

AD-A075 538

STANFORD UNIV CALIF STANFORD ELECTRONICS LABS

F/G 9/2

SYNDIA USER'S GUIDE.(U)

AUG 79 W E CORY

DAA629-79-C-0047

UNCLASSIFIED

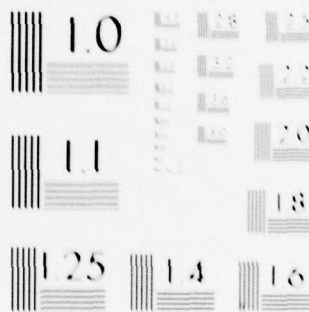
SU-SEL-79-028

NL

| OF |  
AD  
A075538



END  
DATE  
FILMED  
3-80  
DDC



RESOLUTION TEST CHART  
NATIONAL BUREAU OF STANDARDS-1963-A

# COMPUTER SYSTEMS LABORATORY

STANFORD ELECTRONICS LABORATORIES  
DEPARTMENT OF ELECTRICAL ENGINEERING  
STANFORD UNIVERSITY · STANFORD, CA 94305



AD A 0 7 5 5 3 8

## SYNDIA USER'S GUIDE

by

W.E. Cory

Technical Report No. 176

August 1979

DISTRIBUTION STATEMENT A  
Approved for public release  
Distribution Unlimited

This work was supported by the Joint Services Electronics  
Program under Contract N-00014-75-C-0601 and the  
Tektronix Foundation.

79 10 25 061

SEL 79-028

SYNDIA USER'S GUIDE

by

W.E. Cory

Technical Report No. 176

August 1979

Computer Systems Laboratory  
Departments of Electrical Engineering  
and Computer Science  
Stanford University  
Stanford, California 94305

This work was supported by the Joint Services Electronics  
Program under Contract DAAG-29-79-C-0047 and the Tektronix  
Foundation.

SYNDIA USER'S GUIDE

W.E. Cory

Technical Report No. 176

August 1979

Computer Systems Laboratory  
Departments of Electrical Engineering  
and Computer Science  
Stanford University  
Stanford, California 94305

ABSTRACT

This report describes how to use the Syndia/Syngra system available at SU-SCORE. This system accepts a BNF-like grammar specification and automatically generates syntax diagrams on a Tektronix graphics terminal. Syndia is the major component of this system; Syngra acts as an interface between Syndia and the SUDS2 graphics editor. Syndia performs no ambiguity or consistency checks on the BNF input.

This report assumes that the reader is familiar with BNF and syntax diagram representations of grammars.

INDEX TERMS: Syndia, automatic syntax diagram generation, BNF, Backus-Naur Form, language documentation

## TABLE OF CONTENTS

	Page
1.0 INTRODUCTION . . . . .	2
2.0 OVERVIEW . . . . .	3
3.0 SYNDIA CHARACTER SET, IDENTIFIERS, AND CONSTANTS . . . . .	4
3.1 Character Set . . . . .	4
3.2 Identifiers . . . . .	5
3.3 Constants . . . . .	7
4.0 PARAMETER SECTION . . . . .	8
5.0 SYMBOL DECLARATIONS . . . . .	11
6.0 BNF SECTION . . . . .	12
6.1 Productions . . . . .	13
6.2 Modifications . . . . .	15
7.0 HOW TO USE SYNDIA . . . . .	19
8.0 EXAMPLE FROM ZUERICH SHOWING USE OF SYNDIA . . . . .	21
9.0 SYNDIA SYNTAX DIAGRAMS . . . . .	26

## 1.0 INTRODUCTION

Syndia is a Pascal program which reads a modified-BNF description and writes instructions for drawing syntax diagrams on a hypothetical plotter. One drawing is generated for each BNF production.

Syndia is now available at SU-SCORE and is interfaced to the SCORE graphics editor SUDS2 by a second program Syngra. This manual describes the use of Syndia and Syngra along with the input format required by Syndia.

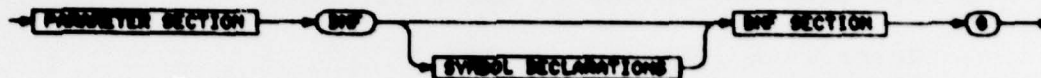
Syndia was originally written by J. Spillman and was modified and extended by Karl Josef Bucher at Eidg. Technische Hochschule in Zuerich. Larry Paulson (Stanford SAIL) modified Syndia to run under TOPS-10. Warren Cory made further modifications and has set up the current working version on SU-SCORE.

This manual (minus diagrams) is on-line at SU-SCORE in DOC:SYNDIA.MAN. The original Syndia files for all the examples in this manual are

```
PS:<CSL.DA.SYNDIA>SME1,  
PS:<CSL.DA.SYNDIA>SME2,  
PS:<CSL.DA.SYNDIA>SME3, and  
PS:<CSL.DA.SYNDIA>SYNDIA.SYN.
```

## 2.0 OVERVIEW

## BNF INPUT



A Syndia BNF description contains three major sections. The first is the parameter section. In this section, the user specifies what output should be generated, the width of the plots, etc.

The second section, the symbol declaration section, is optional. Here the user may define the character string values of identifiers. This is useful for two reasons:

1. The user may define short abbreviations for long character strings.
2. The character string value is always treated as an identifier, even if it contains meta-characters or keywords. This will be explained in more detail later.

The final section contains the BNF productions. This section may also include modifications which affect the layout of individual diagrams.

These three sections are described in turn in Sections 4, 5, and 6, following a discussion of identifiers and constants in Section 3. The use of Syndia and Syngra is explained in Section 7. Finally, a complete example appears in Section 8.

## 3.0 SYNDIA CHARACTER SET, IDENTIFIERS, AND CONSTANTS

## 3.1 Character Set

Syndia uses the following character set:

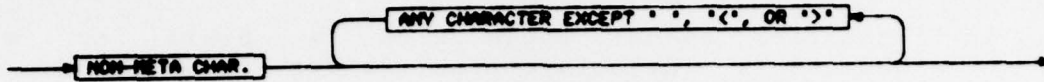
Upper case letters	A-Z
Digits	0-9
Special characters	! " # \$ % & ' ( ) * + , - . / : ; < > = ? @ [ ] \ ^ _
Blank	

The remaining printing 7-bit ASCII characters are "folded" (upper-cased) on input according to the table below. Hence, Syndia will not recognize the characters "`", "{", "}", "|", or "~", and these characters should not appear in the input. Syndia will expand tabs (CTRL-I) to blanks; other non-printing characters are ignored.

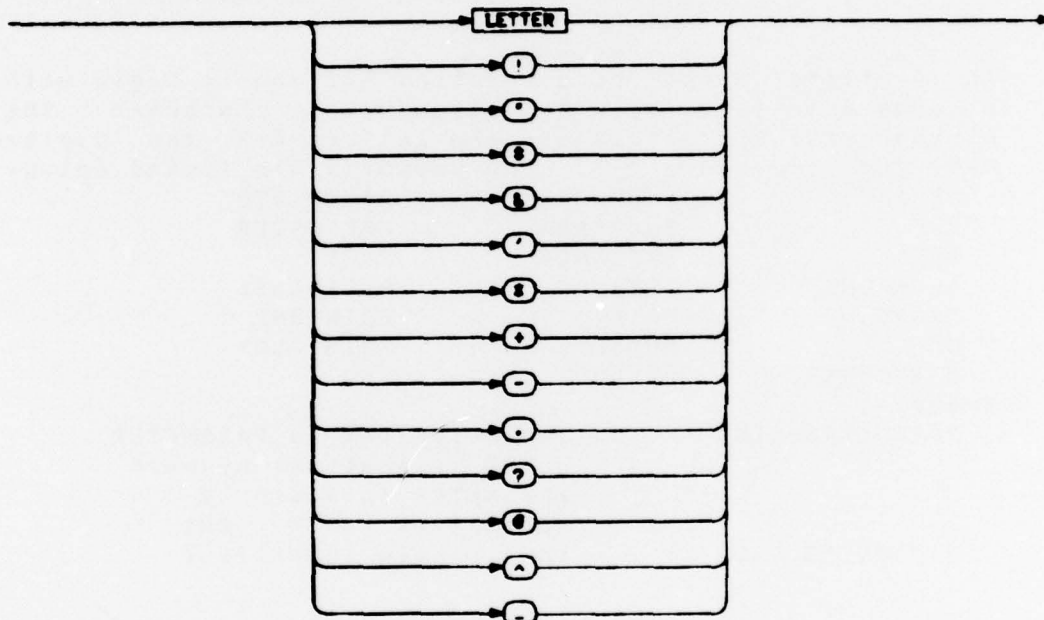
ASCII CHARACTERS:		"FOLDED" TO:	
Lower case letters	a-z	Upper case letters	A-Z
`		@	
{		[	
}		]	
		\	
~		^	
DEL (ASCII code 177 octal)		_	

## 3.2 Identifiers

## IDENTIFIER



## NON-META CHAR.



Identifiers in Syndia are used as names for character strings. The syntax for identifiers in Syndia is more flexible than in most languages, as the following examples show:

## VALID IDENTIFIERS:

```

**STAR**
.+1
EXPRESSION
#
META$%( ), / : ; = [ ] \

```

The following restrictions apply to identifier names:

1. Identifiers longer than 40 characters are truncated to 40 characters.
2. Blanks cannot be embedded in identifiers.

3. Identifiers cannot contain the characters "<" or ">".

Example:

TERM> is equivalent to TERM > ;  
that is, ">" is not part of the  
identifier.

