

PRECISION  
**CRT**  
DISPLAY

TYPE  
**30**



digital

CERN COMPUTER  
Ref. DIG (7-13 (30))  
copy No. 1

# CRT 30



The DEC Precision CRT Display Type 30 is a 16-inch random-position, point-plotting cathode ray tube which permits rapid conversion of digital computer data into graphic and tabular form. A self-contained unit with built in control and power supplies, the Type 30 requires only logic level inputs for operation and thus may be easily connected to any digital system.

Location of any desired point may be specified by any of the 1,024 X and 1,024 Y coordinate addresses contained in a 9½ inch square on the tube face. X and Y coordinate information in two ten-bit words is received from the computer and, on command, displayed as a spot of light on the tube face. Discrete points may be plotted in any sequence at a 20 kilocycle rate (one point every 50 microseconds). Magnetic deflection and focusing techniques result in uniform resolution over the entire usable area of the tube face and maximum spot size of approximately .015 inches when measured by shrinking raster techniques. Construction is solid state throughout with excellent stability.

The Light Pen Type 370 is an optional input device which, when used in conjunction with the Precision Display Type 30, can greatly extend its usefulness. It is a photosensitive device with which the operator can cause the computer to change or modify the display on the cathode ray tube. As the pertinent display information is selected by the operator, the pen signals the computer by generating a pulse. Acting upon this signal, the computer can then instruct other points to be plotted across the tube face in accordance with the pen movements or exercise specific options previously programmed without the need for separate input devices. The Type 370 combines a fiber optic light pipe and photomultiplier system for increased sensitivity and high reliability. For further information see Bulletin F-03 (370).





# APPLICATIONS

## DATA ANALYSIS AND EVALUATION

The Precision CRT Display Type 30 can significantly aid in the analysis and evaluation of stored, digital data. In the many cases where a visual presentation is useful but where hard copy output is neither needed nor desired, the Type 30 offers a rapid presentation of reference data to the user either in text, graphical or tabular form without the normal processing delays associated with mechanical print-out devices.

The display is particularly useful when observing data variations over a period of time. By providing dynamic, on-line observation of data, interpretation of a series of print-outs is eliminated and data evaluation simplified. An example is the evaluation of average response

computations on input data composed of a repetitive signal component in the presence of random noise, such as is encountered in electrophysiological studies. The input data is sampled at various times and the results recorded in the computer memory. Successive samples are averaged with the data already stored, and the averages are displayed on the scope face. As the number of samples increases, the ratio of the signal to the random noise is greatly increased. The operator observes the signal on the Type 30 Display as it emerges. This is illustrated by the two photos which show the average response after the computation of one average (Fig. 1) and after 772 averages (Fig. 2).

