOLE OR IN PART, INCLUDING ALL VENDOR SHOP DRAWINGS, SHALL BE MADE IN ACCORDANCE WITH THE POINT OF MEASURE & CO. THE INFORMATION AND DATA CONTAINED HEREON MAY NOT BE USED FOR THE DRAWING OF ANY MACHINE OR EQUIPMENT WITHOUT THE WRITTEN PERMISSION OF THE COMPANY. ALL REPRODUCTIONS IN WHOLE OR IN PART, INCLUDING ALL VENDOR SHOP DRAWINGS, SHALL BE MADE IN ACCORDANCE WITH THE POINT OF MEASURE & CO.

General Test Title BLDG. 38
 AUTOMATIC WIDESTOCK
 EXPOSURE



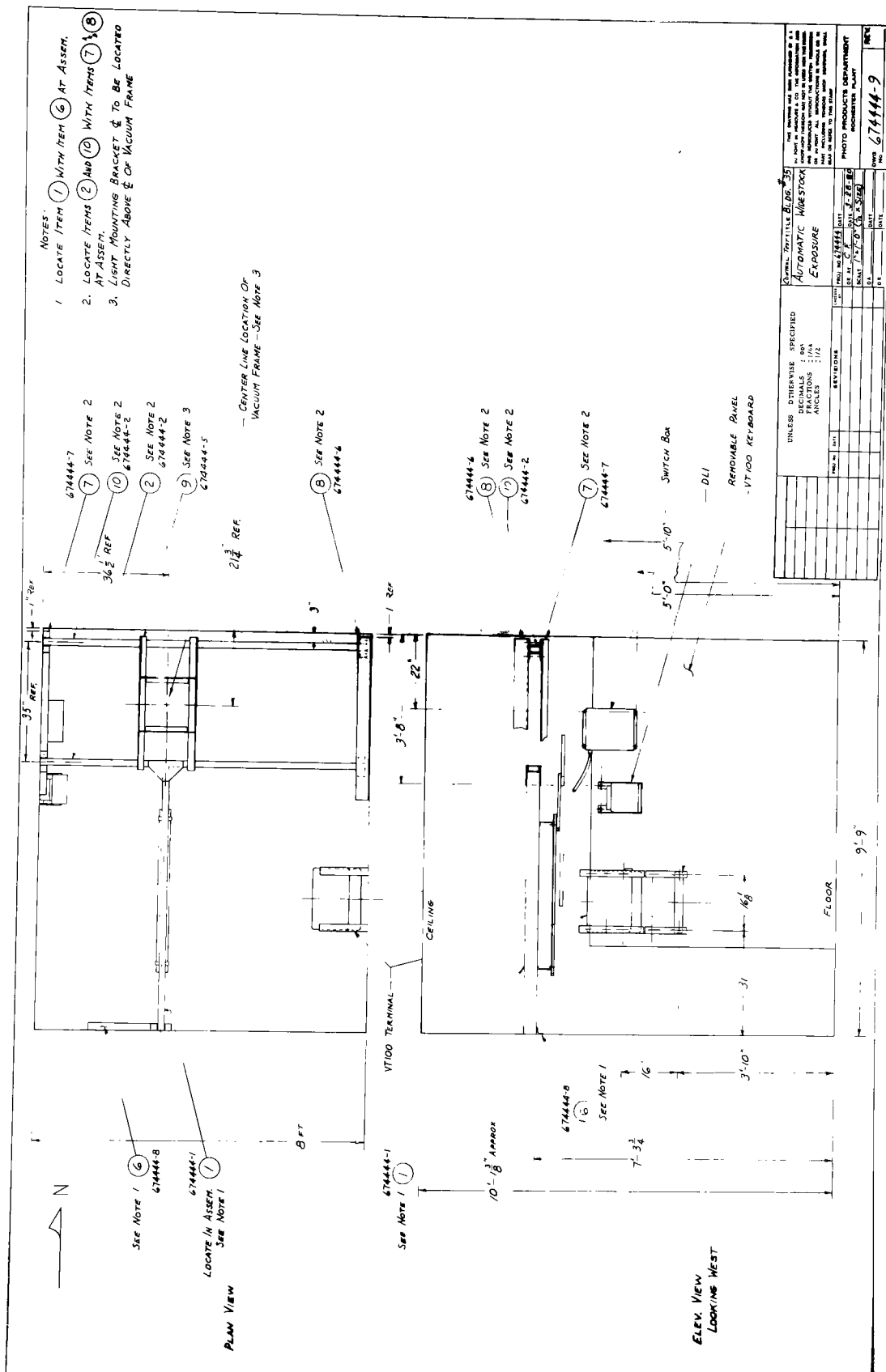
⑦ WEST BRACKET
 2" x 2" x 1/2" ANGLE
 (1) REQ'D.