4. An identifier cannot begin with a digit or a meta-character. The meta-characters are listed below:

< > / = : , ; % \$ \ [ ] ( )

Example:

[BOX] is equivalent to [ BOX] ;  
"[" is not part of the identifier  
(but "]" is!).

5. An identifier cannot be a keyword, nor can it begin with a keyword followed by a non-alphanumeric character. The alphanumeric characters are the letters A-Z, the digits 0-9, and underscore "\_". The keywords are listed below:

APPEND	ENDMODIFY	PAGewidth
BNF	ENDPARAM	PARAMETER
BREAK	EXCHANGE	PLOT
BREAKOPT	LABELS	PLOTLABEL
CHARS	MAIN	PRINTBNF
CM	MODIFY	PRINTPLOT
DIANUMBER	OZERO	SYM

Example:

PARAMETER-LIST is equivalent to PARAMETER  
-LIST ; that is, keyword  
PARAMETER followed by  
identifier -LIST. But  
PARAMETER\_LIST is a single identifier.

Note that meta-characters (except "<" and ">") which follow an identifier but are not intended to be part of the identifier name MUST BE SEPARATED FROM THE IDENTIFIER BY SPACE OR END-OF-LINE. Also, the string "PLOT(15,0)" is not an identifier (since PLOT is a keyword); it is equivalent to "PLOT ( 15 , 0 )".

Blanks may not be embedded in keywords.

## 3.3 Constants

INTEGER



NUMBER



In Syndia, constants are unsigned integers or fixed point real numbers. In real numbers, at least one digit must precede the decimal point. Blanks may not be embedded in numbers.

Examples:

0

1.7

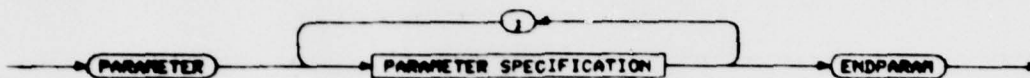
0.1683

22001

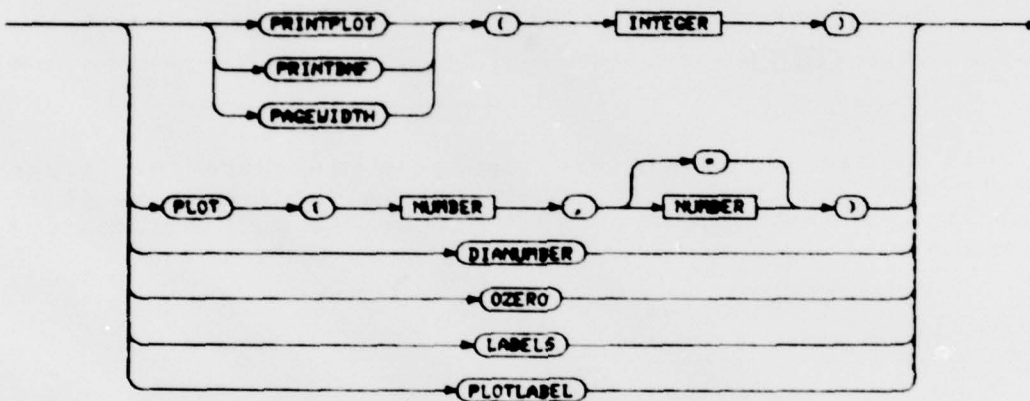
2.

## 4.0 PARAMETER SECTION

## PARAMETER SECTION



## PARAMETER SPECIFICATION



Syndia generates two output files: a lineprinter listing showing the input with other optional output, and a second file containing instructions for the hypothetical plotter. In the parameter section, the user may specify up to eight parameters which indicate the nature of this output. These are discussed in turn:

## 4.1 PRINTPLOT

PRINTPLOT specifies that the lineprinter listing include plots of the several diagrams, drawn with standard ASCII characters for output on an ordinary lineprinter. This is useful if it is inconvenient to obtain plotter drawings every time Syndia is run during the BNF debugging process. The integer argument specifies the default width in columns to be used for the plots. (If this default value is too small for some diagram, then the smallest possible width will be used.)

#### 4.2 PRINTBNF

PRINTBNF specifies that Syndia include in the listing the final BNF resulting after any symbol substitutions have been carried out. The integer argument gives the width in columns of the BNF listing. Syndia makes no attempt to "pretty print" this listing.

#### 4.3 PAGEWIDTH

PAGEWIDTH gives the width in columns of the page on which the listing is to be printed. The number given does not include the first column, which Syndia always sets to blank ' ' for Fortran carriage control. When no PAGEWIDTH parameter is present, a page width of 130 is assumed.

Syndia will allow the widths given with PRINTPLOT and PRINTBNF to exceed the page width. In such cases, Syndia will split the output at the page boundary.

#### 4.4 PLOT

The PLOT parameter specifies that instructions for the hypothetical plotter be output. The first number argument gives the default width in centimeters for the syntax diagrams. (15 cm. is just under 6 inches.) The second argument gives the width of the characters to be used in the diagrams. Syndia will NOT check to ensure that the character size specified is not too big.

The plotter drawings will be scaled to resemble the lineprinter drawings obtained by PRINTPLOT. If PRINTPLOT is not specified, the plotter drawings will resemble lineprinter plots 100 columns wide.

There are two possible special values for the second argument. If the second argument is zero, then Syndia will compute the largest character size it can use for each drawing.

The other possible special value for the second argument is equals-sign "=". This value causes Syndia to use the same character size used in the lineprinter plots, scaled by the difference in sizes between the lineprinter and plotter drawings. This character size will be somewhat smaller than the size computed if the second argument is zero.

\*\*\*NOTE\*\*\* The current version of the graphics editor at SCORE handles only a single character size, 0.1683 cm. Syndia will automatically select this size unless it is

forced (by excessive drawing density) to choose a smaller size. It is therefore recommended that the user set the second PLOT argument to zero (or, perhaps, to 0.1683).

#### 4.5 DIANUMBER

A diagram generated by Syndia is ordinarily labeled only with the nonterminal name from the left hand side of the corresponding production. If DIANUMBER is specified, then Syndia will precede this label with the integer preceding the production in the BNF section (see Section 6).

#### 4.6 OZERO

If OZERO is specified, then Syndia will change all O's ("oh") to 0's ("zero") and vice versa in the lineprinter and plotter drawings. This is useful, for example, if the plotting software slashes O's ("oh") while the user wants to slash 0's ("zero").

#### 4.7 LABELS

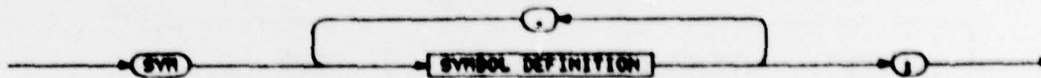
In its internal representation, each syntax diagram has all of its nodes numbered, where a node is a corner or intersection. The user may refer to these node numbers in modifications to alter the layout of the diagram. LABELS specifies that these node numbers will appear in the lineprinter drawings generated by PRINTPLOT.

#### 4.8 PLOTLABEL

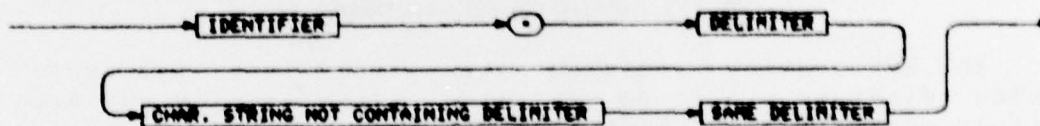
PLOTLABEL specifies that the node numbers mentioned above will appear in the plotter drawings generated by PLOT.

## 5.0 SYMBOL DECLARATIONS

## SYMBOL DECLARATIONS



## SYMBOL DEFINITION



## DELIMITER



Normally, the value of an identifier is the same as its name. For example, the identifier REGISTER has as its value the character string 'REGISTER'. However, identifiers may be assigned different values in the symbol declaration section. When these identifiers appear later in the BNF, they are replaced by their values, the character strings given in the declarations. The replacement strings are always treated as identifiers, even if they contain embedded blanks, meta-characters, or keywords. String replacement is not recursive; for example, after

B = 'C',

A = 'B',

the value of A is 'B', not 'C'. Note that any printing character may be used as the delimiter. The replacement string, like all identifiers, must not exceed 40 characters in length.

