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Produced by the NASA Center for Aerospace Information (CASI)
SUTIL: System Utilities Routines
Revision C

by: Dale Harper, Sigma Corporation

Prepared for:
NASA Johnson Space Center
Houston, Texas 77058
December, 1976
PREFACE

This report was prepared under Contract NAS9-14520, "Development of the Engineering Design Intergration System". The study was performed during a period from January 1975 through December 1976. The study was funded by the National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston Texas. The prime contractor for the study was Sigma Corporation and the study was monitored by Mr. Robert Abel of the NASA Engineering Analysis Division.
# Table of Contents

<table>
<thead>
<tr>
<th>Introduction</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subroutine Descriptions</td>
<td></td>
</tr>
<tr>
<td>Get value from operator</td>
<td></td>
</tr>
<tr>
<td>IGET</td>
<td>3</td>
</tr>
<tr>
<td>Calling Sequence</td>
<td>4</td>
</tr>
<tr>
<td>Arguments</td>
<td>4</td>
</tr>
<tr>
<td>Error Conditions</td>
<td>4</td>
</tr>
<tr>
<td>RGGET</td>
<td>5</td>
</tr>
<tr>
<td>Calling Sequence</td>
<td>6</td>
</tr>
<tr>
<td>Arguments</td>
<td>6</td>
</tr>
<tr>
<td>Error Conditions</td>
<td>6</td>
</tr>
<tr>
<td>OGET</td>
<td>7</td>
</tr>
<tr>
<td>Calling Sequence</td>
<td>8</td>
</tr>
<tr>
<td>Arguments</td>
<td>8</td>
</tr>
<tr>
<td>Error Conditions</td>
<td>8</td>
</tr>
<tr>
<td>Get AMOS string from operator</td>
<td></td>
</tr>
<tr>
<td>SGET</td>
<td>9</td>
</tr>
<tr>
<td>Calling Sequence</td>
<td>9</td>
</tr>
<tr>
<td>Arguments</td>
<td>9</td>
</tr>
<tr>
<td>Error Conditions</td>
<td>9</td>
</tr>
<tr>
<td>Get yes or no answer from operator</td>
<td></td>
</tr>
<tr>
<td>YESNO</td>
<td>10</td>
</tr>
<tr>
<td>Calling Sequence</td>
<td>10</td>
</tr>
<tr>
<td>Arguments</td>
<td>13</td>
</tr>
<tr>
<td>Monitor listing device</td>
<td></td>
</tr>
<tr>
<td>MLIST</td>
<td>12</td>
</tr>
<tr>
<td>Calling Sequence</td>
<td>12</td>
</tr>
<tr>
<td>Error Conditions</td>
<td>14</td>
</tr>
<tr>
<td>Time Delay</td>
<td></td>
</tr>
<tr>
<td>IDELAY</td>
<td>16</td>
</tr>
<tr>
<td>Calling Sequence</td>
<td>16</td>
</tr>
<tr>
<td>Error Conditions</td>
<td>16</td>
</tr>
<tr>
<td>Ring TTY bell</td>
<td></td>
</tr>
<tr>
<td>RBELL</td>
<td>16</td>
</tr>
<tr>
<td>Calling Sequence</td>
<td>16</td>
</tr>
<tr>
<td>Error Conditions</td>
<td>16</td>
</tr>
<tr>
<td>Free format ANX/TTY input</td>
<td></td>
</tr>
<tr>
<td>RDLIN</td>
<td>17</td>
</tr>
<tr>
<td>Calling Sequence</td>
<td>17</td>
</tr>
<tr>
<td>Error Conditions</td>
<td>17</td>
</tr>
<tr>
<td>Examples</td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td>11</td>
</tr>
<tr>
<td>Test1</td>
<td>15</td>
</tr>
</tbody>
</table>
Language............................ 18
Subroutine Length.................. 18
Equipment.......................... 18
Authorship.......................... 18
INTRODUCTION

SUTIL is a package of FORTRAN callable subroutines which allow efficient communication of data between users and programs.

Calls to SUTIL routines which output text to the screen will unconditionally load monitor overlay buffer 1 with the LABEL segment (if not already loaded), i.e. Calls into the SUTIL package must not be concurrent with FORTRAN use of monitor overlay buffer 1.

