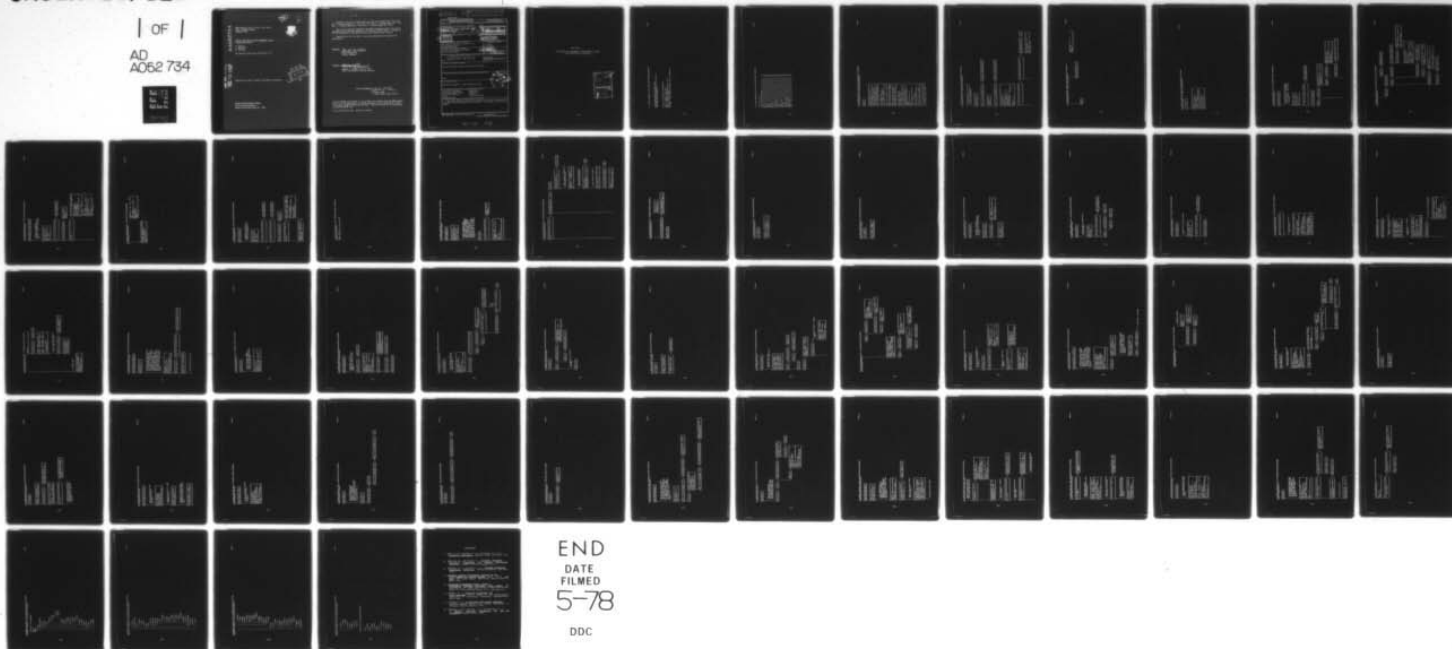


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Final Technical Report
February 1978



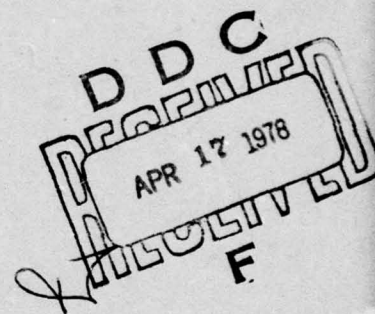
JOVIAL STRUCTURED DESIGN DIAGRAMMER (JSDD), *Volume 4*
Program Description, *Part 4*

G. Goddard
M. Whitworth
E. Strovink

The Charles Stark Draper Laboratory, Inc.

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Air Force Systems Command
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The report presents a detailed description of the JOVIAL Structured Design Diagrammer program implementation for purposes of maintaining or modifying the system.		