## Examples:

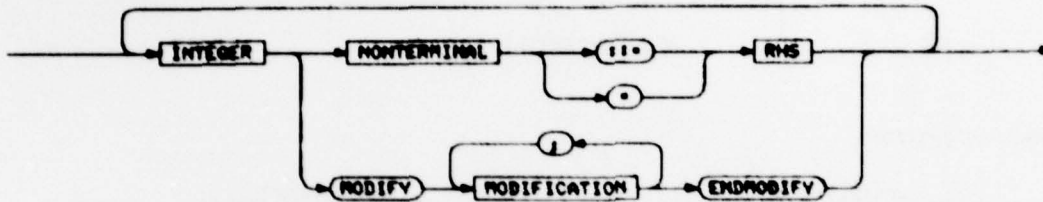
SYM L( = '(', R) = ')',

PX = '%', C, = ',',

SHORT = /LONGER CHARACTER STRING/;

## 6.0 BNF SECTION

## BNF SECTION



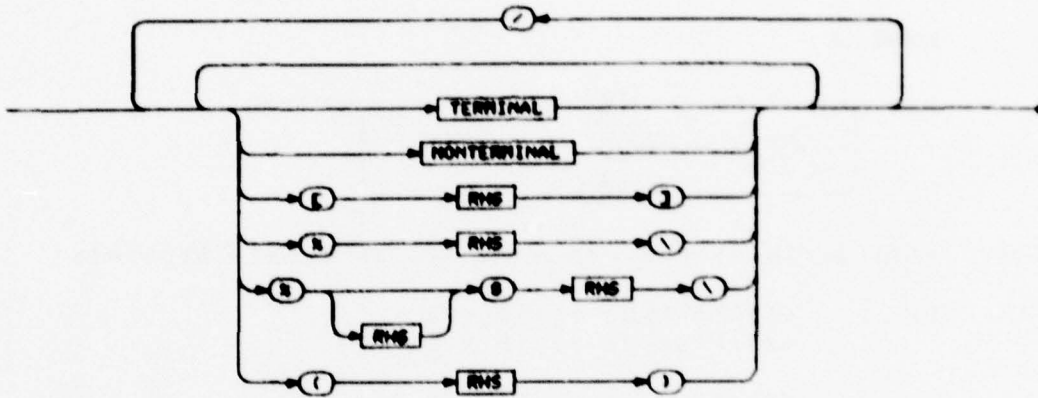
The BNF section contains the productions for which syntax diagrams are to be generated. This section may also contain modifications which alter the layout of specified diagrams. Productions and modifications may be mixed in any order.

Syndia draws one syntax diagram per production. It performs absolutely no checking to ensure that the grammar being described makes any sense; the sole function of Syndia is to draw the diagrams specified, nonsensical or not.

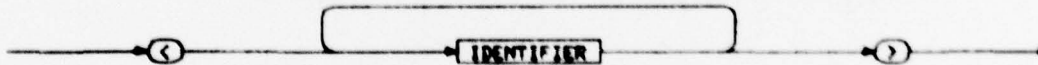
The integer preceding each production appears before the label in the syntax diagram if the DIANUMBER parameter is given. In addition, the integers serve as "handles" for the modifications. All modifications preceded by a given integer are applied to all productions preceded by the same number. (The same number may precede several productions.) Note that the integer in front of a production or modification marks the end of the preceding production.

6.1 Productions

RHS



NONTERMINAL



TERMINAL



Syndia production syntax is quite similar to normal BNF. Syndia has special notation for \*-closure, +-closure, and lists, which allows the efficient generation of aesthetic diagrams. The syntax is illustrated by examples below in which Syndia's notation is contrasted with standard BNF.

In the simplest production, the right-hand side is a non-empty sequence of terminals and/or nonterminals. The left- and right-hand sides may be separated either by "::<=" or by "=":

<EXAMPLE\_1> ::= B <C> <D E> \*STAR

EXAMPLE\_1

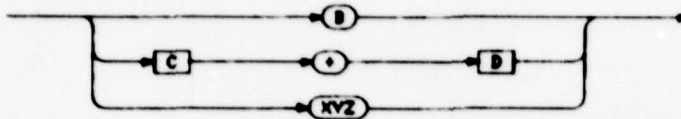


Note the different shapes of the boxes for terminals and nonterminals. Multiple productions for the same nonterminal may be written as a single production with the several alternatives separated by slashes:

BNF:     <EXAMPLE\_2> ::= B  
           <EXAMPLE\_2> ::= <C> + <D>  
           <EXAMPLE\_2> ::= XYZ

Syndia: <EXAMPLE\_2> ::= B / <C> + <D> / XYZ

EXAMPLE\_2

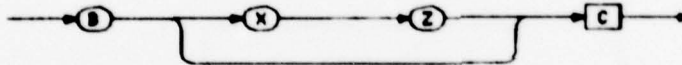


Optional strings in Syndia are enclosed in square brackets:

BNF:     <EXAMPLE\_3> ::= B <C>  
           <EXAMPLE\_3> ::= B X Z <C>

Syndia: <EXAMPLE\_3> ::= B [ X Z ] <C>

EXAMPLE\_3



Plus-closure is denoted by enclosing text in "%" and "\":

BNF:     <EXAMPLE\_4> ::= Q  
           <EXAMPLE\_4> ::= <EXAMPLE\_4> Q

Syndia: <EXAMPLE\_4> ::= % Q \

EXAMPLE\_4

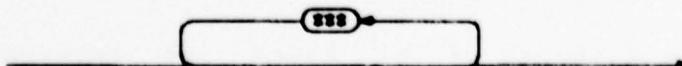


Star-closure is indicated by adding a "\$" to the above notation:

BNF:     <EXAMPLE\_5> ::= null  
           <EXAMPLE\_5> ::= <EXAMPLE\_5> \*\*\*

Syndia: <EXAMPLE\_5> ::= % \$ \*\*\* \

EXAMPLE\_5

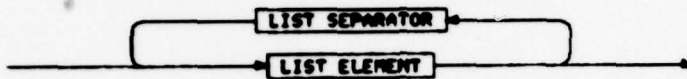


Finally, Syndia has a special list notation which may be regarded as an extension of \*-closure:

BNF:       <EXAMPLE\_6> ::= <LIST ELEMENT>  
           <EXAMPLE\_6> ::= <EXAMPLE\_6> <LIST SEPARATOR>  
                                   <LIST ELEMENT>

Syndia:    <EXAMPLE\_6> ::= % <LIST ELEMENT> \$  
                                   <LIST SEPARATOR> \

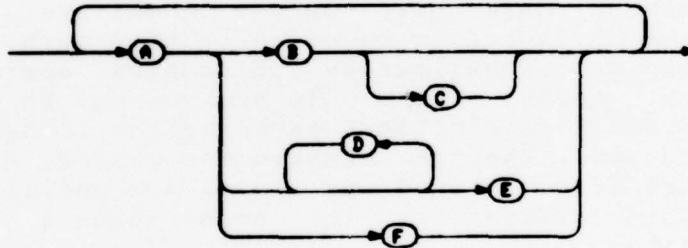
EXAMPLE\_6



The above constructs may be combined and nested to any degree, with parentheses used where necessary to achieve the proper grouping:

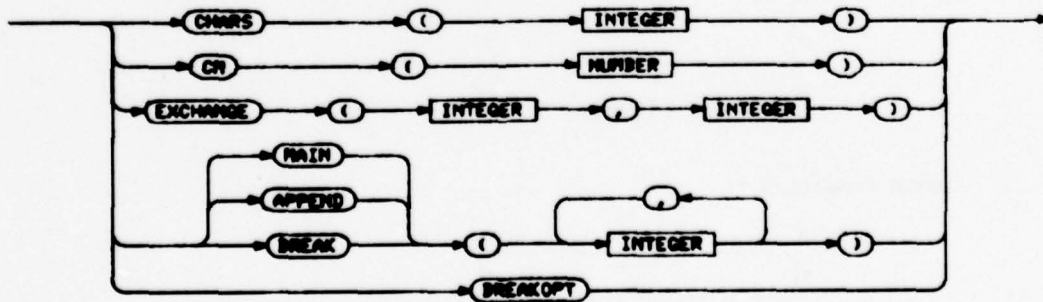
<EXAMPLE\_7> ::= % A ( B [ C ] / % \$ D \ E / F ) \

EXAMPLE\_7



6.2 Modifications

MODIFICATION



Seven different modifications are available for altering the appearance of a diagram.

## CHARS

The CHARS modifier sets the width in columns of the lineprinter drawing for the associated production(s). If CHARS is not specified, then Syndia will use the default width given with PRINTPLOT (or 100 if PRINTPLOT was not specified). Recall from Section 4 that the width chosen for the lineprinter drawing can affect the appearance of the plotter drawing.

## CM

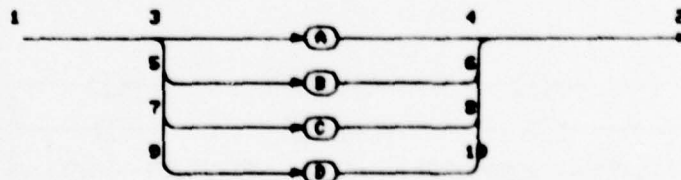
The CM modifier sets the width in centimeters of the plotter drawings for the associated production(s). If CM is not specified, then Syndia will use the default width given with PLOT.