Text and values output to the screen by SUTIL routines IGET, RGET, OGET, SGET, and YESNO cannot be printed on the PPL, as PPL driver uses monitor overlay buffer 1.

Proper utilization of the SUTIL package will significantly reduce program core requirements and expedite program development.
IGET

IGET is a FORTRAN callable routine designed to display a message for the operator on the AGT screen.

Routine will display the minimum and maximum bounds and current value for an integer variable, accept the current value with a C/R, or a new typein value from the operator.

If an image is being displayed prior to calling IGET a subimage link is formed to enable the image to remain on the screen with message, bounds and current value display, this link is removed on return from subroutine.

If operator types in a new value, it is compared to the upper and lower bound. If within bounds, new value is returned to the calling program. If out of bounds, variable is set to the value of the crossed boundary, the TTY bell is rung, and the following error message is displayed for the operator:

LIMIT EXCEEDED, DEFAULT VALUE ASSUMED
(MIN=XXX,MAX=XXX) CURRENT=XXX

Simple math may be included in typein, however it must be in polish string format.
i.e. no ( ) and solution is from left to right.

Characters which may be included in type string are:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>Add</td>
</tr>
<tr>
<td>-</td>
<td>Subtract</td>
</tr>
<tr>
<td>*</td>
<td>Multiply</td>
</tr>
<tr>
<td>/</td>
<td>Divide</td>
</tr>
<tr>
<td>=</td>
<td>Sum</td>
</tr>
<tr>
<td>X</td>
<td>Change sign</td>
</tr>
</tbody>
</table>

Other characters cause the TTY bell to ring and the following error message is displayed for the operator:

ERROR: ILLEGAL CHARACTER

i.e. 100/25*25-50+50 equals 100
100/2.5+60 equals 100
100 + 50X + 50 equals 100 (X = change sign)

Typein followed by an '=' sign will cause the sum to replace typein. This sum may be accepted with a C/R or a new VALUE typed.
CALLING SEQUENCE

CALL IGET (IVALUE, MIN, MAX, "MESSAGE", IFLAG)

ARGUMENTS

1 IVALUE Variable (I/O integer).
2 MIN Minimum bound for IVALUE (input integer).
3 MAX Maximum bound for IVALUE (input integer).
4 MESSAGE ASCII string (input).
   An ASCII character string to be displayed for the
   user. The MESSAGE is small characters at left side
   of screen unless ASCII control characters are in
   MESSAGE string,
   i.e., \$0000,\$V000,\$C,\$F,\$E,\$S characters will
   change MESSAGE size and position.

5 IFLAG (input integer).
   If positive, clear prior MESSAGE(s) before
   displaying MESSAGE. Else add this MESSAGE to any
   previous MESSAGE(s).

ERROR CONDITIONS

All errors are properly handled internally. If numbers are out of range as
input, TTY bell rings and a message to the user will appear requesting a
new input.
RGET

RGET is a FORTRAN callable routine designed to display a message for the operator on the HGT screen.

Routine will display the minimum and maximum bounds and current value for a real variable, accept the current value with a C/R, or a new typein value from the operator.

If an image is being displayed prior to calling RGET a subimage link is formed to enable the image to remain on the screen with message, bounds and current value display, this link is removed on return from subroutine.

If operator types in a new value, it is compared to the upper and lower bound. If within bounds, new value is returned to the calling program. If out of bounds, variable is set to the value of the crossed boundary, the TTY bell is rung, and the following error message is displayed for the operator:

LIMIT EXCEEDED, DEFAULT VALUE ASSUMED

\texttt{<MIN=XXX,MAX=XXX CURRENT=XXX>}

Simple math may be included in typein, however it must be in polish string format, i.e. no ( ) and solution is from left to right.