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Section 9

Invocation Diagrammer Structured Design
and Invocation Diagrams

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C S DRAPER LABORATORY JOVIAL STRUCTURED DESIGN DIAGRAMMER

THIS LISTING CONSISTS OF OUTPUT FROM
THE CHARLES STARK DRAPER LABORATORY'S JOVIAL J3
STRUCTURED DESIGN DIAGRAMMER.

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C S ORAPER LABORATORY JOVIAL STRUCTURED DESIGN DIAGRAMMER

TABLE OF CONTENTS

THE INVOCATION DIAGRAMMER	3
OUT	7
SUBSTR	9
CAT	11
CHVERT	13
SPACES	18
NULL	19
LENGTH	20
OUT*LINE	21
PUT*OUT	22
STUMP*NO	24
NUMJ	25
INITIALIZATION	26
FIRST*PASS	27
FIND	30
INSEPT	32
EQUALS	33
SECOND*PASS	35
SET*BIT	38
GET*BIT	39
WARSHALL	40
CHECK*RECURSION	43
PRINT	44
WRITE*PROC*NAME	45
WRITE*HORIZ	48
PUSH	49

C S DRAPER LABORATORY JOVIAL STRUCTURED DESIGN DIAGRAMMER
DESIGN DIAGRAM OF THE INVOCATION DIAGRAMMER

```

*****
*START $
*****
.
.
*****
*ITEM GTEMP70 H 70 $
*OFFLINE INTEGER --I 36 S-- $
*DEFINE CHARACTER --M 150-- $
*ARRAY BIT*ARRAY 200H 70 $
*ITEM CONT*FLAG INTEGER P 0 $
**TO DETERMINE WHETHER TO
*PRINT CONTINUATION MESSAGE**
*ITEM LINE*NUMBER INTEGER P 0 $
.
*ITEM TEMP11 H 1 $
*ITEM TEMP12 CHARACTER $
*ITEM TEMP13 CHARACTER $
*FILE DIAG*OUT H 10000 V 150 13*
. $
*ITEM PAGE CHARACTER P 5H(PAGE
. ) $
*ARRAY STOP*FLAG 200 INTEGER $
*ARRAY NEXT*CALLED 200 INTEGER
. $
*ARRAY HOST*PROC 200 INTEGER $
*ARRAY COLUMN 200 INTEGER $
*ITEM HOST H 120 P 1H( ) $
*ARRAY FLAG*ARRAY 200 INTEGER $
.
*ITEM INDEX INTEGER $
*ITEM TEMP11 INTEGER $
*ITEM TEMP13 H 30 $
*FILE FILE B 10000 R 301 V(A)
* V(D) V(C) V(D) V(E) V(F) 11 $
*ITEM REC*SIZE INTEGER $
*ITEM MAX*ENTRY INTEGER P 0 $
*TABLE FILE08 R 60 S N $
*BEGIN
*ITEM FG*ENTRY H 30 $
*END
*ARRAY PROC*ARRAY 200H 30 $
. BEGIN 3CH(==
. ) END
*ITEM PTR INTEGER P 0 $
*ITEM STUMP*NUMBER INTEGER P 0
. $
***TO KEEP TRACK OF STUMPS**
*ITEM LINE*LENGTH INTEGER P 118*
. $
***SHOULD EVENTUALLY BE EQUATED*
*TO THE VARIABLE MARK USES TO
*DETERMINE MAY PAGE WIDTH**
*****

