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PDP-X Technical Memorandum # 15

Title: Incremental Plotter Control

Author(s): Henry Burkhardt

Index Keys: IO
Peripherals
Plotter

Distribution
Keys: A, B, C

Obsolete: None

Revision: None

Date: July 31, 1967

0. Overall Description

The Incremental Plotter Control is used to drive one of four models of California Computer Products Digital Incremental Recorders. Characteristics of the four recorders are:

CCP Model	Step Size (inches)	Speed (Steps/Minute)	Paper Widths (inches)
563	0.01 or 0.005	12,000	31
565	0.01 or 0.005	18,000	12

1. General Specifications

1.5 General Performance

The principles of operation are the same for each of the four models of Digital Incremental Recorders. Bidirectional rotary step motors are employed for both the X and Y axes. Recording is produced by movement of a pen relative to the surface of the graph paper, with each IOW causing an incremental step. X-axis deflection is produced by motion of the drum; Y-axis deflection by motion of the pen carriage. The pen may be raised or lowered from the surface of the paper.

Each incremental step can be in any one of eight directions through appropriate combinations of X and Y-axes motion. All recording (discrete points, continuous curves or symbols) is accomplished by the incremental stepping action of the paper drum and pen carriage.

3. Programming

The incremental plotter is controlled by setting or changing bits in its status register by the use of IOC or IOX instructions respectively. Data bytes are then sent to the recorder by IOW commands or by means of the multiplexor channel. When data is received by the plotter control, REQ is cleared and BUSY is set (see 3.6). When the appropriate motion has been made, BUSY is cleared and REQ is set.

3.1 Instructions

The plotter control will respond to all IO instructions issued by the central processor when the DA (Device Address) field contains the address of the plotter. The instructions IOC, IOX may be used to alter the contents of the Status Register. The instructions IOS, IOT may be used to sense the contents of the Status Register. The IOW instructions may be used to transmit data to the plotter or the plotter may be used in a multiplexor-channel mode. The IOR instruction will read a zero data byte.

3.2 Maintenance Instructions

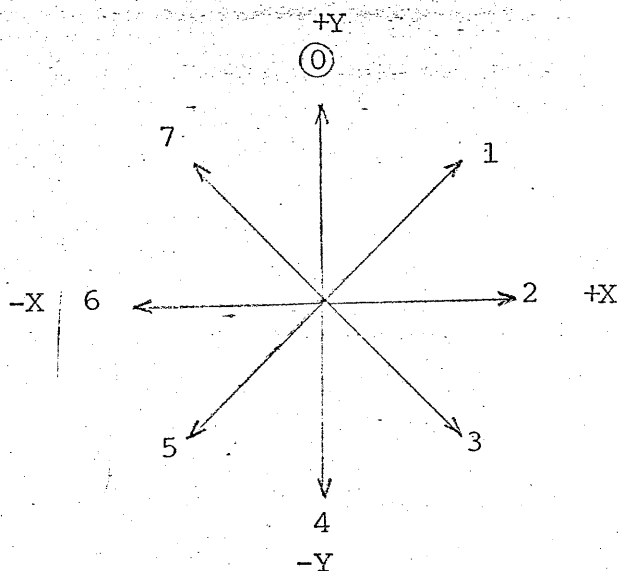
There are no special maintenance instructions.

3.3 Data Formats

The right four bits of the data byte are used to select the desired function. The left four bits of the data byte are ignored.

There are eight possible step motions. In addition, the pen may be raised or lowered:

3.3



The data values 0-7 are used to select one of these eight motions where:

+X	represents drum down
-X	represents drum up
+Y	represents pen left
-Y	represents pen right

Data values 10_8 - 17_8 are decoded to mean:

10_8	raise the pen from the paper
11_8	lower the pen
12_8 - 17_8	do nothing.

For each data word, BUSY is set and REQ is cleared. When the plotter has performed the requested motion, BUSY is cleared and REQ is set.

3.5 Operator Controls

Front panel controls permit single-step or continuous-step manual operation of the drum and carriage and manual control of the pen solenoid.

3.6 Status Register

The Status Register appears as:

1	REQ	BUSY	LOW	ENABLE
11	12	13	14	15

All bits have the standard meaning.

3.7 Programming Examples

The incremental plotter is programmed as any standard output device (i.e., paper tape punch). Special sub-routines are used to draw straight lines, continuous curves and symbols. The reader is referred to the SCOOP Manual, published by California Computer Products.