UNLESS OTHERWISE SPECIFIED		REVISIONS	
DECIMALS	1/1000	NO.	DATE
FRACTIONS	1/16		
ANGLES	1/12		
CONTRACT TITLE <i>Bldg. # 35</i>		PROJ. NO. <i>67444</i>	DATE <i>4-2-50</i>
AUTOMATIC WIDESTOCK EXPOSURE		DR BY <i>C.F.</i>	SCALE <i>1/2" = 1'-0" (1/4" SIZE)</i>
THIS DRAWING WAS PREPARED BY E. J. ROY FOR NEAQUE & CO. THE INFORMATION AND DATA HEREON MAY NOT BE USED FOR REPRODUCTION OR FOR ANY OTHER PURPOSE WITHOUT THE WRITTEN PERMISSION OF NEAQUE & CO. ALL REPRODUCTIONS IN WHOLE OR IN PART, INCLUDING VERTICAL SHOP DRAWINGS, SHALL BE SUBJECT TO THIS STATE.		PHOTO PRODUCTS DEPARTMENT ROCHESTER PLANT	
		DWG. NO. <i>67444-7</i>	REV.



(6) SOUTH BRACKET
 2 x 2 x 1/4 ANGLE
 (1) REQ'D.

UNLESS OTHERWISE SPECIFIED DECIMALS : .005 FRACTIONS : 1/64 ANGLES : 1/2		THIS DRAWING HAS BEEN EXAMINED BY E. L. WYKOFF FOR INFORMATION AND IS NOT TO BE USED FOR THE FABRICATION OF ANY PART. ALL REPRODUCTIONS IN WHOLE OR IN PART, INCLUDING VARIOUS SHOP MARKINGS, SHALL BEAT ON OVER TO THIS STAMP.	
DESIGNED BY: <u>C. E.</u> DRAWN BY: <u>C. E.</u> CHECKED BY: <u>C. E.</u> DATE: <u>4-2-80</u>	TITLE: <u>AUTOMATIC WIDE STOCK EXPOSURE</u> PROJECT NO: <u>67444</u>	PHOTO PRODUCTS DEPARTMENT ROCHESTER PLANT	DWG NO: <u>67444-8</u> REV:
REVISIONS NO. DATE 1 4-2-80	SCALE: <u>AS SHOWN</u>		



- 674444-7 SEE NOTE 2
- 7 SEE NOTE 2
- 10 SEE NOTE 2
- 674444-2
- 2 SEE NOTE 2
- 674444-2
- 9 SEE NOTE 3
- 674444-5

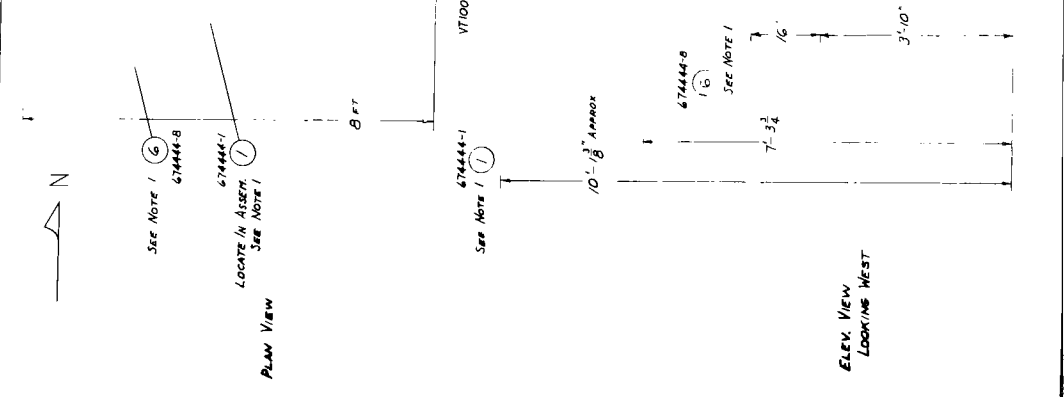
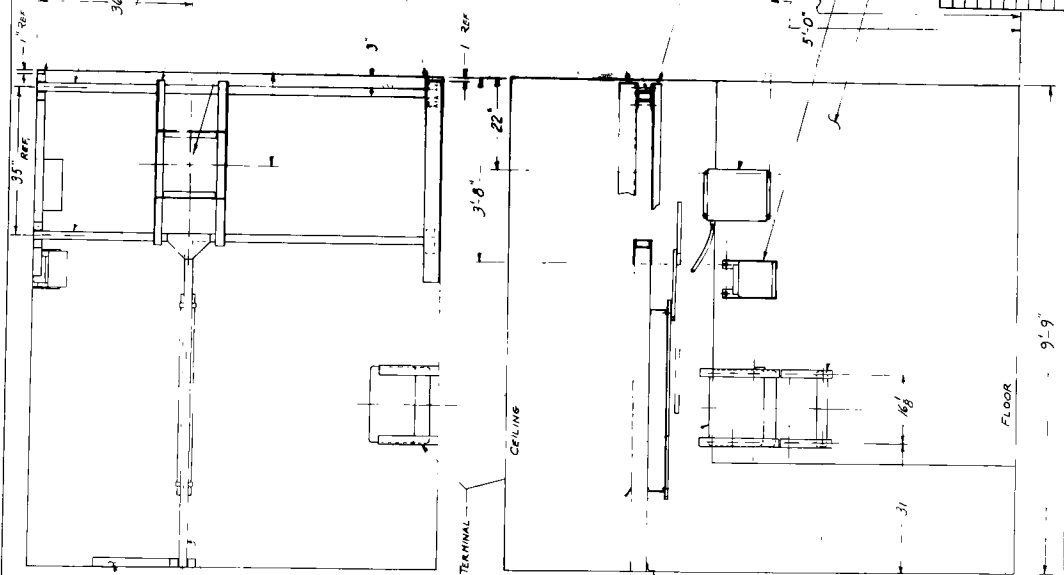
— CENTER LINE LOCATION OF VACUUM FRAME — SEE NOTE 3