```

C S DRAPER LABORATORY JOVIAL STRUCTURED DESIGN DIAGRAMMER
DESIGN DIAGRAM OF THE INVOCATION DIAGRAMMER

```

*****
*****
**START OF MAIN PROGRAM FOR
** INVOCATION DIAGRAMS**
*****
*****
*****INITIALIZATION $ *****
**FIRST PASS $ **
*****
*****
*****
*****TEMPH30 = PROC*ARRAY($IS) $ *****
**FOR I = 0, 1, MAX*ENTRY - 1 $ *****
*****
*****
*****
*****SECOND PASS $ *****
*****MARSHALL $ *****
*****
*****
*****
*****TEMPH30 = PROC*ARRAY($IS) $ *****
**FOR I = 0, 1, MAX*ENTRY - 1 $ *****
*****
*****
*****
*****CHECK*RECUPSION $ *****
*****PTR = 0 $ *****
*****STOP*FLAG($IS) = 0 $ *****
*****HORIZ = 1H( ) $ *****
*****NEXT*CALLED($IS) = 0 $ *****
*****COLUMN($IS) = 0 $ *****
*****HCST*PROC($IS) = 0 $ *****
*****PROC*ARRAY($IS) = 30H(***MAIN
***** ) $ *****
*****PRINT $ *****
*****TEMP11 = 1 $ *****
*****
*****
*****DO WHILE [TEMP11 LS MAX*ENTRY] *****
*****IF FLAG*ARRAY($TEMP11) EQ 1 $ *****
*****IF CONT*FLAG EQ 0 $ ***** 6 *****
*****
*****
*****
*****STOP*FLAG($IS) = 0 $ *****
*****HORIZ = 1H( ) $ *****
*****NEXT*CALLED($IS) = TEMP11 $ *****
*****COLUMN($IS) = 0 $ *****

```

```
*PTR = 0 $
*PRINT $
```

```

. . .
*TEMPI = TEMPI + 1 $

```

*TERM \$ *

C S DRAPER LABORATORY JOVIAL STRUCTURED DESIGN DIAGRAMMER
DESIGN DIAGRAM OF THE INVOCATION DIAGRAMMER

```

*****
* 6 FROM 4 *
*****
.
.
*****
*CONT*FLAG = 1 $
*TEMPH2 = SPACES(1) $
*PUT*OUT(TEMPH2) $
*PUT*OUT(TEMPH2) $
*TEMPH2 = 3*(CONTINUATIONS
* AND INDEPENDENT ROUTINES) $
*PUT*OUT(TEMPH2) $
*TEMPH2 = SPACES(1) $
*PUT*OUT(TEMPH2) $
*PUT*OUT(TEMPH2) $
*****

```


[illegible]

601

602

C S DRAPER LABORATORY JOVIAL STRUCTURED DESIGN DIAGRAMMER
DESIGN DIAGRAM OF SUBSTR

```

*ENCODE(CH(I IG), NUM = YC6) *
* *
*TC1 = TC6 $
*OUTCAT(TC, TC1), {PTERR) $
*LN1 = CONST $
*SUBSTR = SF1 $
*RETURN $
*.....

```

```

*.....
*BYTE(86, NUMS)(SF2) = BYTE(85
* + FIRST, NUMS)(SF1) $
*LN2 = NUM + CONST $
*SUBSTR = SF2 $
*.....

```


C S ORAPER LABORATORY JOVIAL STRUCTURED DESIGN DIAGRAMMER
DESIGN DIAGRAM OF CAT

```

.....
*PROC CAT(AA, BB) $ *
.....
*
*
* **RETURNS THE RESULT OF
*   CONCATENATING STRING BB TO
*   THE END OF STRING AA**
*
*
*.....
*ITEM AA M 150 $ *
*ITEM BB M 150 $ *
*ITEM CAT M 150 $ *
*SF1 = AA $ *
*SF2 = BB $ *
*.....
*
*
*.....
*IF BYTE(10, 18)(SF1) NQ 1H(( ) *
* $ *-----SF1 = CNVERT(AA) $ *
*.....
*
*
*.....
*IF BYTE(10, 18)(SF2) NQ 1H(( ) *
* $ *-----SF2 = CNVERT(BB) $ *
*.....
*
*
*.....
*IF (LN2 - CONST) EQ 0 $ *-----CAT = SF1 $ *
*.....
*RETURN $ *
*.....
*
*
*.....
*IF (LN1 + LN2 - CONST2) GR *
* MAXCOL $ *-----LN2 = MAXCOL - LN1 + CONST2 $ *
*.....
*TC = 20H(*** CONCAT ERROR ***)*
* $ *
*OUT(TC, RPTERR) $ *
*TC = 18H(TRUNCATED STRING) $ *
*
*
*OUT(TC, RPTERR) $ *
*OUT(SF2, RPTERR) $ *
*.....
*
*
*.....
*BYTE(16 + LN1 - CONST, LN2 - *
* CONST)(SF1) = BYTE(16, LN2 - *
* CONST)(SF2) $ *
*LN1 = LN1 + LN2 - CONST $ *

