The Institute for Interconnecting and Packaging Electronic Circuits

IPC-NC-349

Computer Numerical Control Formatting for Drillers and Routers

IPC-NC-349

Original Publication
August 1985

A standard developed by the Institute for Interconnecting and Packaging Electronic Circuits

2215 Sanders Road
Northbrook, Illinois
60062-6135

Tel 847 509.9700
Fax 847 509.9798
URL: http://www.ipc.org

Computer Numerical Control Formatting for Drillers and Routers

1.0 SCOPE

This standard defines a machine readable input format for Computer Numerical Control (CNC) drilling and routing machine tools related to the printed wiring board industry.

The format may be used directly to transfer drilling and routing information between printed board designers, manufacturers and users or as the output CNC standard from converters that expand higher level design input such as IPC-D-350 data.

This standard is intended to provide a common command structure that can assist in the board manufacturing process and is not intended to provide for every possible software enhancement.

2.0 Applicable Documents

2.1 IPC

IPC-T-50 Terms and Definitions

IPC-D-350 Printed Board Description in Digital Form

2.2 American National Standards Institute

ANSI x 3.2 Recorded Magnetic Tape for Information Exchange

2.3 Electronic Industries Association

EIA-RS-227 One-inch Perforated Tape

EIA-RS-244 Character Code for Numeric Control by Perforated Tape

2.4 Others

IBM 3740 Singe Density Floppy Disk

3.0 TERMS AND DEFINITIONS

3.1 NC Numeric control is the automatic control of electromechanical devices by means of a digital input to an electronic controller.

3.2 CNC Computer numerical control defines a system utilizing a computer and software as the primary controlling technique.

3.3 Coordinates Coordinates are X, Y and Z control characters. X and Y are used primarily as table positioning commands; Z is used for tool positioning.

3.4 Miscellaneous Commands Control characters other than X, Y and Z are called miscellaneous commands. These commands control machine and data manipulation functions.

3.5 Modal The technique where a data description or other pertinent command is given only once at the beginning of a related set of data.

4.0 GENERAL REQUIREMENTS

4.1 Coordinate Format Coordinate systems are inch or metric, absolute or incremental, and are fixed length or have leading/trailing zeros omitted (EIA only).

Inch coordinates have 0.0001-in. resolution (00.0000). Metric commands five digit 10-micron resolution (000.00), six digit 10-micron resolution (0000.00) or *six digit 1-micron resolution (000.000).*

Absolute mode references all coordinates to a zero position. Incremental mode references each coordinate to the previous coordinate (or machine position).

Plus signs may be omitted from coordinates. Minus signs must be used for negative values.

4.2 Transfer Media Communication interfaces shall be mutually agreed to between user and receiver. The data shall be restricted to the printable ASCII character set. Data transfer media may be one of the following.

4.2.1 Punched Paper Tape Punched paper tape shall conform to EIA-RS-227 and be one inch perforated. The character code shall be per EIA-RS-244.

4.2.2 Floppy Disk Same as 4.5.3 of I PC-D-352.

4.2.3 Magnetic Tape

4.2.3.1 Unrecorded tape shall conform to W-T-0051.

4.2.3.2 Nine-track recording shall conform to ANSI X3.22.

4.2.3.3 Seven-track recording shall be NRZI compatible, 800 BPI and odd parity. The ASCII characters shall be recorded as shown below.

4.2.3.4 Magnetic tape recording format shall be 80-column card-image records, packed 20 records (1600 bytes) to the block. No magnetic labels shall be written on the tape.