8 SEE NOTE 2
674444-4

674444-4 SEE NOTE 2
8 SEE NOTE 2
674444-2

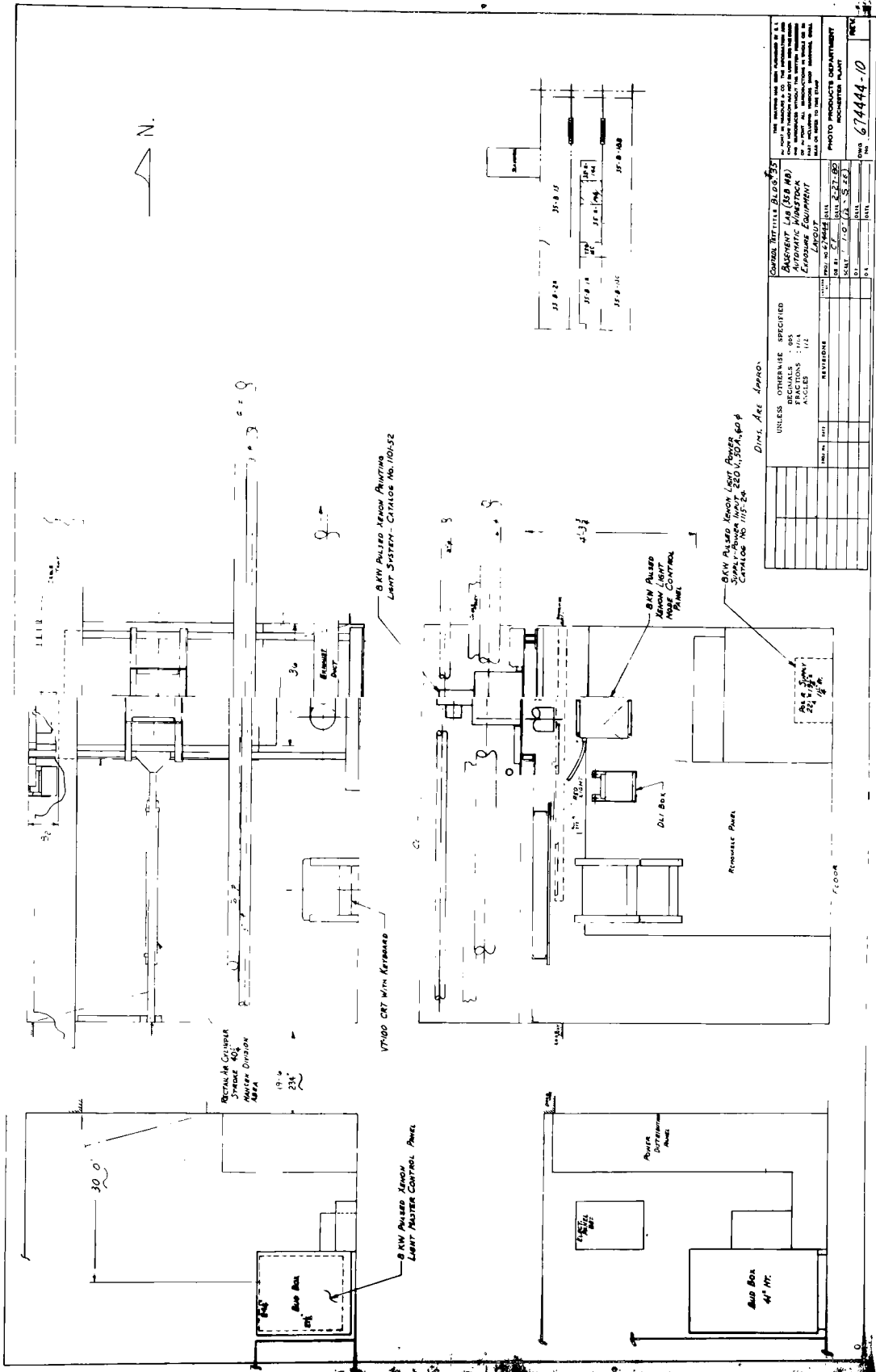
7 SEE NOTE 2
674444-7

5'-0" 5'-10" SWITCH BOX
DLI
REMOVABLE PANEL
- VT 100 KEYBOARD



PLAN VIEW

ELEV. VIEW
LOOKING WEST

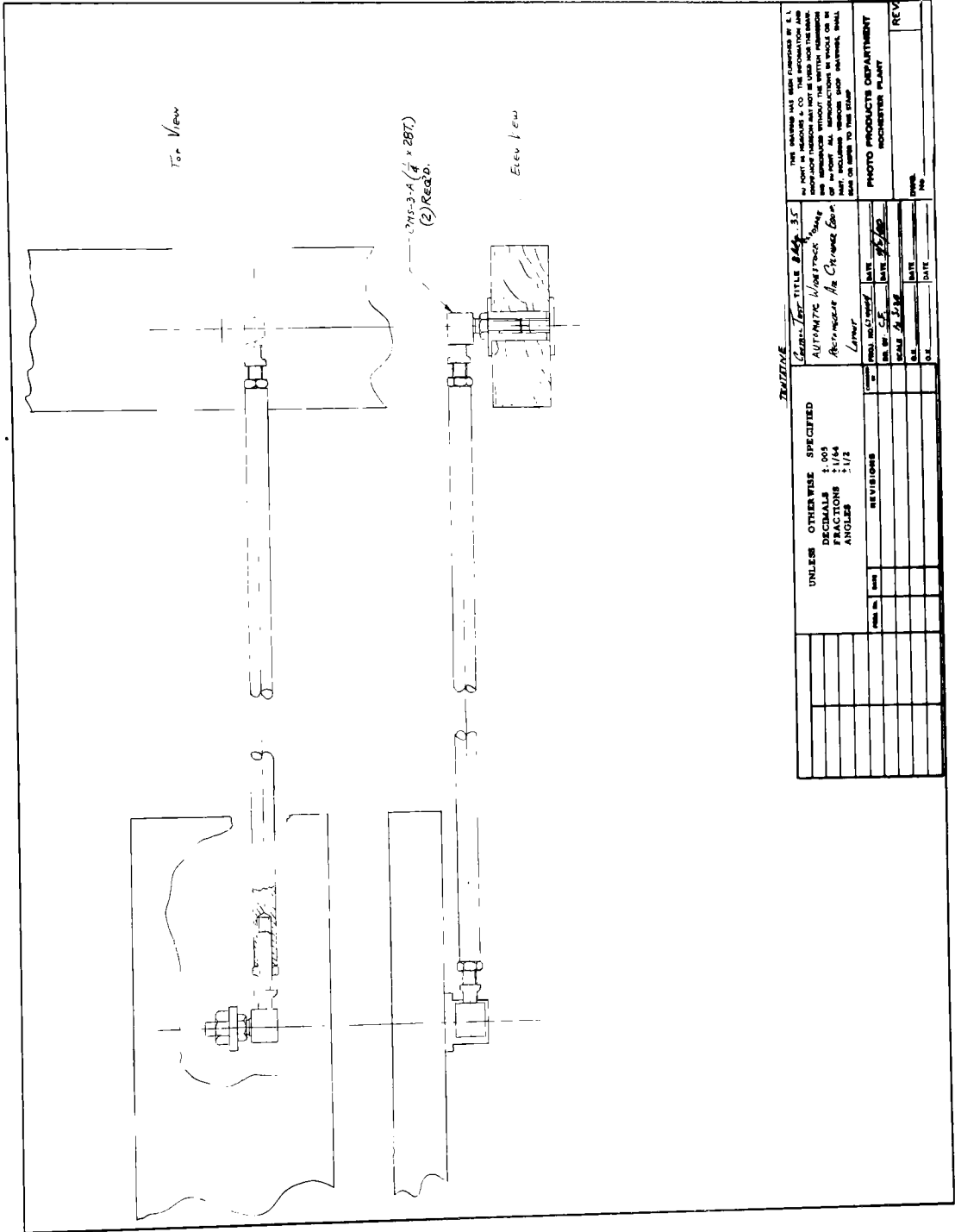


NO.	DATE	BY	CHKD	APP'D	SCALE	PROJECT	DESIGNER