## EXCHANGE, MAIN, and APPEND

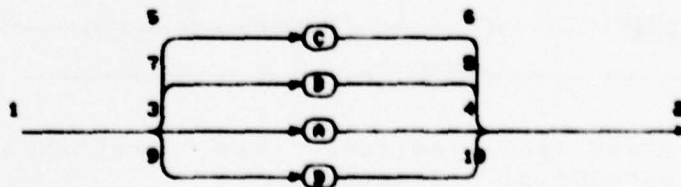
The EXCHANGE, MAIN, and APPEND modifiers specify horizontal paths which are to be moved in some fashion. The horizontal paths are identified by the numbers assigned to their left-most nodes. These node numbers may be obtained by specifying LABELS or PLOTLABEL as described in Section 4. After modifications, the node numbers may change, but these new node numbers are NOT valid for use in new modifications. The user should always use the node numbers from the unmodified diagram.

The EXCHANGE modifier identifies two horizontal paths which are to be interchanged.

BEFORE EXCHANGE(3,7)

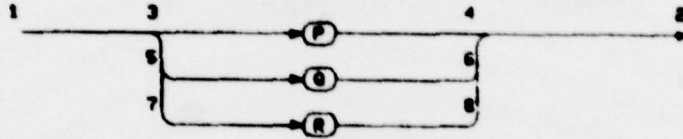


AFTER EXCHANGE(3,7)

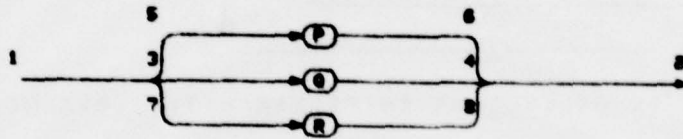


The MAIN modifier specifies a horizontal path which is to be drawn in line with the entry and exit lines at the end branch points.

BEFORE MAIN(S)



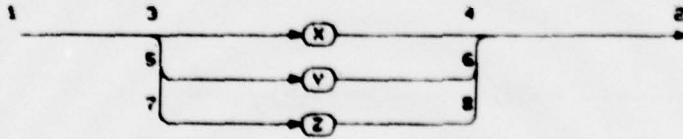
AFTER MAIN(S)



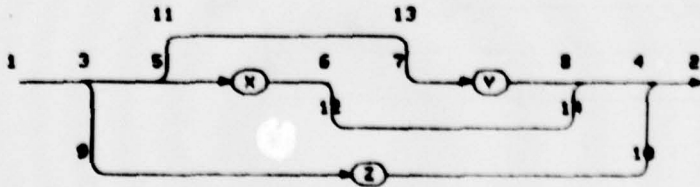
"MAIN(p1, ..., pk)" is equivalent to "MAIN(p1); ...; MAIN(pk)".

The APPEND modifier specifies a horizontal path which is to be drawn in line with the horizontal path above it.

BEFORE APPEND(S)



AFTER APPEND(S)

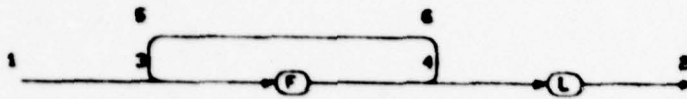


"APPEND(p1, ..., pk)" is equivalent to "APPEND(p1); ...; APPEND(pk)".

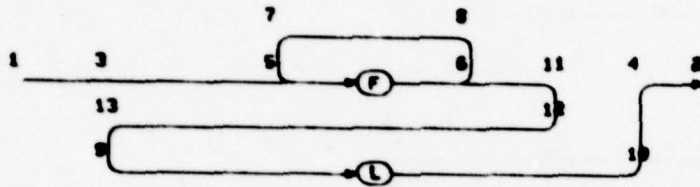
**BREAK**

The BREAK modifier identifies a node where a single horizontal path should be broken into two levels. The node numbers should always be taken from the unmodified drawing.

BEFORE BREAK(4)



AFTER BREAK(4)



"BREAK(p1,...,pk)" is equivalent to "BREAK(p1);...;BREAK(pk)".

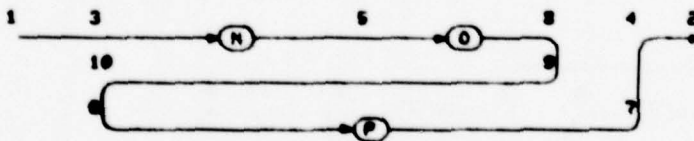
**BREAKOPT**

The BREAKOPT modifier causes Syndia to automatically insert BREAK's where required to make the lineprinter diagram fit in the width specified in PRINTPLOT (or 100 columns if PRINTPLOT was not specified).

BEFORE BREAKOPT



AFTER BREAKOPT



## 7.0 HOW TO USE SYNDIA

Any file name used by Syndia, Syngra, or the graphics editor must be a valid TOPS-10 file specification in which the name has not more than six characters and the extension has not more than three characters. A TOPS-10 device spec may precede the name, and a directory spec, if present, must be in the form of a PPN following the extension. (The PPN for a directory may be found by the TRANSLATE command.) Hence, in its most general form, a valid file specification has the format

```
dev:name.ext[ppn]
```

The procedure for running Syndia at SU-SCORE follows:

1. Prepare your Syndia input file.
2. Give the EXEC command to run Syndia:  
@SYNDIA
3. Syndia will prompt for INPUT, OUTPUT, and MAINPLOT file names. The INPUT file is the file prepared in Step 1. The OUTPUT and MAINPLOT files will contain the lineprinter listing and the hypothetical-plotter instructions, respectively.

If you follow any file name in this step with "/SYNGRA", as in

```
INPUT = SYNTAX.IN/SYNGRA
```

then Syndia will automatically start Syngra if no errors are found in the input. If the input contains errors, Syndia will print a message "ERROR(S) IN INPUT" at the terminal. The error messages may then be found in the OUTPUT listing file.

4. If you did not specify "/SYNGRA" when you ran Syndia, then you may start Syngra by giving the EXEC command:  
@SYNGRA
5. Syngra will prompt for the MAINPLOT file name. Respond with the same MAINPLOT file name you gave Syndia. If you follow this file name with "/EDIT", then Syngra will automatically start the graphics editor when it is done.
6. The function of Syngra is to convert the MAINPLOT output from Syndia into a form readable by the graphics editor. In general Syngra will generate many output files. Each output file corresponds to one screenful of diagrams on the Tektronix 4014. Syngra automatically puts as many diagrams as it can in one screenful; conversely, if one diagram is too big to fit on the screen, Syngra will split it into as many parts as necessary, with enough overlap between parts to allow easy cut-and-paste.

During execution, Syngra will do three things at the

terminal.

1. Syngra will print the sequence number and name of each diagram as it is encountered in the input.
  2. Syngra will prompt for output file names as required. When choosing the output file names, remember that the graphics editor will be expecting input files with the extension ".INT" or ".SYM".
  3. Syngra will flag the appearance of character sizes not supported by the graphics editor. If you specified a character width of zero in the PLOT parameter, then this error condition indicates a diagram that is too crowded. This may be corrected by adding modifications, splitting the production into several shorter productions, increasing the plotter diagram width, or (in some cases) by DECREASING the lineprinter diagram width.
7. You must be logged in at the Tektronix 4014 terminal in order to run the graphics editor. If you did not specify "/EDIT" when you ran Syngra, then you may start the editor by giving the EXEC command:

```
@SUDS2
```

The use of the editor is described in a manual in the ERL terminal room next to the 4014 terminal. The manual is also on-line at SU-SCORE in DOC:SUDS2.MAN. The use of a small subset of the available commands will suffice to generate the diagrams.



```

@:;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
@;
@;   NOW RUN SYNDIA AND SYNGRA
@;
@:;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
@;
@SYNDIA
INPUT   = PS:SME3[4,1007]/SYNGRA
OUTPUT  = SME3.LIS
MAINPLOT = SME3.SYO
**STARTING SYNGRA**
MAINPLOT = SME3.SYO
NEW OUTPUT FILE STARTING IN DIAGRAM 1:
OUTPUTFILE= SME3.INT
STARTING DIAGRAM NO. 1: T1
STARTING DIAGRAM NO. 2: T2
STARTING DIAGRAM NO. 3: T3
STARTING DIAGRAM NO. 4: T3      ( T5 )
STARTING DIAGRAM NO. 5: T6

```

```

EXIT
@;
@:;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
@;
@;   LOOK AT THE OUTPUT LISTING
@;
@:;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
@;
@TYPE SME3.LIS
SYNDIA VERSION JUNE 4, 1979 / SU-SCORE

