NX-SCI™

User's Manual

Preliminary
April 1985

p·cad™

PERSONAL CAD SYSTEMS INC.

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NX-SCI USER'S MANUAL

PRELIMINARY

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INTRODUCTION

NX-SCI is a program that interfaces P-CAD's
schematic system with the SCICARDS printed
circuit board layout system. NX-SCI takes a
netlist extracted from a P-CAD schematic and
converts it into SCICARDS input files.

This manual provides an overview of NX-SCI
input, output, and operations. Also included
are appendices describing error messages, an
example circuit, and an example output file.

OVERVIEW

Using the P-CAD system in conjunction with
SCICARDS provides an excellent mix of tools
for designing various types of boards found
in a typical production environment. All
schematic capture can be done on inexpensive
IBM Personal Computers.

PC-CARDS, P-CAD's own printed circuit board
layout system, can generate the artwork for
small and medium size boards. Using PC-CARDS
to lay out these smaller boards increases
layout department capacity without adding
additional SCICARDS workstations. Large
boards can then be sent to SCICARDS for
placement and routing.

Note that there are differences in
terminology between P-CAD and SCICARDS.
To use the two systems, the user should
understand the correspondence between the
following terms:

P-CAD   SCICARDS

Schematic Symbol   Function
Section   Slot

SCICARDS also distinguishes between two
classes of components, both of which are
input to NX-SCI:

   o   Functionally encoded devices; these may
       have many devices per physical package
       and allow pin swapping (e.g., 74LS00).

   o   Signally encoded components; these have
       one device per package and do not allow
       pin swapping (e.g., 74LS192).

INPUT

To create an input file to SCICARDS, NX-SCI
reads schematic components, net assignments,
packing information, and certain reserved
attributes from a P-CAD schematic netlist.
This netlist has been generated by the PC-
NODES and PC-LINK Utility Programs and
contains information extracted from the P-CAD
schematic database.

To create this database, you enter two kinds
of information using PC-CAPS.

1. Information that distinguishes different
   types of components.

2. Information interpreted by the interface
   program.

The following sections describe the elements
entered in PC-CAPS that allow SCICARDS to
interpret components and to use PC-CAPS
information.

Functionally Encoded Devices

Unless certain reserved attributes are
entered, components are assumed to be
functionally encoded, and no special handling
is required.

  Enter preassigned packaging information through
  the PC-CAPS SCMD/PNUM command.

  Enter gate count and gate per package
  information through the PC-CAPS SCMD/PNLC
  command.

NX-SCI creates a PARTS subfile and assigns
the packaging information to the FUNCTIONS
subfile.

Signally Encoded Devices

For a component to be interpreted as signally
encoded, a reserved attribute 'PRTPIN=n' is
required, where n is the number of pins on
the part. NX-SCI uses the pin count
to assign nets to pins in the COMPONENTS
subfile.

  To define the number of pins for the
  component symbol use the PC-CAPS ATTR/ACOM
  command in the symbol mode.

All signally encoded devices must have fully
preassigned packaging information, including
reference designator and section 'A'. With
this information, the interface makes the
required symbol pin-to-part pin mapping.

  Enter packing information on the schematic
  with the PC-CAPS SCMD/PNUM command.

Supply pins are not assigned to nets since
this information is not available on the
schematic. These pins are assigned to net
zero. To properly assign the pins, use the
SCICARDS CHANGE NODE ALL command.

Signally encoded devices may be defined by
component type rather than by name. To do
this, an attribute of 'CTYPE=' is defined for
a component.

To define the "CTYPE=' attribute for either
the component symbol or the component
invocation, use the PC-CAPS ATTR/ACOM
command.

The ATTR/ACOM command is also used for the
'SHAPE='z attribute. If this attribute is
present, the appropriate entry is made in the
COMPONENTS subfile.

Connectors

For a component to be interpreted as a
connector, a reserved attribute 'CONN=' is
required. The value of the 'CONN' attribute
is assigned to the CONNECTORS subfile.
Connectors must be defined as components with
a single gate and many pins per gate.

To define the "CONN=" attribute, use the
the PC-CAPS ATTR/ACOM command.

Pin numbers are assumed to be in the order in
which pins were entered in the symbol.

Because the name of the component on the
schematic is read as the designator, these
components need not be preassigned.
Node assignments are made using the SCICARDS
NODES command.

Net Names

Net-number-to-name mapping is assigned
to the NAMED NODES subfile.

Symbol Library Requirements

Certain demands are made on symbol libraries
used in the P-CAD system. The order in which
pins are defined for functional symbols must
be the same for the P-CAD library and the
SCICARDS library. Certain reserved
attributes, as described in the preceding
sections, are also necessary. Because of
these requirements, SCICARDS users will have
to modify the standard P-CAD libraries or
build their own libraries.

OUTPUT

Running NX-SCI produces a file composed
of a header and several SCICARDS subfiles
such as the subfiles described in previous
sections. For example, functionally encoded
devices are read to create the FUNCTIONS
subfile, and are also interpreted to create
the PARTS subfile. Signally encoded devices
are read to create a COMPONENTS subfile.
Connector components are read to create the
CONNECTORS subfile.

Non fatal errors are reported in the NX-SCI
output file. Refer to APPENDIX B: ERROR
MESSAGES.

OPERATION

This section describes the operation of NX-SCI.

Assumptions:

Correct system configuration is established and NX-SCI program files are on your disc and input file. The following are also required:

o   An IBM PC, XT, AT or equivalent.

o   640K of RAM

o   Color monitor for PC-CAPS, PC-CARDS

o   Color or monochrome monitor for other P-CAD programs

o   DOS 2.0 or higher operating system

o   CONFIG.SYS file in the root directory containing the following text:

> BUFFERS=12
> FILES=15

To run NX-SCI:

1. Type NXSCI at the DOS prompt.

    The program responds with an opening
    menu. Press any key to continue.