67					1/8" = 1'-0"	LASER	L. J. S. S. S.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
FRACCTIONS 1/2
ANGLES 1/2
REVISED
DATE
BY
CHKD
APP'D

SCALE: 1/8" = 1'-0" DATE: 2-27-59
PROJECT: LASER
DESIGNER: L. J. S. S. S.

PHOTO PRODUCTS DEPARTMENT
ACCIDENTAL POINT
OVER: 67444-10
NO. 67



REVIZIONE

Gen. Title 2MS-3 35

AUTOMATIC WEAPON

Revised by Chemical Corp

Lerner

DATE	DATE	DATE	DATE
BY	BY	BY	BY
SCALE	SCALE	SCALE	SCALE
NO.	NO.	NO.	NO.

UNLESS OTHERWISE SPECIFIED

DECIMALS 1/100

FRACTIONS 1/64

ANGLES 1/16

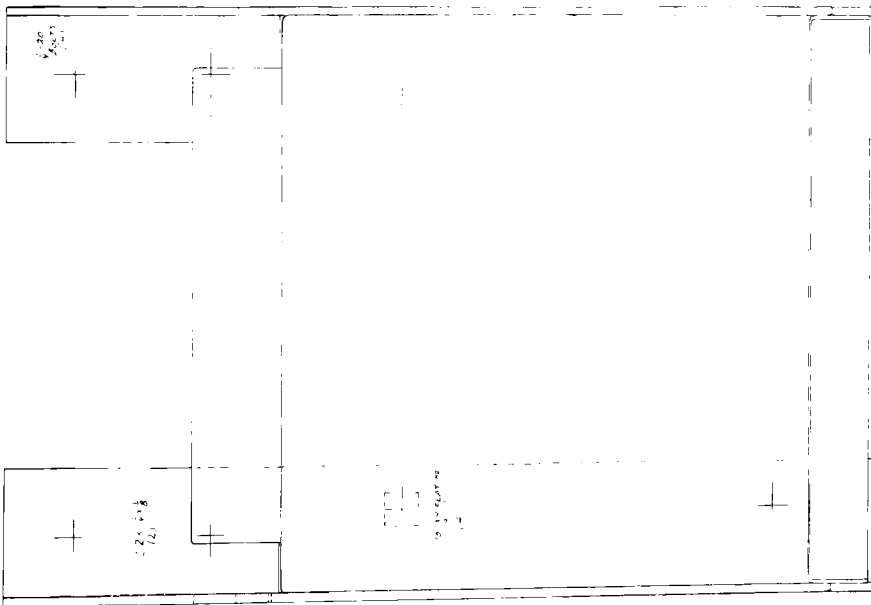
REVISIONS

NO.	DATE	DESCRIPTION

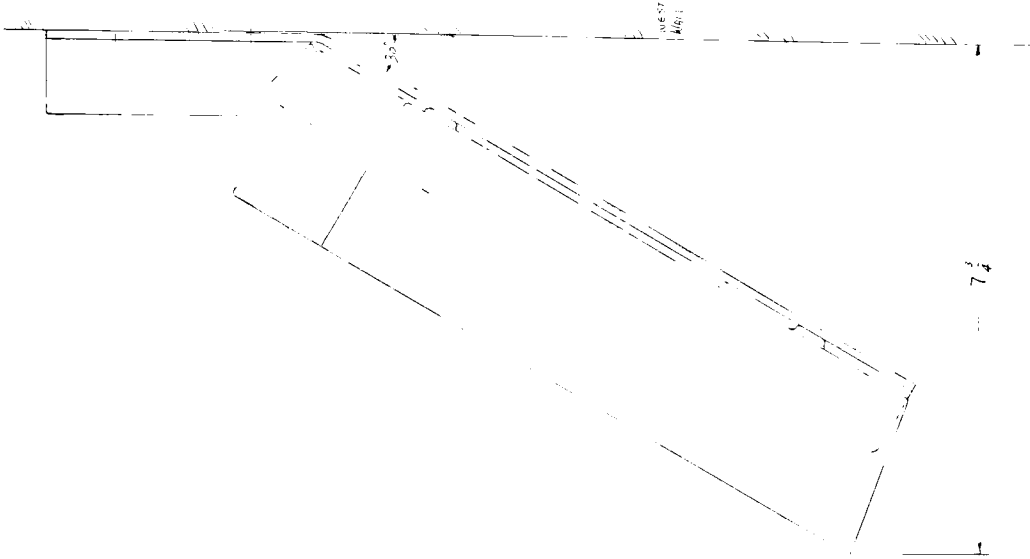
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PHOTO PRODUCTS DEPARTMENT
ROCKEFELLER PLANT