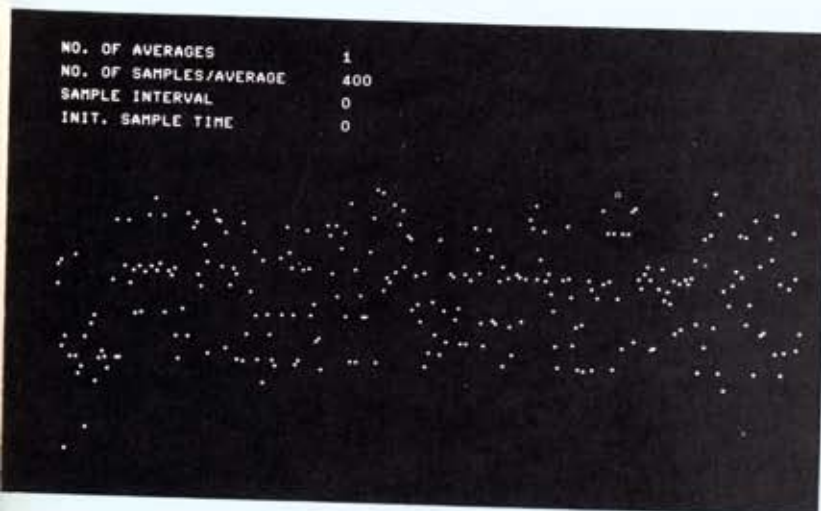


Figure 1

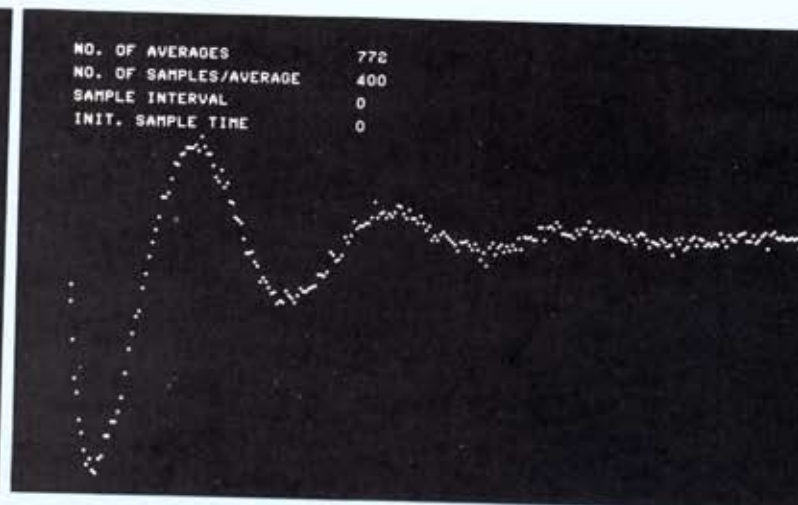


Figure 2

## DATA SELECTION AND MODIFICATION

By using the Light Pen Type 370 in conjunction with the Type 30, data of interest which is stored in the computer memory may be easily selected and modified. Pointing the light pen at a selected displayed point

causes the pen to signal the computer. The computer program may then operate on the data selected in a manner previously determined or under the immediate control of the user via switch inputs on the console.

## DATA CONVERSION

The Type 30 provides a fast, direct method of converting line drawings, photographs and other written data into digital information when used with a photo multiplier system. (See Fig. 3). In such a system, the Type 30 is used as a programmed spot scanning source of light in combination with a lens system to focus the

raster being scanned on the film being read. The photo multiplier gathers the light passing through the film and signals the computer whenever light is sensed. In this manner a digital record of the photograph being scanned is accumulated in the computer memory.

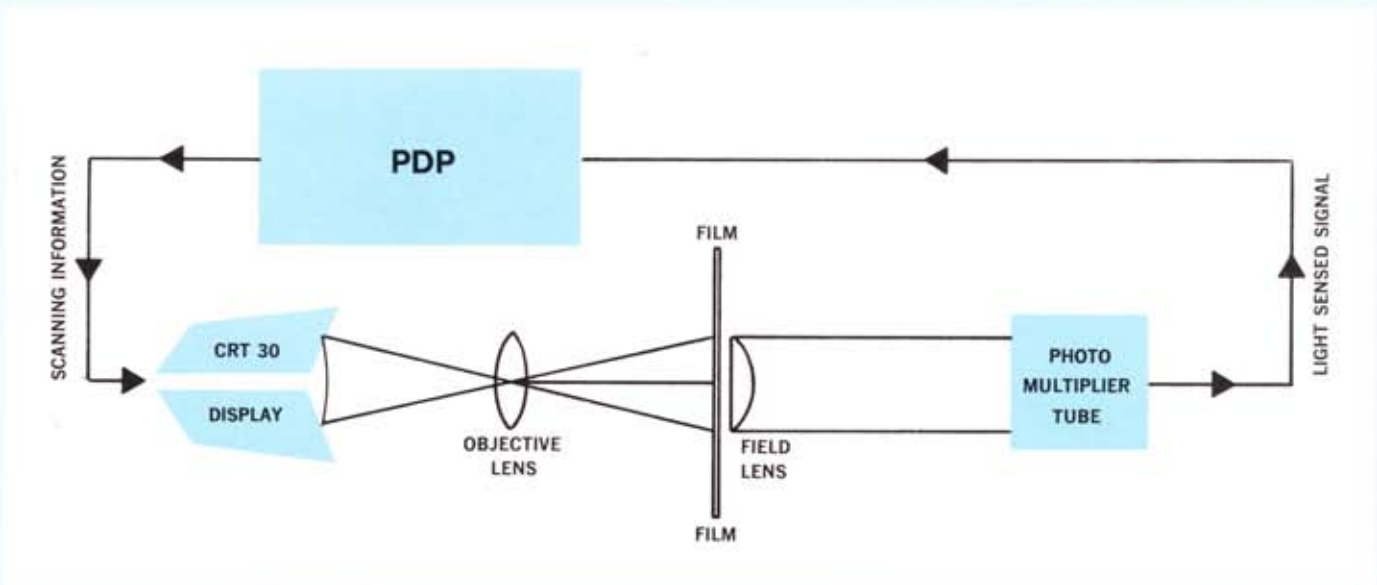


Figure 3  
Typical Data Conversion Photo Multiplier System

Programming of the scan is a very powerful feature that allows the film to act as a truly random access storage. In many cases, very generalized scanning techniques, such as line following can be employed to eliminate the need for scanning the entire frame.