       NX-SCI then prompts for the name of a
       binary netlist.

2. Enter name of binary netlist.

    This file is the the output of the PC-
    NODES or PC-LINK utility programs. If
    the file has the default extension .NLT
    (generated by PC-NODES), type only the
    filename preceding the period. NX-SCI
    then generates a recommended output file
    name.

3. Type [RETURN] to use the recommended file
    name or enter the desired output file
    name.

APPENDIX A: ERROR MESSAGES

NX-SCI error messages are of three types:

o   Immediately fatal errors

o   Errors that require new input

o   Errors reported in the output file

IMMEDIATELY FATAL ERRORS

Message: "Can't load net list file."
            "Corrupt net list at ..."

Action: Check net list file, regenerate
            using PC-NODES or PC-LINK.

Message: "Can't init net list cache."

Cause: May not be enough room on disk
            for .WKF workfiles.

Message: "Bad command."
            "Corrupt configuration."
            "Configuration syntax"
            "Configuration attribute"

Action: Delete the reserved file OF.CFG

Message: "Not enough memory"

Cause: Not enough RAM to hold data.

Message: "Bad PNLC attribute for component ..."

Action: Check and/or redo SCMD/PNLC command.

Message: "Internal at ..."

Cause: Program bug.

Action: Save all files and report the
            problem to P-CAD customer support.
            (408) 354-7193.

ERRORS THAT REQUIRE NEW INPUT

Message: "Can't open output file."
            "Input and output name must be different.
            "... format is not compatible. "
            "... not found."

Action: Re-enter the file name.

ERRORS REPORTED IN THE OUTPUT FILE

Message: "Bad part pin number"

Cause: A pin number is not in the range
          of the PRTPIN count.

Message: "PRTPIN not integer"

Cause: The PRTPIN attribute must have an
          integer value.

Message: "Signal component not preassigned"

Cause: Signally encoded devices is not
          fully preassigned.

Message: "Bad PNUM attribute"

Cause: The information entered during symbol
          creation with the SCAT/PNUM command
   could not be interpreted.

APPENDIX B: EXAMPLE CIRCUIT

A sample circuit follows.   Note the following:

Schematic component A2 has been preassigned to U2/A, A3 to U2, A4 and A5 to U3.

Schematic component A1 has symbol name 7442.SYM.   It has attributes 'PRTPIN=16', 'CTYPE=IC', 'SHAPE=DIP16', and has been preassigned to U1/A.

Schematic components A10 and A11 have symbol name C.SYM and attributes 'PRTPIN=2' and 'SHAPE=C29'.   A10 has been preassigned to C2/A and A11 to C1/A.
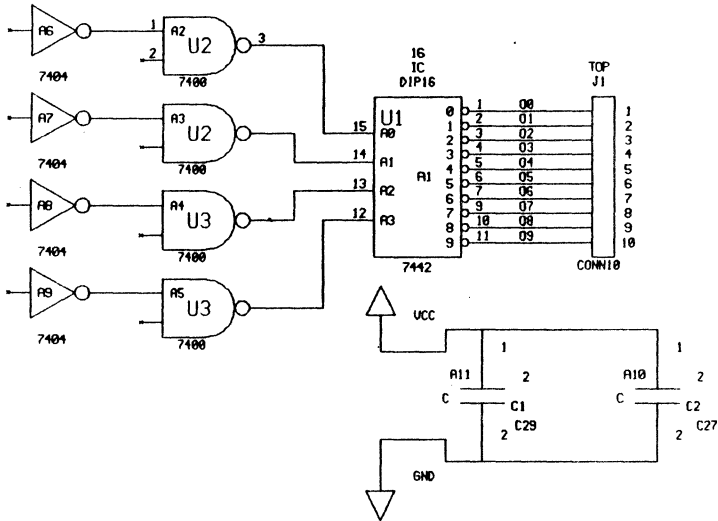
APPENDIX C: EXAMPLE OUTPUT FILE

```
***********************************************
*                                             *
* Copyright(C) 1984 Personal CAD Systems Inc  *
*                                             *
* Program    :   NX-SCI    1.00               *
* Date       :   Feb 19 1985g                 *
* Time       :   11:14AM                       *
* Input      :   TEST.NLT                      *
* Output     :   TEST.SCI                      *
*                                             *
***********************************************

PARTS
7400 U2 U3
7404 U4
EOS

FUNCTIONS
7400 A2
ASSIGN A2 U2 G1
NODES A2 15 0 12
7400 A3
ASSIGN A3 U2
NODES A3 16 0 11
7400 A4
ASSIGN A4 U3
NODES A4 17 0 13
7400 A5
ASSIGN A5 U3
NODES A5 18 0 14
7404 A6
NODES A6 15 0
7404 A7
NODES A7 16 0
7404 A8
NODES A8 17 0
7404 A9
```

NODES A9 18 0
EOS

COMPONENTS CONTINUE
IC U1 DIP16 1 2 3 4 5 6 7 0 8 9 10 14 13 11 12 0
CAP C29 C1 19 20
CAP C27 C2 19 20
EOS

CONNECTORS
J1 TOP
NODES 1 2 3 4 5 6 7 8 9 10
EOS

NAMED NODES
1 O0
2 O1
3 O2
4 O3
5 O4
6 O5
7 O6
8 O7
9 O8
10 O9
11 UN000000
12 UN000001
13 UN000002
14 UN000003
15 UN000004
16 UN000005
17 UN000006
18 UN000007
19 VCC
20 GND
EOS