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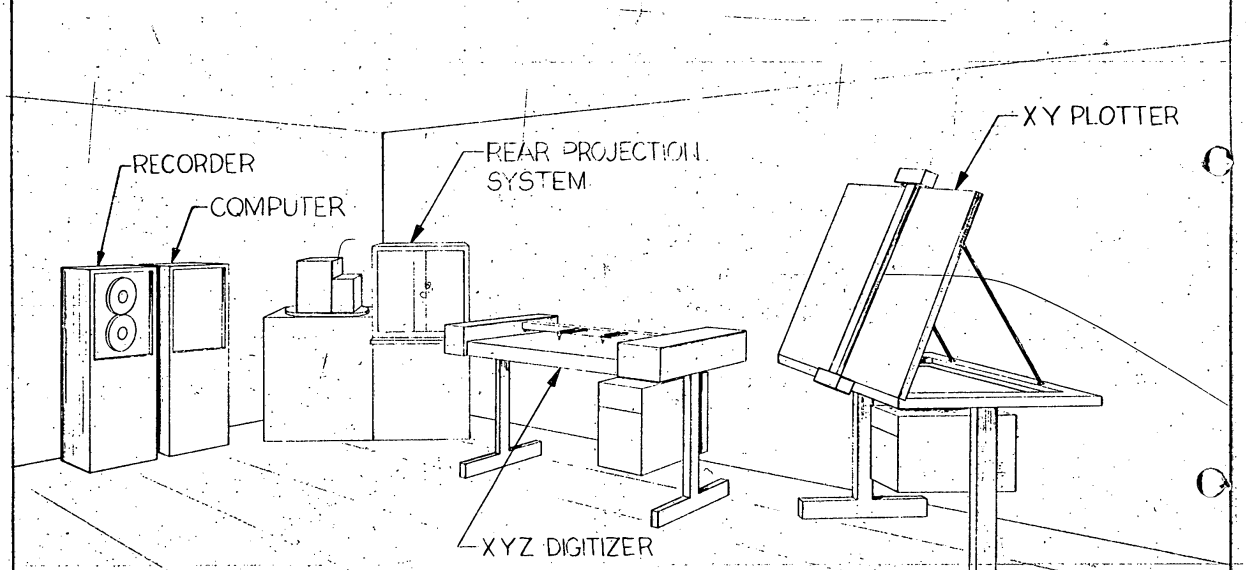

PERSPECTIVE INCORPORATED

PHOTOGRAPH CONVERSION SYSTEM 1160-C

DIGITAL COMPUTER, XY DIGITAL PLOTTER, XYZ DIGITIZER, ROLL FILM AND PROJECTION UNIT, DIGITAL RECORDER AND PLAYBACK.

INPUT: PHOTOGRAPHIC PRINTS OR NEGATIVES AND ROLL FILM.