NO.	DATE	REV.



Looking West
(PLAN)

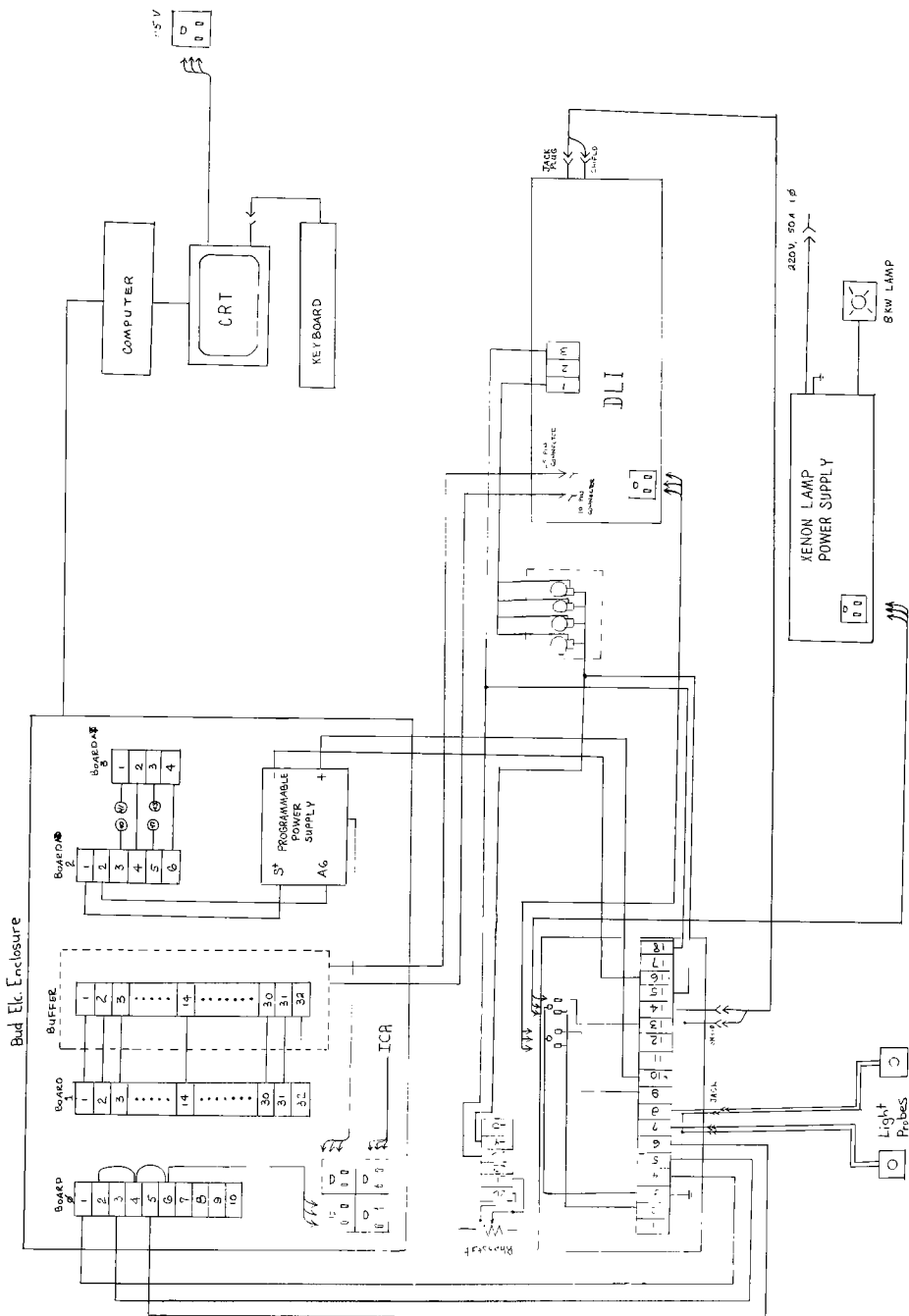


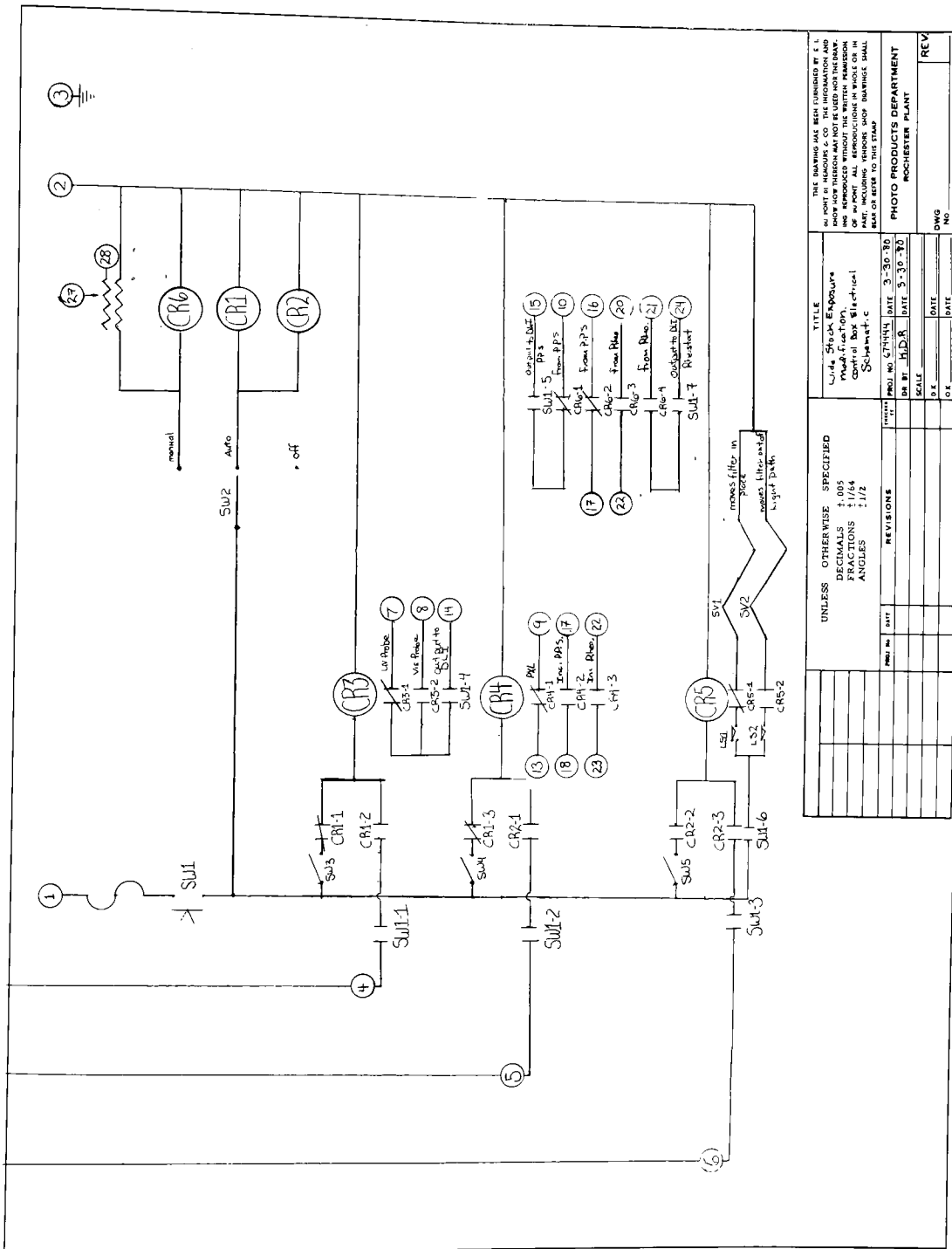
DLI BOX
Looking South
(ELEV)

4/6/68
Curtain Box
Rm. - 620044
Ammunition
Packing
BLW #35
Curtain Box
Main Table
Table
Said: 1/4
THIN/30