```

```

PARAMETER
  PRINTPLOT(50);
  PLOT(10,0);
  PAGESWIDTH(50);
  LABELS;
  PRINTBNF(50);
  OZERO
ENDPARAM

```

```

BNF
SYM
  A1 = / /, L( = /( /, R) = / )/, SLASH = ./.;
  1 < T1 > ::= % B$ C \
  1 < T2 > ::= % B $ C \
  20 < T3 > ::= [ < A1 > % L( C R) \ ]
  1 MODIFY CHARS(40) ENDMODIFY
  3 MODIFY APPEND(5) ENDMODIFY
  3 < T3 A1 L( T5 R) > = A / B / C
  5 < T6 > ::= < A > SLASH < B > SLASH/
  3 MODIFY MAIN(7) ENDMODIFY
0

```

TABLE OF ABBREVIATIONS

A1	<-- ' ' '
L(	<-- '('
R)	<-- ')'
SLASH	<-- '/'

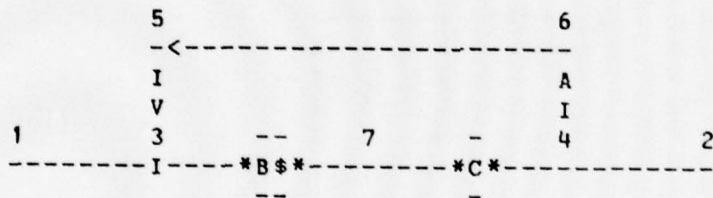
BACKUS - NAUR - FORM

```

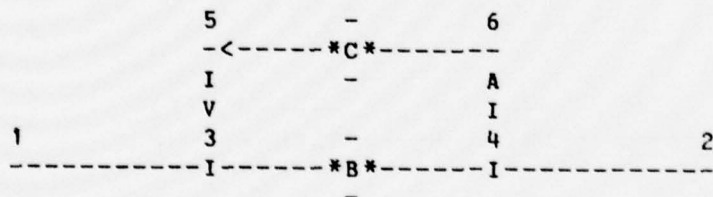
1 < T1 > ::= % 'B$' 'C' \
2 < T2 > ::= % 'B' $ 'C' \
3 < T3 > ::= [ < > % '(' 'C' ')' \ ]
4 < T3 ( T5 ) > ::= 'A' / 'B' / 'C'
5 < T6 > ::= < A > '/' < B > 'SLASH/'
    
```

END OF BACKUS-NAUR-FORM

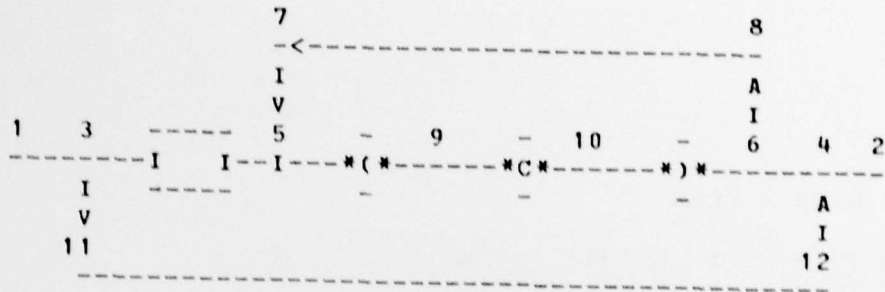
T1



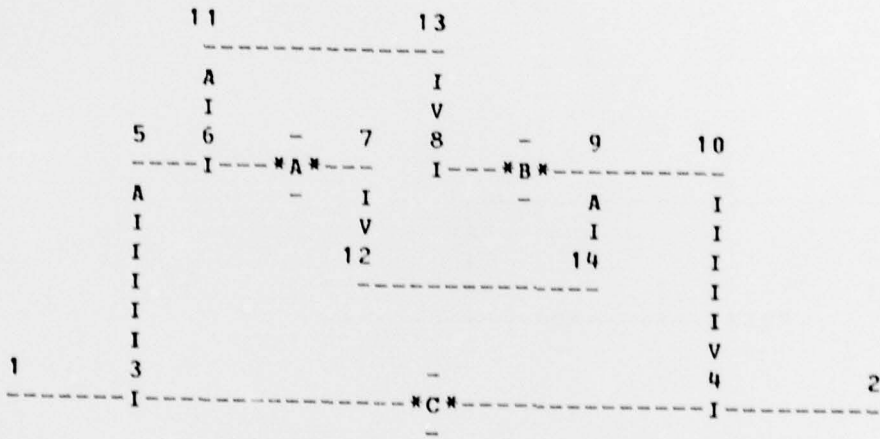
T2



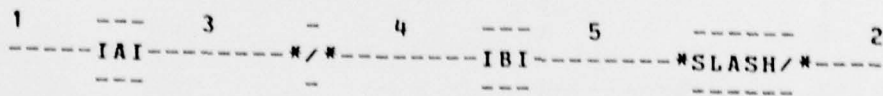
T3



T3 ( T5 )



T6

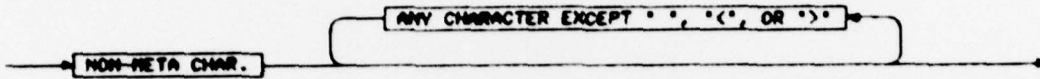




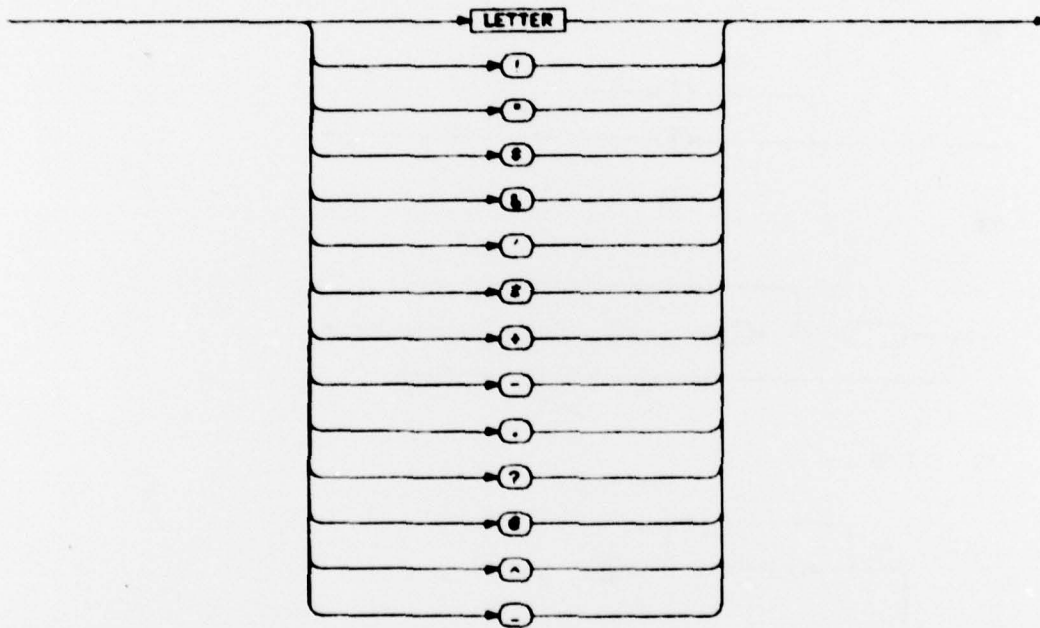
9.0 SYNDIA SYNTAX DIAGRAMS

The Syntax diagrams for Syndia are repeated here for reference.

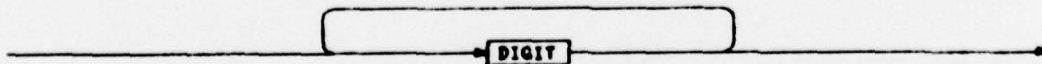
IDENTIFIER



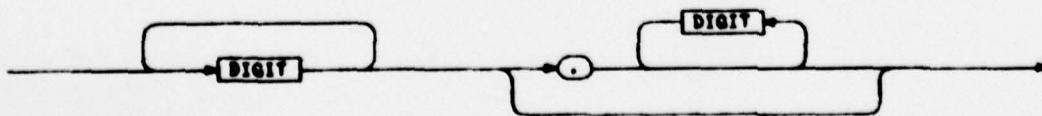
NON-META CHAR.