FIG. 2
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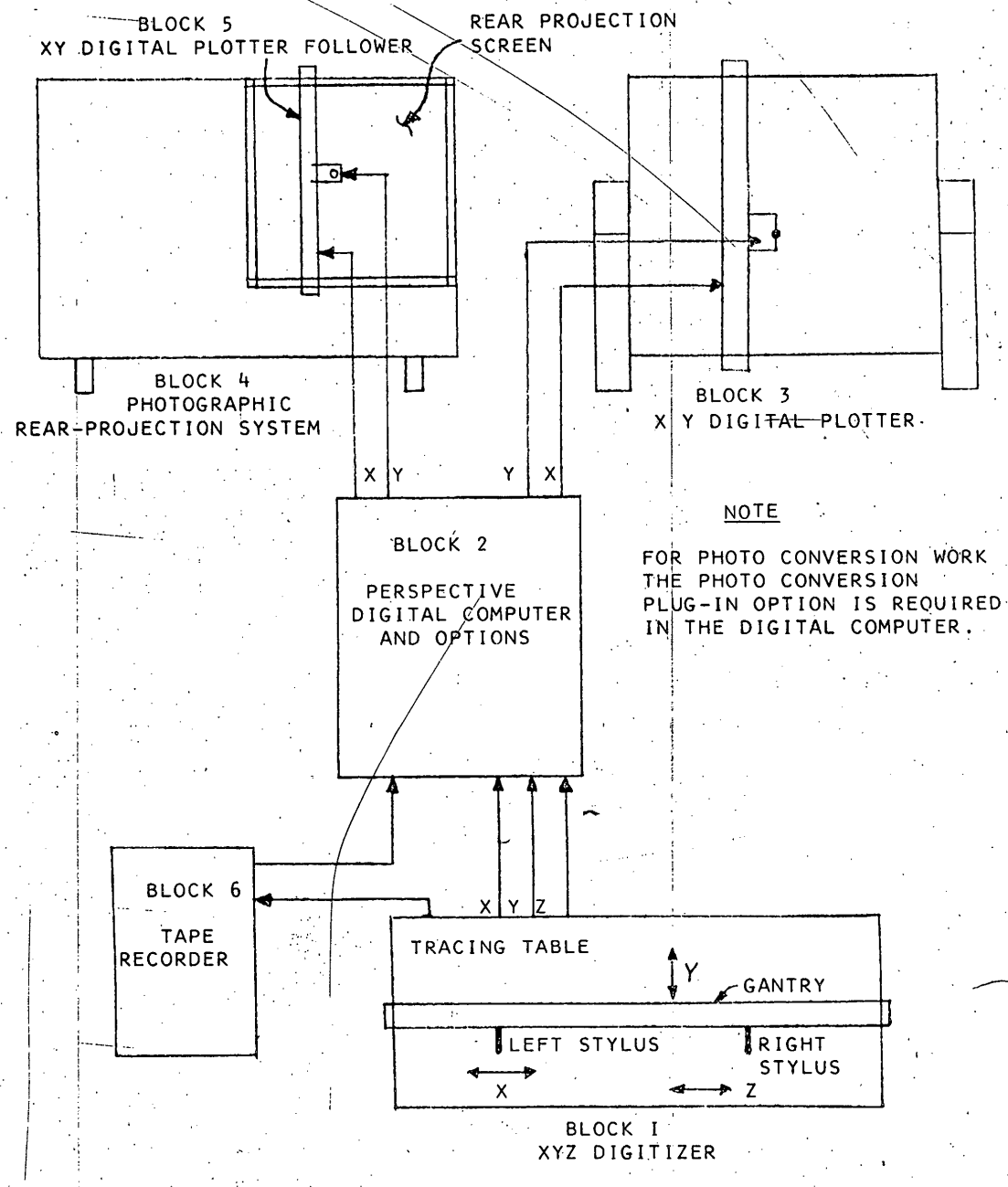

PHOTOGRAPH CONVERSION SYSTEM
I BLOCK DIAGRAM

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PHOTOGRAPH CONVERSION SYSTEM

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II. Detailed Description of Each Block

BLOCK I: X, YZ Digitizer.

The XYZ digitizer consists of a flat surface, called the tracing table, a GANTRY mounted over the tracing surface and moveable with respect to the surface providing "Y" digitized information; a LEFT STYLUS mounted on the GANTRY and movable at right angles with respect to the GANTRY movement, providing X digitized information; a RIGHT STYLUS also mounted on the GANTRY and movable at right angles with respect to the GANTRY movement, providing Z digitized information. Standard tracing surface size is 4 feet (in the Y direction) by 7 feet in the X and Z direction. Dimensions up to 12 feet (and possibly larger) is possible but with the probability of slightly reduced repeatibility and positional accuracy. Digitizing increments can be selected for .01, .005 or .001 inch depending upon users application. Other increments can be supplied as required.

BLOCK 2: Digital Computer.

The digital computer shown here is designed and programmed to process X, Y, Z information (input) and provide X, Y information (output). The output X, Y information, when plotted or displayed, represents a two-dimensional plot of the three-dimensional input information. Through additional manual programming, via switches, controls, etc., the output information may represent perspective coordinate information, axonometric coordinate information (which includes trimetric, dimetric, and isometric drawing forms). In addition, the manual programming capability includes:

1) Angle of Rotation 0-360^{o} in .001^{o} steps.
2) Angle of Tilt 0-360^{o} in .001^{o} steps.
3) Viewing Distance (Perspective Mode only) 1 to 100 inches or feet in .001 steps.
4) Perspective/Axonometric Control
5) X-axis input scale 0 to 9.999 in .001 steps
6) Y-axis input scale 0 to 9.999 in .001 steps
7) Z-axis input scale 0 to 9.999 in .001 steps
8) X-axis Mirror Image Control
9) Y-axis Mirror Image Control
10) Z-axis Mirror Image Control
11) Right-eye, Left-eye (3-D Stereo) Presentation control.