APPENDIX B

Electrical Schematics of System and Simulator





UNLESS OTHERWISE SPECIFIED	
DECIMALS	1/100
FRACTIONS	1/64
ANGLES	1/12

REV	DATE	BY	CHKD

NO.	REVISIONS	DATE

PROJ. NO.	DATE	BY	CHKD

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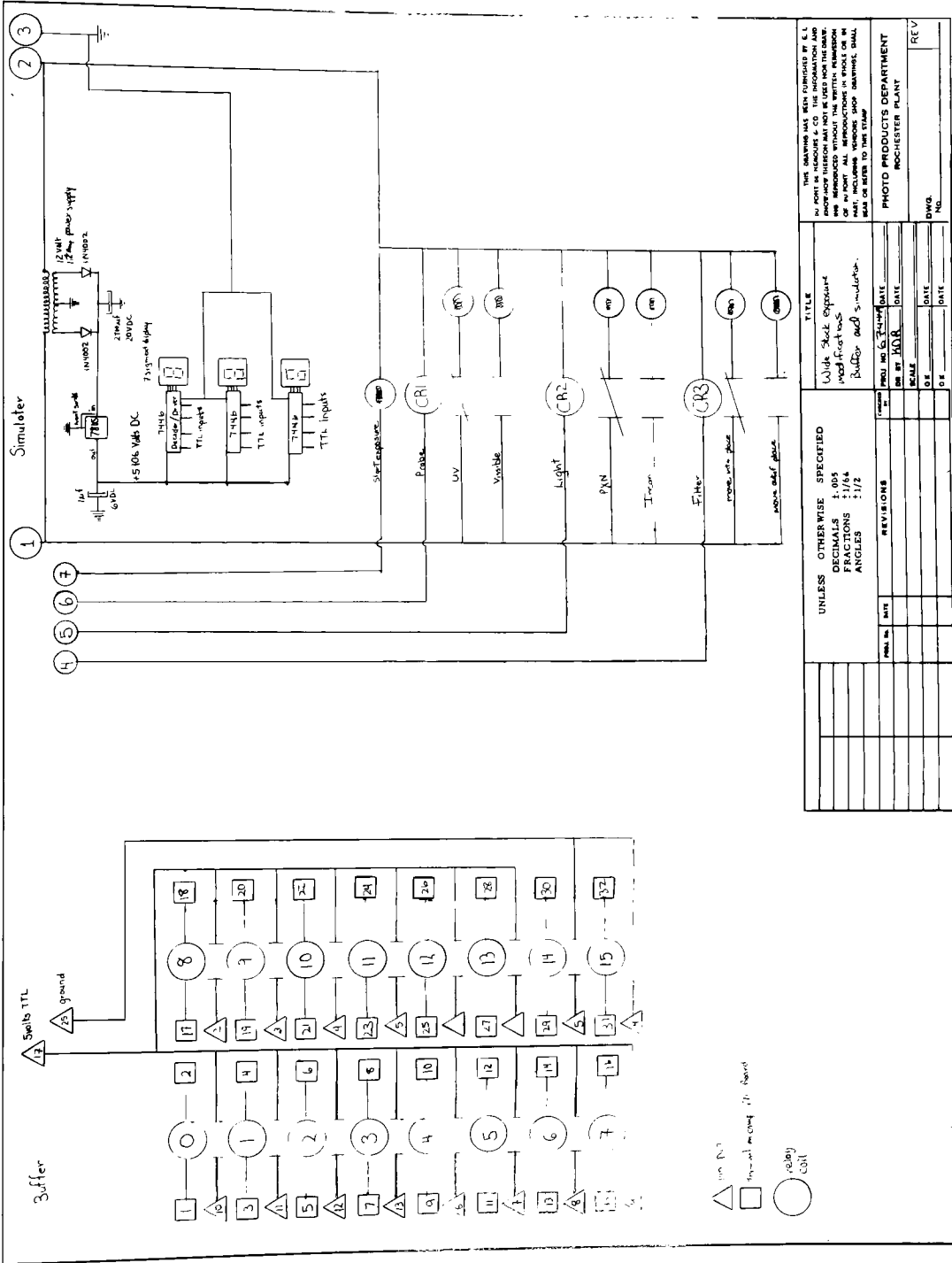
TITLE
 L.S.D. Shop Exposure
 modification
 Control Box Electrical
 Schematic

PROJ. NO. 3-30-30 DATE 3-30-30
 DRAWN BY H.D.R. DATE 3-30-30

SCALE
 OF

PHOTO PRODUCTS DEPARTMENT
 ROCHESTER PLANT

DWG. NO.
 REV



UNLESS OTHERWISE SPECIFIED		TITLE	
DECIMALS	1.005	Wide Area Support	
FRACTIONS	1/16	components	
ANGLES	1/2	Buffer and Simulator	
DATE		DATE	
SCALE		SCALE	
REVISIONS		DATE	
REV		DATE	
REV		DATE	
REV		DATE	

PHOTO PRODUCTS DEPARTMENT
ROCHESTER PLANT