In its simplest form, a system of this sort merely detects the presence or absence of light so it is best suited for reading in graphical or tabular data. More complex systems have been constructed however, that permit gray scale information to be detected with accuracies of four to six bits. Figure 4 illustrates re-display of an A-scope radar presentation which has been read into PDP-1 from a 16mm film using such a system.

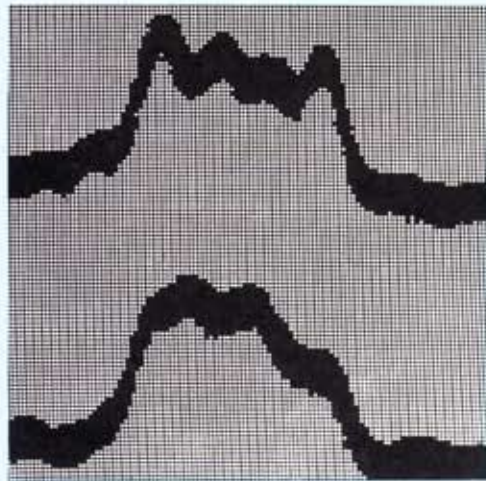
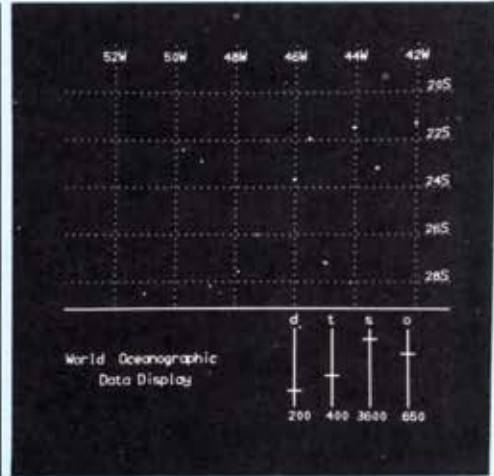
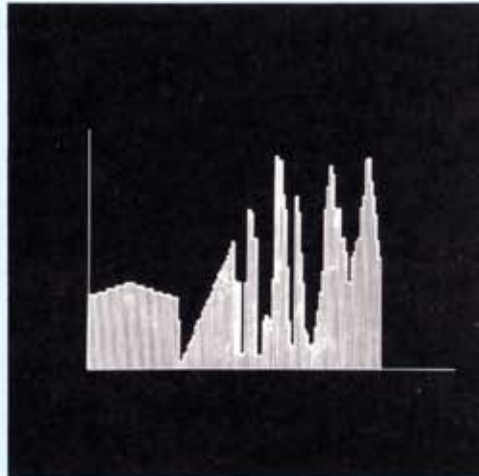


Figure 4

OTHER EXAMPLES OF CRT DISPLAYS





## PHYSICAL SPECIFICATIONS

<b>DIMENSIONS:</b>	50 inches wide, 34 inches deep, 24 inch table height, 49 inches overall height.	<b>CLEARANCE:</b>	Access room for maintenance requires 3 feet in the rear and 2 feet above.
<b>COLOR:</b>	Blue and Gray Tweed.	<b>DISPLAY TUBE:</b>	The CRT housing can be tilted approximately 5° forward, 20° backward, and 60° sideways. Full 360° rotation is possible by removing stop bolts. A 1/8 inch thick sheet of form-fitted plexiglas protects the face of the CRT.
<b>WEIGHT:</b>	360 pounds.	<b>CONTROLS:</b>	The only operating control is a Light Pen Gain control located under the right front corner of the CRT housing.
<b>MOUNTING:</b>	All circuits and power supplies are mounted on or under a table. The table legs have adjustable feet for leveling, and normally support 75-100 pounds each.		