OPTIONAL PLUG-IN CAPABILITY

12) Roll, Pitch, Yaw (provide rotation about each of the three subject axes. Each axis having independent capability of 0 to 360^{o} in .001^{o} steps).

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13) Auxiliary X-axis Mirror Image;
Auxiliary Y-axis Mirror Image;
Auxiliary Z-axis Mirror Image;

14) Photo Interpretation Plug-In;

This unit, through operator procedure, will program the perspective computer with the proper angle of Rotation, Tilt and Viewing Distance (i.e., camera focal length), relative to a photograph from which orthographic information is desired. Details of the procedure involved will be covered in the overall system operation.

15) Continuous Line Interpolator.

This unit will cause the computer's output to represent continuous line information when only end points of that line are known.

Other features of Digital Computer include digital read-out of all pertinent data such as X, Y, Z input position information, X, Y plotter position information, etc.

BLOCK 3: X-Y Digital Plotter.

The function of this unit is to plot, upon command, the output of the Digital Computer. This unit will conform to those currently available.

BLOCK 4: Photo - Rear Projection System.

This unit includes the capability of projecting photographic negatives (70 mm to 9 x 9" in size) via a rear projection optical system. The photographic projection can be enlarged by 5x , 15x or 30x. Other enlargement factors and film sizes can be accommodated as required.

BLOCK 5: X-Y Plotter - Follower.

This unit differs from the plotter shown in Block 3 in that it is an integral part of the rear projection system. Its function, however, is the same as a standard digital X-Y plotter; namely, positioning in X and Y. The physical placement of this system can be in front of the rear projection screen or optical coupled to photograph itself. Both approaches have advantages. The use of this system will be explained in the Overall System Operations.

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BLOCK 6: Digital Tape Recorder System.

The tape recorder is used to record and store X-Y-Z information. Having recorded X Y Z data via the Tracing Table (BLOCK I) it can be "played back" to the computer to obtain a perspective, axonometric, etc., view of the subject. This enables one to draw many perspective views (for example) of a subject in as many orientations as desired. Any time a tape is played the entire capability of the Digital computer is at the operator's disposal.

III: Description of Overall System Operation.

For the purposes of this initial discussion, consider only blocks 1, 2 and 3. With these three blocks one has the basic capabilities currently found in the ILLUSTROMAT "1100", plus those capabilities mentioned as optional to BLOCK 2. For Photo-Interpretation work, BLOCKS 4 and 5 are required in addition 1, 2 and 3. For this type of work operation of the system is as follows:

1) The film negative is inserted into the rear projection system and the subject is appropriately displayed.

2) The operator, through horizontal and vertical position controls, locates 12 discretely chosen points on the subject with the X, Y plotter follows (Block 5).

3) Upon locating each point, the operator enters the X-Y information into the computer via a pushbutton switch.

NOTE: The information contained in the 12 points just located is sufficient to calculate the angle of rotation, the angle of tilt, the cameras (equivalent) focal length - which correpsonds to the computers Viewing Distance control - the optical center of the projected image, and the rotation of the image relative to the horizontal axis of the plotter-follower. All pertinent information such as Angle of Rotation, Angle of Tilt and Tilt and Focal Length will be digitally displayed and automatically programmed into the computer. The length of time for the entire computational and programming process will be virtually instantaneous (less than 500 nanoseconds).

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4) Upon completion of step 3), the operator is ready to begin construction of the orthographic views. The exact details of this operation will not be covered here but it is sufficient to say he must manipulate the three inputs on the tracing table and locate points and lines in the photograph. The process is basically straightforward and one can develop a significant amount of skill in a short period of time.

5) Having completed the orthographic views they may be quickly traced and recorded, utilizing the recorder system previously described. Once recorded, the orthographic information may be stored for future use or used immediately to draw many different perspective views of the subject in a matter of minutes.

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PHOTOGRAPH CONVERSION SYSTEM "1160-C"

A Physical configuration of the System showing:

1. XYZ Digitizer
2. Digital Computer
3. Digital Plotter
4. Rear Projection System
5. XY Digital Plotter follower

B Block Diagram - Showing electrical and electronic relationships between the five (5) modules

C Detailed description of each block

D Brochure describing ILLUSTROMAT "1100", the basic instrument from which the Photograph Conversion System was developed.

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