```

C S DRAPER LABORATORY JOVIAL STRUCTURED DESIGN DIAGRAMMER
DESIGN DIAGRAM OF CAT

*CAT = SF1 8

606

607

G S DRAPER LABORATORY JOVIAL STRUCTURED DESIGN DIAGRAMMER
DESIGN DIAGRAM OF CHVERT

```

.
.
.
.
.
.
.....
*II = II + 1 $ *
*LOOP ON II .. *
.....
.....
*IF II EQ 25 AND DONE EQ 0 $ *---SF6 = SPACES(MAXCOL) $ *
.....
*LINE WAS ENTIRELY BLANK .. *
.....
.
.....
*CHVERT = SF6 $ *
.....

```

C S DRAPER LABORATORY JOVIAL STRUCTURED DESIGN DIAGRAMMER
DESIGN DIAGRAM OF CNVRT

```

.....
* 16 FROM 14 *
.....
.
.
.....
* BYTE(S12 - JJ, 144 - 6 *
* IIS(SF6) = BYTE(SII * 6 + 6 *
* 144 - 6 * IIS(SF3) *
.....

```

C S DRAPER LABORATORY JOVIAL STRUCTURED DESIGN DIAGRAMMER
DESIGN DIAGRAM OF CNVERT

```

.....
* 17 FROM 14 *
*.....
*
*
*.....
* LWS = MAXCOL + CONST 8 *
* ** TRUNCATE THE STRING **
*.....

```

611

612

613

614

615

616

617

618

619

620

621

C S DRAPER LABORATORY JOVIAL STRUCTURED DESIGN DIAGRAMMER
DESIGN DIAGRAM OF FIRST-PASS

```

.....
* 29 FROM 27 *
.....
.
.
.....
*TEMP30 = F0-ENTRY(SI) $
**PICKUP SYNTAB ENTRY**
.....
.
.....
*IF FIND(TEMP30) NO 1 $
**INSERT IF NOT THERE**
*-----*INSERT(TEMP30) $
.....

```

623

624

625

```
*****
**PROC EQUALS(SEARCH, TEMP30) &
*****
```

```

* *COMPARES CHARACTER STRINGS
* *ON A BIT LEVEL FOR SORTING
* *PURPOSES. RETURNS 0 IF
* *ARGUMENTS ARE EQUAL (IF
* *INDEXED NAME IN PROC=ARRAY
* *(INDEXED BY SEARCH) IS EQUAL
* *TO ARGUMENT STRING TEMP30). 1
* *IF TEMP30 BELONGS AFTER THE
* *INDEX, AND -1 IF IT BELONGS
* *BEFORE*.

```

[illegible]

```

*****
***** DO WHILE {1} *****
***** *-----*COUNT = COUNT + 1 *
***** *TEMP1 = BIT(COUNT * 30, *
***** * 30)(TEMP3) *
*****
*****

```

- ••CLEARLY, COMPARISON IS GOING
- TO TAKE PLACE ON BIT LEVEL,
- SINCE WE HAVE TO TREAT THE
- CHARACTERS IN THE NAMES AS
- NUMBERS..

```
*****
TEMP12 = BIT(COUNTER * 30,
             30$(TEMP301) $
*****
```

```

*****      *****
**IFEITH **--*TEMPI LS TEMPI2 $ *---+
*****      *****
**WE'RE LUCKY - THE FIRST

```



```

: COMPARISON WORKED**
:
:
*****
*EQUALS = - 1 $ *
*RETURN $
*****

*****
*****EQUALS = 1 $
*****SAME LUCK AS ABOVE**
*RETURN $
*****

*****ORIF TEMPI1 GR TEMPI2 $
*****
*****ORIF COUNTER EQ 5 $
*****
*****EQUALS = 0 $
*****RETURN $
*****

```

628

G S DRAPER LABORATORY JOVIAL STRUCTURED DESIGN DIAGRAMMER
DESIGN DIAGRAM OF SECOND-PASS

```

.....
* 36 FROM 35 *
.....
.
.
.....
*CUR*PROC = INDEX $ *
**LOOKUP NAME**
.....