## OPERATING SPECIFICATIONS

<b>INPUT POWER:</b>	115 ± 10 volts, 60 cycles, single phase at 7 amps.	<b>STABILITY:</b>	±0.05 inch in 8 hours at constant temperature (±3°F.).
<b>AMBIENT TEMPERATURE:</b>	50°F(10°C) to 110°F(43°C).	<b>REPEATABILITY:</b>	± 0.05 inch regardless of the location of the preceding point.
<b>CATHODE RAY TUBE:</b>	16ADP7A., radius of curvature: 40 inches.	<b>TIMING SEQUENCE:</b>	2.5 microseconds for address transfer, 35 microseconds for deflection setup, and 10 microseconds for spot intensification.
<b>RASTER SIZE:</b>	9 3/8 inches by 9 3/8 inches, containing 1024 points by 1024 points.	<b>INTENSIFICATION:</b>	Normally preset. Circuits exist to allow the intensity to be controlled by the computer.
<b>PINCUSHION DISTORTION:</b>	Less than 3/32 inch per side when viewed from a point on the CRT axis 2 feet from the surface.	<b>INDICATORS:</b>	Current state of the coordinate address is shown on two rows of ten lights. A row of four lights indicates the status of the Light Pen and Intensification circuits. A single light indicates the existence of a Need-A-Completion command.
<b>DEFLECTION:</b>	Magnetic.		
<b>FOCUS:</b>	Magnetic.		
<b>SPOT SIZE:</b>	Approximately 0.030 inch, 0.015 inch at the half-power points.		
<b>ADDRESSING SCHEME:</b>	1's complement, with + 0 = -0 at the center of the screen for each axis. May be adjusted for 2's complement.		

## INTERFACE CONNECTIONS

<b>INPUTS:</b>	10 levels for each axis which must be present for at least 2.5 microseconds before a display pulse is supplied. A pulse must be supplied for each point to be displayed to clear the display buffer, followed at least 2.5 microseconds later by another pulse to load the buffer with the 20 information bits. Both pulses must have an amplitude of -2.5 to -3 volts, a rise time of less than		0.2 microseconds, and a duration of at least 0.4 microseconds but less than 1 microsecond.
		<b>OUTPUTS:</b>	45 microseconds after the load buffer pulse is given, a completion pulse will be emitted. This pulse is a 3 volt negative, 0.4 microsecond pulse. X, Y, and Z outputs are provided to drive a monitoring oscilloscope.

## OPTIONS

**THE DIGITAL SYMBOL GENERATOR TYPE 33.** Addition of a symbol generator to the Type 30 Display greatly increases its capabilities and capacity for character and symbol generation. The Type 33 plots symbols on a 35 dot matrix (5 dots wide and 7 dots high) in one of four sizes. A total of 220 characters (based upon an average character of 16 points) may be displayed flicker-free. Rate of plotting is increased approximately ten times. For additional information see Bulletin F-13 (33B).

**CAMERA MOUNT TYPE 372.** Permits a camera to be directly mounted on the Type 30 Display. Recommended for use with the Fairchild/Dumont Type 450A Camera, it facilitates the repetitive photographic recording of displayed points. For further information see Bulletin F-03 (372).

**REMOTE DISPLAY TYPE 343.** Slave unit containing only the analog portion of the Type 30 Display. Turn on may be accomplished independently or by master display control.

## OTHER DISPLAYS



Precision Incremental CRT Display Type 340

**THE PRECISION INCREMENTAL CRT DISPLAY TYPE 340** has been designed to provide a wide degree of versatility, accuracy, and speed. It has a total of six modes available for a variety of applications and a fast incremental plotting rate of  $1\frac{1}{2}$  microseconds per point. Discrete points may be plotted in any sequence at a rate of 35 microseconds per point. The Type 340 permits simplified programming by means of a single information channel which allows sequential storage of both control and data information in core memory. Requires only one computer instruction for block transfer. Contains 1,024X and 1,024Y coordinate addresses in a  $9\frac{3}{8}$  inch square on the tube face. For further details see Bulletin F-13 (340).

**THE ULTRA PRECISION CRT DISPLAY TYPE 31** meets the particular needs of those requiring a high degree of resolution. It is a highly stable, precision device with built-in deflection and focus correction containing a 5-inch cathode ray tube. The Type 31 is particularly suited for photographic recording of digital output data and may be used in combination with a photomultiplier as a precision programmed spot scanner for the input of photographic data to digital computers. For further information see Bulletin F-13 (31A).