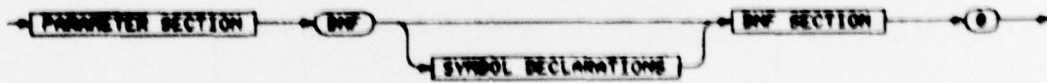
INTEGER



NUMBER



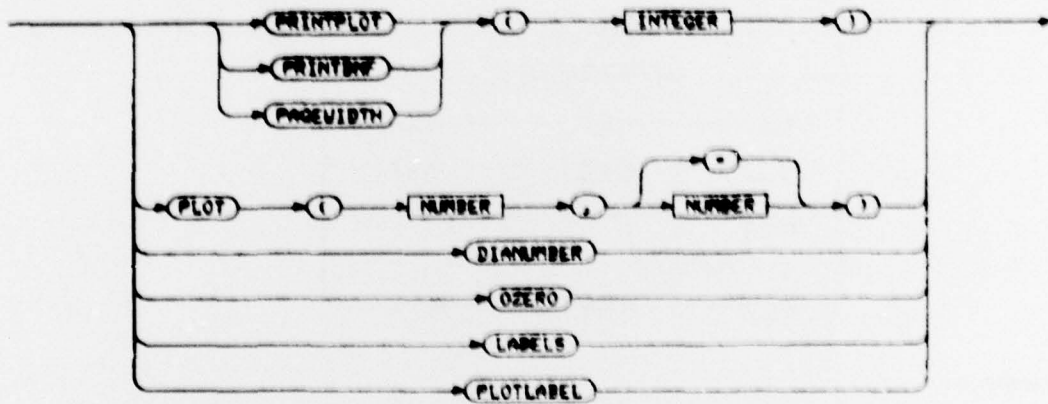
BNF INPUT



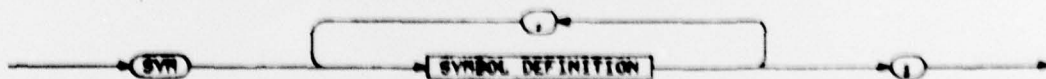
PARAMETER SECTION



PARAMETER SPECIFICATION



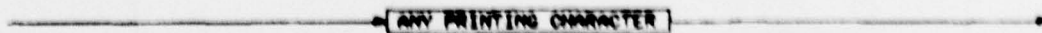
SYMBOL DECLARATIONS



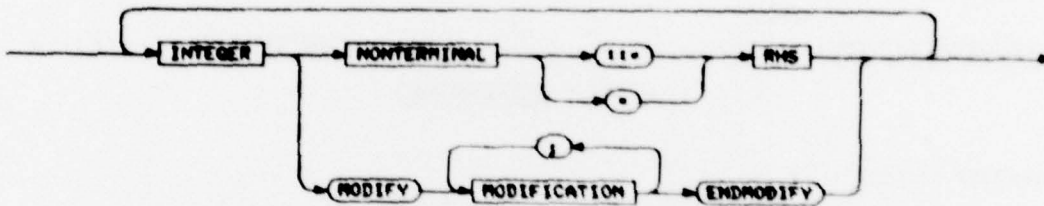
SYMBOL DEFINITION



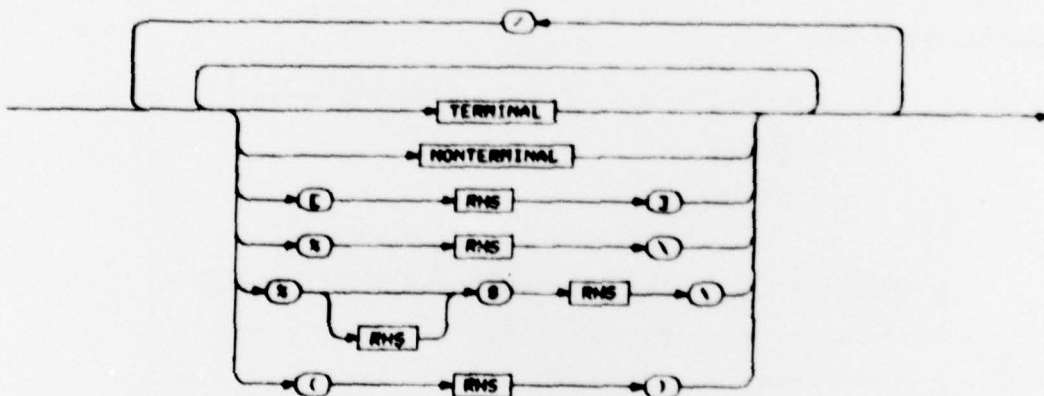
DELIMITER



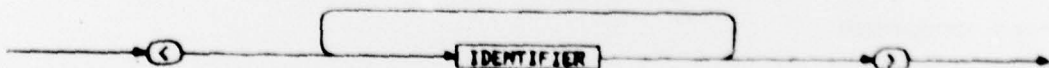
**RWF SECTION**



**RWS**



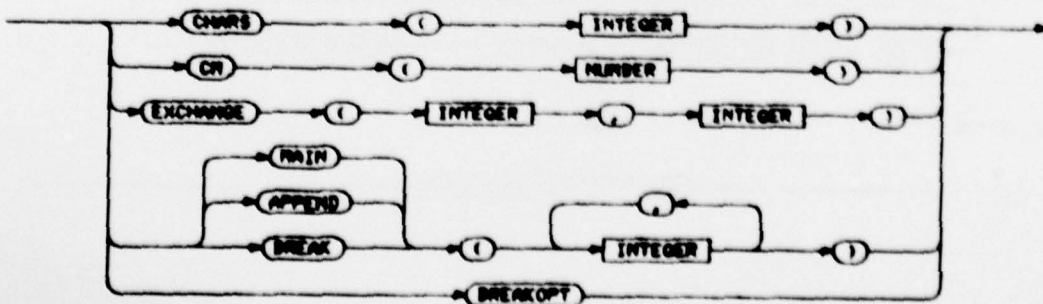
**NONTERMINAL**



**TERMINAL**



**MODIFICATION**



REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM	
1. REPORT NUMBER Technical Report No. 176	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER	
4. TITLE (and Subtitle) SYNDIA USER'S GUIDE		5. TYPE OF REPORT & PERIOD COVERED Technical Report	
		6. PERFORMING ORG. REPORT NUMBER	
7. AUTHOR(s) Warren E. Cory		8. CONTRACT OR GRANT NUMBER(s) DAAG-29-79-C-0047	
		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 2 DRN 921	
9. PERFORMING ORGANIZATION NAME AND ADDRESS Computer Systems Laboratory Stanford University Stanford, CA 94305		12. REPORT DATE August 1979	13. NO. OF PAGES 28
11. CONTROLLING OFFICE NAME AND ADDRESS Joint Services Electronics Program		15. SECURITY CLASS. (of this report) unclassified	
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE	
14. MONITORING AGENCY NAME & ADDRESS (if diff. from Controlling Office)		16. DISTRIBUTION STATEMENT (of this report) Reproduction in whole or in part is permitted for any purpose of the U.S. Government.	
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from report)			
18. SUPPLEMENTARY NOTES			
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Syndia, automatic syntax diagram generation, BNF, Backus-Naur Form, language documentation			
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report describes how to use the Syndia/Syngra system available at SU-SCORE. This system accepts a BNF-like grammar specification and automatically generates the major component of this system; Syngra acts as an interface between Syndia and the SUDS2 graphics editor. Syndia performs no ambiguity or consistency checks on the BNF input.  This report assumes that the reader is familiar with BNF and syntax diagram representations of grammars.			

DD FORM 1473  
1 JAN 73

EDITION OF 1 NOV 65 IS OBSOLETE

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

JSEP REPORTS DISTRIBUTION LIST

Department of Defense

Director  
National Security Agency  
Attn: Dr. T. J. Beahn  
Fort George G. Meade  
Maryland 20755

Defense Documentation Center (12)  
Attn: DDC-TCA (Mrs. V. Caponio)  
Cameron Station  
Alexandria, Virginia 22314

Dr. George Gamota  
Acting Assistant for Research  
Deputy Under Secretary of Defense  
for Research and Engineering  
(Research & Advanced Technology)  
Room 3D1079, The Pentagon  
Washington, D. C. 20301

Mr. Leonard R. Weisberg  
Office of the Under Secretary of Def.  
for Research & Engineering/EPS  
Room 3D1079, The Pentagon  
Washington, D. C. 20301

Defense Advanced Research  
Projects Agency  
Attn: Dr. R. Reynolds  
1400 Wilson Boulevard  
Arlington, Virginia 22209

Department of the Army

Commandant  
US Army Air Defense School  
Attn: ATSAD-T-CSM  
Fort Bliss, Texas 79916

Commander  
US Army Armament R & D Command  
Attn: DRDAR-RD  
Dover, New Jersey 07801

Commander  
US Army Ballistics Research Lab.  
Attn: DRXRD-BAD  
Aberdeen Proving Ground  
Aberdeen, Maryland 21005

Commandant  
US Army Command & General Staff College  
Attn: Acquisitions, Lib. Div.  
Fort Leavenworth, Kansas 66027

Commander  
US Army Communication Command  
ATTN: CC-OPS-PD  
Fort Huachuca, Arizona 85613

Commander  
US Army Materials and Mechanics  
Research Center  
Attn: Chief, Materials Sci. Div.  
Watertown, Massachusetts 02172

Commander  
US Army Material Development and  
Readiness Command  
Attn: Technical Library, Rm. 7S 35  
5001 Eisenhower Avenue  
Alexandria, Virginia 22333

Commander  
US Army Missile R & D Command  
Attn: Chief, Document Section  
Redstone Arsenal, Alabama 35809

Commander  
US Army Satellite Communications Agency  
Fort Monmouth, New Jersey 07703

Commander  
US Army Security Agency  
Attn: IARD-T  
Arlington Hall Station  
Arlington, Virginia 22212

Project Manager  
Army Tactical Data Systems  
EAI Building  
West Long Branch, New Jersey 07764

Commander  
Atmospheric Sciences Lab. (ERADCOM)  
Attn: DRSEL-BL-DD  
White Sands Missile Range  
New Mexico 88002

NOTE: One (1) copy to each addressee unless otherwise indicated.