```

630

C S DRAPER LABORATORY JOVIAL STRUCTURED DESIGN DIAGRAMMER
DESIGN DIAGRAM OF SET-BIT

```

*****
*PROC SET-BIT(AA, BB, CC) $ *
*****
.
.
.
*..UTILITY PROCEDURE TO SET A
* BIT IN THE BIT ARRAY
* DATABASE..
.
.
*****
*ITEM AA INTEGER $
*ITEM BB INTEGER $
*ITEM CC INTEGER $
*ITEM TEMP70 W 70 $
*TEMP70 = BIT-ARRAY(AAAS) $
*****
.
.
.
*..INTRODUCE TEMPORARY TO AVOID
* COMPILER BOMB..
.
*****
*BIT(88 * 2, 28)(TEMP70) =
* BIT(84, 28)(CC) $
*****
.
.
.
*..BIT-ARRAY IS IMPLEMENTED AS
* CHARACTER STRINGS, SO THAT $
* WHY THE BIT FUNCTION MUST BE
* USED..
.
.
*****
*BIT-ARRAY(AAAS) = TEMP70 $
*..RE-ASSIGNMENT OF TEMPORARY..
*
*****

```


632

633

```

*****
* 41 FROM 49 *
*****
.
.
.
*****
IF GET'BIT(J, I) NQ 0 $ *****
FOR K = 0, 1, MAX'ENTRY - 1 $ *****
IF GET'BIT(I, K) NQ 0 $ *****
***** 42 *****

```

C S DRAPER LABORATORY JOVIAL STRUCTURED DESIGN DIAGRAMMER
DESIGN DIAGRAM OF MARSHALL

```

.....
* 42 FROM 41 *
.....
.
.
.
.....
*IF GET-BIT(J, K) EQ 8 $ *-----SET-BIT(J, K, 2) $ *
.....
*FLAG = 0 $
.....

```

```
*****PROC CHECK* RECURSION $*****
```

- "ALL WE HAVE TO DO TO CHECK
- FOR RECURSIVE LOOPS IS TO
- EXAMINE THE MAIN DIAGONAL OF
- THE BIT MATRIX. IF THERE ARE
- ANY NONZERO ELEMENTS, THEN
- THE PROCEDURE OF THAT INDEX
- IS EITHER PART OF A RECURSIVE
- LOOP OR SIMPLY CALLS
- ITSELF."

```
*****
*ITEM FLAG B $
*ITEM MESSAGE M 150 $
*FLAG = 0 $
*****
```

```
*-----IF GET'DITL, I) HQ O $ *---FLAG*ARRAY(SIS) = 10000 $ *
```

```
*FOR I = 0, MAXENTRY - 1 $
```

```
*FLAG = 1 $
```

```
*****
** FLAG $ *****
*****
***** MESSAGE = 25H(ULTIMATELY
*****
***** SELF-RECURSIVE) $
*****
***** PUT-OUT (MESSAGE) $
*****
***** MESSAGE = SPACES(1) $
*****
***** PUT-OUT (MESSAGE) $
*****
*****
```

```

*****
FOR I = 0, 1, MAX*ENTRY - 1 $ *****IF FLAG*ARRAY(SIS) EQ 1000 $ *****MESSAGE = PROC*ARRAY(SIS) $ *****PUT*OUT(MESSAGE) $ *****
*****

