



*The Institute for
Interconnecting
and Packaging
Electronic Circuits*

IPC-NC-349

Computer Numerical Control Formatting for Drillers and Routers

IPC-NC-349

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

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Standards Should:

- Show relationship to DFM & DFE
- Minimize time to market
- Contain simple (simplified) language
- Just include spec information
- Focus on end product performance
- Include a feed back system on use and problems for future improvement

Standards Should Not:

- Inhibit innovation
- Increase time-to-market
- Keep people out
- Increase cycle time
- Tell you how to make something
- Contain anything that cannot be defended with data

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The material in this standard was developed by the CNC Machine Standards Subcommittee of the Computer-Aided Technology Committee of the Institute for Interconnecting and Packaging Electronic Circuits.





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Users of this standard are encouraged to participate in the development of future revisions.

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Acknowledgment

Any standard involving a complex technology draws materials from a vast number of sources. While the principle members of the

IPC Computer Aided Technology Committee are shown below, it is not possible to include all of those who

helped develop this Standard. To each of them, the members of the IPC extend their gratitude.

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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 Single 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 IPC-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.



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