Director  
US Army Electronics R & D Command  
Night Vision & Electro-Optics Labs  
Attn: Dr. Ray Balcerak  
Fort Belvoir, Virginia 22060

Commander  
US Army Communications R & D Command  
Attn: DRDCO-COM-C (Dr. H. S. Bennett)  
Fort Monmouth, New Jersey 07703

Commander  
US Army Research Office  
Attn: DRXRO-MA (Dr. Paul Boggs)  
P. O. Box 12211  
Research Triangle Park, N. C. 27709

Commander  
US Army Missile R & D Command  
Physical Sciences Directorate  
Attn: DRDMI-TRD (Dr. Charles Bowden)  
Redstone Arsenal, Alabama 35809

Director  
TRI-TAC  
Attn: TT-AD (Mrs. Briller)  
Fort Monmouth, New Jersey 07703

Commander  
US Army Missile R & D Command  
Advanced Sensors Directorate  
Attn: DRDMI-TER (Dr. Don Burlage)  
Redstone Arsenal, Alabama 35809

Commander  
US Army Electronics R & D Command  
Night Vision & Electro-Optics Labs  
Attn: DELNV (Dr. Rudolf G. Buser)  
Fort Monmouth, New Jersey 07703

Director  
US Army Electronics R & D Command  
Night Vision & Electro-Optics Labs  
Attn: Mr. John Dehne  
Fort Belvoir, Virginia 22060

Director  
US Army Electronics R & D Command  
Night Vision & Electro-Optics Labs  
Attn: Dr. William Ealy  
Fort Belvoir, Virginia 22060

Director  
US Army Electronics R & D Command  
Attn: DELEW (Electronic Warfare Lab.)  
White Sands Missile Range  
New Mexico 88002

Executive Secretary, TAC/JSEP  
US Army Research Office  
P. O. Box 12211  
Research Triangle Park, N. C. 27709

Commander  
US Army Missile R & D Command  
Physical Sciences Directorate  
Attn: DRDMI-TER (Dr. M. D. Fahey)  
Redstone Arsenal, Alabama 35809

Commander  
US Army Missile R & D Command  
Physical Sciences Directorate  
Attn: DRDMI-TRO (Dr. W. L. Gamble)  
Redstone Arsenal, Alabama 35809

Commander  
White Sands Missile Range  
Attn: STEWS-ID-SR (Dr. A. L. Gilbert)  
White Sands Missile Range  
New Mexico 88002

Project Manager  
Ballistic Missile Defense Program Off.  
Attn: DACS-DMP (Mr. A. Gold)  
1300 Wilson Blvd.  
Arlington, Virginia 22209

Commander  
US Army Communications R & D Command  
Attn: CENTACS (Dr. D. Haratz)  
Fort Monmouth, New Jersey 07703

Commander  
Harry Diamond Laboratories  
Attn: Mr. John E. Rosenberg  
2800 Powder Mill Road  
Adelphi, Maryland 20783

HQDA (DAMA-ARZ-A)  
Washington, D. C. 20310

Commander  
US Army Electronics R & D Command  
Attn: DELET-E (Dr. J. A. Kohn)  
Fort Monmouth, New Jersey 07703

Commander  
US Army Electronics Techn. & Dev. Lab.  
Attn: DELET-EN (Dr. S. Kroenberg)  
Fort Monmouth, New Jersey 07703

Commander  
US Army Communications R & D Command  
Attn: CENTACS (Mr. R. Kulinyi)  
Fort Monmouth, New Jersey 07703

Commander  
US Army Communications R & D Command  
Attn: DRDCO-TCS-BG (Dr. E. Lieblein)  
Fort Monmouth, New Jersey 07703

Commander  
US Army Electronics Techn. & Dev. Lab.  
Attn: DELET-MM (Mr. N. Lipetz)  
Fort Monmouth, New Jersey 07703

Director  
US Army Electronics R & D Command  
Night Vision & Electro-Optics Labs  
Attn: Dr. Randy Longshore  
Fort Belvoir, Virginia 22060

Commander  
US Army Electronics R & D Command  
Attn: DRDEL-CT (Dr. W. S. McAfee)  
2800 Powder Mill Road  
Adelphi, Maryland 20783

Commander  
US Army Research Office  
Attn: DRXRO-EL (Dr. J. Mink)  
P. O. Box 12211  
Research Triangle Park, N. C. 27709

Director  
US Army Electronics R & D Command  
Night Vision Laboratory  
Attn: DELNV  
Fort Belvoir, Virginia 22060

Col. Robert Noce  
Senior Standardization Representative  
US Army Standardization Group, Canada  
Canadian Force Headquarters  
Ottawa, Ontario, Canada KIA )K2

Commander  
Harry Diamond Laboratories  
Attn: Dr. R. Oswald, Jr.  
2800 Powder Mill Road  
Adelphi, Maryland 20783

Commander  
US Army Communications R & D Command  
Attn: CENTACS (Dr. D. C. Pearce)  
Fort Monmouth, New Jersey 07703

Director  
US Army Electronics R & D Command  
Night Vision & Electro-Optics Labs  
Attn: DELNV-ED (Dr. John Pollard)  
Fort Belvoir, Virginia 22060

Commander  
US Army Research Office  
Attn: DRXRO-EL (Dr. W. A. Sander)  
P. O. Box 12211  
Research Triangle Park, N. C. 27709

Commander  
US Army Communications R & D Command  
Attn: DRDCO-COM-RH-1 (Dr. F. Schwering)  
Fort Monmouth, New Jersey 07703

Commander  
US Army Electronics Techn. & Dev. Lab.  
Attn: DELET-I (Dr. C. G. Thornton)  
Fort Monmouth, New Jersey 07703

US Army Research Office (3)  
Attn: Library  
P. O. Box 12211  
Research Triangle Park, N. C. 27709

Director  
Division of Neuropsychiatry  
Walter Reed Army Inst. of Research  
Washington, D. C. 20012

Commander  
USA ARRADCOM  
Attn: DRDAR-SCF-CC (Dr. N. Coleman)  
Dover, New Jersey 07801

Director  
US Army Signals Warfare Lab.  
Attn: DELSW-OS  
Vint Hill Farms Station  
Warrenton, Virginia 22186

Department of the Air Force

Mr. Robert Barrett  
RADC/ES  
Hanscom AFB, Massachusetts 01731

Dr. Carl E. Baum  
AFWL (ES)  
Kirtland AFB, New Mexico 87117

Dr. E. Champagne  
AFAL/DH  
Wright-Patterson AFB, Ohio 45433

Dr. R. P. Dolan  
RADC/ESR  
Hanscom AFB, Massachusetts 01731

Mr. W. Edwards  
AFAL/DH  
Wright-Patterson AFB, Ohio 45433

Professor R. E. Fontana  
Head, Dept. of Electrical Engineering  
AFIT/ENE  
Wright-Patterson AFB, Ohio 45433

Dr. Alan Garscadden  
AFAPL/POD  
Wright-Patterson AFB, Ohio 45433

USAF European Off. of Aerosp. Res.  
Attn: Major J. Gorrell  
Box 14  
FPO, New York 09510

LTC Richard J. Gowen  
Department of Electrical Engineering  
USAF Academy, Colorado 80840

Mr. Murray Kesselman (ISCA)  
Rome Air Development Center  
Griffiss AFB, New York 13441

Dr. G. Knausenberger  
Air Force Member, TAC  
Air Force Office of Scientific  
Research, (AFSC) AFSOR/NE  
Bolling Air Force Base, D. C. 20332

Col. R. V. Gomez  
Air Force Member, TAC  
Air Force Office of Scientific  
Research, (AFSC) AFSOR/NE  
Bolling Air Force Base, D. C. 20332

Mr. R. D. Larson  
AFAL/DHR  
Wright-Patterson AFB, Ohio 45433

Dr. Edward Altshuler  
RADC/EEP  
Hanscom AFB, Massachusetts 01731

Mr. John Mottsmith (MCI)  
HQ ESD (AFSC)  
Hanscom AFB, Massachusetts 01731

Dr. Richard Picard  
RADC/ETSL  
Hanscom AFB, Massachusetts 01731

Dr. J. Ryles  
Chief Scientist  
AFAL/CA  
Wright-Patterson AFB, Ohio 45433

Dr. Allan Schell  
RADC/EE  
Hanscom AFB, Massachusetts 01731

Mr. H. E. Webb, Jr. (ISCP)  
Rome Air Development Center  
Griffiss AFB, New York 13441

Dr. R. Kelley  
Air Force Office of Scientific  
Research, (AFSC) AFOSR/NP  
Bolling Air Force Base, D. C. 20332

LTC G. McKemie  
Air Force Office of Scientific  
Research, (AFSC) AFOSR/NM  
Bolling Air Force Base, D. C. 20332