```


637

638

639

640

C S DRAPER LABORATORY JOVIAL STRUCTURED DESIGN DIAGRAMMER
DESIGN DIAGRAM OF WRITE*HORIZ

```

*****
*PROC WRITE*HORIZ $
*****
.
.
.
*..THIS PROCEDURE DUMPS HORIZ
* BASED ON THE CURRENT COLUMN
* VALUE..
.
*****
*ITEM TEMPC1 H 150 $
*ITEM R1 INTEGER $
*R1 = COLUMN(PT8) + 1 $
*TEMPC1 = 1H( ) $
*BYTE(80, R1)(TEMPC1) =
* BYTE(80, R1)(HORIZ) $
*TEMPH1 = BYTE(80, 15)(TEMPC1)
* $
*BYTE(80, 15)(TEMPC1) = 1H( ) $
* $
*TEMPH2 = BYTE(80,
* R1)(TEMPC1) $
*TEMPC1 = CONVERT(TEMPH2) $
*BYTE(86, 15)(TEMPC1) = TEMPH1
* $
*PUT*OUT(TEMPC1) $
*****

```


642

C S DRAPER LABORATORY JOVIAL STRUCTURED DESIGN DIAGRAMMER
DESIGN DIAGRAM OF PUSH

```

*****
* DONE = 0 $
* TEMPI1 = 0 $
*****
.
*****
* DO WHILE (TEMPI1 LQ MAX*ENTRY
* - 1 AND NOT DONE)
*****
*-----IF GET*BIT(HOST*PROC($PTRS)).
* TEMPI1 EQ 1 $
*
*-----NEXT*CALLED($PTRS) = TEMPI1 $
* STOP*FLAG($PTRS) = 0 $
* DONE = 1 $
*****
.
*****
* TEMPI1 = TEMPI1 + 1 $
*****

```

C S WRAPER LABORATORY JOVIAL STRUCTURED DESIGN DIAGRAMMER
INVOCATION DIAGRAM OF THE INVOCATION DIAGRAMMER

ULTIMATELY SELF-RECURSIVE

CNVERT
OUT
SPACES

```

--***MAIN
.
.---CHECK*RECURSION
.
.---GET*BIT
.
.---PUT*OUT
.
.---CAT
.
.---CNVERT
.
.---SPACES
.
.---OUT
.
.---CNVERT*
.
.---TRMOUT*
.
.---OUT*
.
.---ENCODE*
.
.---LENGTH
.
.---CNVERT*
.
.---OUT*LINE
.
.---CNVERT*
.
.---LENGTH
.
.---CNVERT*
.
.---REMQUO*
.
.---SPACES*
.
.---SPACES*
.
.---FIRST*PASS
.
.---FIND
.
.---EQUALS
.
.---REMQUO*
.

```

C S DRAPER LABORATORY JOVIAL STRUCTURED DESIGN DIAGRAMMER
INVOCATION DIAGRAM OF THE INVOCATION DIAGRAMMER

```

.  *--INSERT
.  *--INITIALIZATION
.  *--CAT
.  *--CNVERT*
.  *--OUT*
.  *--CNVERT*
.  *--PRINT
.  *--PUSH
.  *--GET*BIT
.  *--WRITE*HORIZ
.  *--CNVERT*
.  *--PUT*OUT
.  *--CAT
.  *--CNVERT*
.  *--OUT*
.  *--ENCODE*
.  *--LENGTH
.  *--CNVERT*
.  *--OUT*LINE
.  *--CNVERT*
.  *--LENGTH
.  *--CNVERT*
.  *--REMQUO*
.  *--SPACES*
.  *--WRITE*PROC*NAME
.  *--CNVERT*
.  *--PUT*OUT
.  *--CAT

```


C S DRAPER LABORATORY JOVIAL STRUCTURED DESIGN DIAGRAMMER
INVOCATION DIAGRAM OF THE INVOCATION DIAGRAMMER

```

. ---FIND
.
. ---EQUALS
.
. ---REMQUO+
.
. ---SET*BIT
.
. ---SPACES+
.
. ---MARSHALL
.
. ---GET*BIT
.
. ---SET*BIT

```

CONTINUATIONS AND INDEPENDENT ROUTINES

```

--NULL
.
. ---CNVERT+
.
--NUMJ
.
. ---ENCODE+
.
. ---TRMOUT+
.
--SUBSTR
.
. ---CAT
.
. ---CNVERT+
.
. ---OUT+
.
. ---CNVERT+
.
. ---ENCODE+
.
. ---OUT+

```

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