Department of the Navy

Office of Naval Research  
Attn: Code 220/221  
800 North Quincy Street  
Arlington, Virginia 22217

Office of Naval Research  
Attn: Code 427  
800 North Quincy Street  
Arlington, Virginia 22217

Office of Naval Research  
Attn: Code 432  
800 North Quincy Street  
Arlington, Virginia 22217

Naval Research Laboratory  
Attn: Code 1405, Dr. S. Teitler  
4555 Overlook Avenue, S.W.  
Washington, D. C. 20375

Naval Research Laboratory  
Attn: Code 2627 Mrs. D. Folen  
4555 Overlook Avenue, S.W.  
Washington, D. C. 20375

Naval Research Laboratory  
Attn: Code 5200, A. Brodzinsky  
4555 Overlook Avenue, S.W.  
Washington, D. C. 20375

Naval Research Laboratory  
Attn: Code 5210, J. E. Davey  
4555 Overlook Avenue, S.W.  
Washington, D. C. 20375

Naval Research Laboratory  
Attn: Code 5270, B. D. McCombe  
4555 Overlook Avenue, S.W.  
Washington, D. C. 20375

Naval Research Laboratory  
Attn: Code 5403, J. E. Shore  
4555 Overlook Avenue, S.W.  
Washington, D. C. 20375

Naval Research Laboratory  
Attn: Codes 5464/5410, J. R. Davis  
4555 Overlook Avenue, S.W.  
Washington, D. C. 20375

Naval Research Laboratory  
Attn: Code 5510, W. L. Faust  
4555 Overlook Avenue, S.W.  
Washington, D. C. 20375

Naval Research Laboratory  
Attn: Code 7701, J. D. Brown  
4555 Overlook Avenue, S.W.  
Washington, D. C. 20375

Director  
Office of Naval Research  
Branch Office  
495 Summer Street  
Boston, Massachusetts 02210

Director  
Office of Naval Research  
New York Area Office  
715 Broadway, 5th Floor  
New York, New York 10003

Director  
Office of Naval Research  
Branch Office  
536 South Clark Street  
Chicago, Illinois 60605

Director  
Office of Naval Research  
Branch Office  
1030 East Green Street  
Pasadena, California 91101

Office of Naval Research  
San Francisco Area Office  
760 Market Street, Room 447  
San Francisco, California 94102

Naval Surface Weapons Center  
Attn: Technical Library  
Code DX-21  
Dahlgren, Virginia 22448

Dr. J. H. Mills, Jr.  
Naval Surface Weapons Center  
Code DF  
Dahlgren, Virginia 22448

Naval Air Development Center  
Attn: Code 01, Dr. R. Lobb  
Johnsville  
Warminster, Pennsylvania 18974

Naval Air Development Center  
Attn: Code 202, T. Shopple  
Johnsville  
Warminster, Pennsylvania 18974

Naval Air Development Center  
Technical Library  
Johnsville  
Warminster, Pennsylvania 18974

Dr. Gernot M. R. Winkler  
Director, Time Service  
US Naval Observatory  
Mass. Avenue at 34th Str., N.W.  
Washington, D. C. 20390

Dr. G. Gould  
Technical Director  
Naval Coastal Systems Laboratory  
Panama City, Florida 32401

Dr. W. A. VonWinkle  
Associate Technical Dir. for Techn.  
Naval Underwater Systems Center  
New London, Connecticut 06320

Naval Underwater Systems Center  
Attn: J. Merrill  
Newport, Rhode Island 02840

Technical Director  
Naval Underwater Systems Center  
New London, Connecticut 06320

Naval Research Laboratory  
Underwater Sound Reference Div.  
Technical Library  
P. O. Box 8337  
Orlando, Florida 32806

Naval Ocean Systems Center  
Attn: Code 01, H. L. Blood  
San Diego, California 92152

Naval Ocean Systems Center  
Attn: Code 015, P. C. Fletcher  
San Diego, California 92152

Naval Ocean Systems Center  
Attn: Code 9102, W. J. Dejka  
San Diego, California 92152

Naval Ocean Systems Center  
Attn: Code 922, H. H. Wieder  
San Diego, California 92152

Naval Ocean Systems Center  
Attn: Code 532, J. H. Richter  
San Diego, California 92152

Naval Weapons Center  
Attn: Code 601, F. C. Essig  
China Lake, California 93555

Naval Weapons Center  
Attn: Code 5515, M. H. Ritchie  
China Lake, California 93555

Donald E. Kirk  
Professor & Chairman, Elec. Engin.  
Sp-304  
Naval Postgraduate School  
Monterey, California 93940

Mr. J. C. French  
National Bureau of Standards  
Electronics Technology Division  
Washington, D. C. 20234

Harris B. Stone  
Office of Research, Development,  
Test & Evaluation  
NOP-987  
The Pentagon, Room 5D760  
Washington, D. C. 20350

Dr. A. L. Slafkosky  
Code RD-1  
Headquarters Marine Corps  
Washington, D. C. 20380

Dr. H. J. Mueller  
Naval Air Systems Command  
Code 310, JP #1  
1411 Jefferson Davis Hwy.  
Arlington, Virginia 20360

Mr. Larry Sumney  
Naval Electronics Systems Command  
Code 03R, NC #1  
2511 Jefferson Davis Hwy.  
Arlington, Virginia 20360

Naval Sea Systems Command  
Attn: Code 03C, J. H. Huth  
NC #3  
2531 Jefferson Davis Hwy.  
Arlington, Virginia 20362

Officer in Charge  
Attn: Code 522.1, Technical Library  
Carderock Laboratory  
David Taylor Naval Ship Research  
& Development Center  
Bethesda, Maryland 20084

Officer in Charge  
Attn: Code 18, G. H. Gleissner  
Carderock Laboratory  
David Taylor Naval Ship Research  
& Development Center  
Bethesda, Maryland 20084

Naval Surface Weapons Center  
Attn: Code WX-40, Technical Library  
White Oak  
Silver Spring, Maryland 20910

Naval Surface Weapons Center  
Attn: Code WR-303, R. S. Allgaier  
White Oak  
Silver Spring, Maryland 20910

Naval Surface Weapons Center  
Attn: Code WR-34, H. R. Riedl  
White Oak  
Silver Spring, Maryland 20910

Other Government Agencies

Dr. Howard W. Etzel  
Deputy Director  
Division of Materials Research  
National Science Foundation  
1800 G Street  
Washington, D. C. 20550

Mr. J. C. French  
National Bureau of Standards  
Electronics Technology Division  
Washington, D. C. 20234

Dr. Jay Harris  
Program Director  
Devices and Waves Program  
National Science Foundation  
1800 G Street  
Washington, D. C. 20550

Los Alamos Scientific Laboratory  
Attn: Reports Library  
P. O. Box 1663  
Los Alamos, New Mexico 87544

Dr. Dean Mitchell  
Program Director, Solid-State Physics  
Division of Materials Research  
National Science Foundation  
1800 G Street  
Washington, D. C. 20550

Mr. F. C. Schwenk, RD-T  
National Aeronautics & Space Admin.  
Washington, D. C. 20546

M. Zane Thornton  
Deputy Director, Institute for  
Computer Sciences & Technology  
National Bureau of Standards  
Washington, D. C. 20234

Head  
Electrical Sciences & Analysis Sec.  
National Science Foundation  
1800 G Street, N.W.  
Washington, D. C. 20550

Non-Government Agencies

Director  
Columbia Radiation Laboratory  
Columbia University  
538 West 120th Street  
New York, New York 10027

Director  
Coordinated Science Laboratory  
University of Illinois  
Urbana, Illinois 61801

Director  
Division of Engineering &  
Applied Physics  
Harvard University  
Pierce Hall  
Cambridge, Massachusetts 02138

Director  
Electronics Research Center  
The University of Texas  
P. O. Box 7728  
Austin, Texas 78712

Director  
Electronics Research Laboratory  
University of California  
Berkeley, California 94720

Dr. Roy Gould  
Executive Officer for Applied Physics  
California Institute of Technology  
Pasadena, California 91125

Director  
Electronics Sciences Laboratory  
University of Southern California  
Los Angeles, California 90007

Director  
Microwave Research Institute  
Polytechnic Institute of New York  
333 Jay Street  
Brooklyn, New York 11201

Director  
Research Laboratory of Electronics  
Massachusetts Institute of Technology  
Cambridge, Massachusetts 02139

Director  
Stanford Electronics Laboratory  
Stanford University  
Stanford, California 94305

Director  
Stanford Ginzton Laboratory  
Stanford University  
Stanford, California 94305

Dr. Lester Eastman  
School of Electrical Engineering  
Cornell University  
Ithaca, New York 14850

Chairman  
Department of Electrical Engineering  
Georgia Institute of Technology  
Atlanta, Georgia 30332

Dr. Carlton Walter  
ElectroScience Laboratory  
The Ohio State University  
Columbus, Ohio 43212

Dr. Richard Saeks  
Department of Electrical Engineering  
Texas Tech University  
Lubbock, Texas 79409