Characters which may be included in type string are:

\begin{tabular}{|c|c|}
\hline
Symbol & Function \\
\hline
+ & Add \\
- & Subtract \\
* & Multiply \\
/ & Divide \\
= & Sum \\
X & Change sign \\
\hline
\end{tabular}

Other characters cause the TTY bell to ring and the following error message is displayed for the operator:

\textbf{ERROR: ILLEGAL CHARACTER}

\texttt{i.e. 100/25*25-50+50 = 100}
\texttt{100/2.5+60 = 100}
\texttt{100 + 50X + 50 = 100 (X = change sign)}

Typein followed by an '=' sign will cause the sum to replace typein. This sum may be accepted with a C/R or a new VALUE typed.
CALLING SEQUENCE

CALL RGET (VALUE,RMIN,RMAX,"MESSAGE",IFLAG)

ARGUMENTS

1  VALUE  Variable (I/O real).
2  RMIN  Minimum bound for VALUE (input real).
3  RMAX  Maximum bound for VALUE (input real).
4  MESSAGE  ASCII string (input).
   An ASCII character string to be displayed for the user.
   The MESSAGE is small characters at left side of screen
   unless ASCII control characters are in MESSAGE string.
   i.e.,  9X6000,0Y000,6C,6F,6E  characters  will  change
   MESSAGE size and position.
5  IFLAG  (input integer).
   If positive, clear prior MESSAGE(s) before displaying
   MESSAGE.
   Else add this MESSAGE to any previous MESSAGE(s).

ERROR CONDITIONS

All errors are properly handled internally. If numbers are out of range as
input, TTY bell rings and a message to the user will appear requesting a
new input.
OGET is a FORTRAN callable routine designed to display a message for the operator on the CRT screen.

Routine will display the minimum and maximum bounds and current value for an octal variable. Accept the current value with a C/R, or a new typein value from the operator.

If an image is being displayed prior to calling OGET a subimage link is formed to enable the image to remain on the screen with message, bounds and current value display, this link is removed on return from subroutine.

If operator types in a new value, it is compared to the upper and lower bound. If within bounds, new value is returned to the calling program. If out of bounds, variable is set to the value of the crossed boundary, the TTY bell is rung, and the following error message is displayed for the operator:

LIMIT EXCEEDED, DEFAULT VALUE ASSUMED
(MIN=XXX, MAX=XXX) CURRENT=XXX

Simple math may be included in typein, however it must be in polish string format. I.e., no ( ) and solution is from left to right.

Characters which may be included in type string are:

<table>
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<tr>
<td>*</td>
<td>Multiply</td>
</tr>
<tr>
<td>/</td>
<td>Divide</td>
</tr>
<tr>
<td>=</td>
<td>Sum</td>
</tr>
<tr>
<td>X</td>
<td>Change sign</td>
</tr>
</tbody>
</table>

Other characters cause the TTY bell to ring and the following error message is displayed for the operator:

ERROR: ILLEGAL CHARACTER

I.e., 40_8 + 40_8 equals 100_8

Typein followed by an '=' sign will cause the sum to replace typein. This sum may be accepted with a C/R or a new VALUE typed.
CALLING SEQUENCE

CALL OGET (OVALUE, OMIN, OMAX, "MESSAGE", IFLAG)

ARGUMENTS

1 OVALUE Variable (input, output octal).
2 OMIN Minimum bound for OVALUE (input octal).
3 OMAX Maximum bound for OVALUE (input octal).
4 MESSAGE ASCII string (input).
   An ASCII character string to be displayed for the user. The MESSAGE is
   small characters at left side of screen unless ASCII control characters are in
   MESSAGE string. i.e., $X0000,$Y000,0C,0F,0E characters will change
   MESSAGE size and position.

5 IFLAG (input integer).
   If positive, clear prior MESSAGE(s) before displaying
   MESSAGE. Else add this MESSAGE to any previous
   MESSAGE(s).

ERROR CONDITIONS

All errors are properly handled internally. If numbers are out of range as
input, TTY bell rings and a message to the user will appear requesting a
new input.

TN 76-123
SGET is a FORTRAN callable routine designed to display a message for the
operator on the AGT screen, and accept a typed string from the operator.

If an image is being displayed prior to calling SGET a subimage link is
formed to enable the image to remain on the screen with message, bounds and
current value display. This link is removed on return from subroutine.

CALL SEQUENCE

CALL SGET (ARRAY, MESSAGE, KFLAG)

ARGUMENTS

1 ARRAY AMOS character array (output).
   Minimum length of array should be determined as follows:
   (use a multiple of 5 for maximum characters)
   If (maximum characters \leq 5) Length = 1
   Else
   Length = maximum characters / 5 + 1.
   If typed string is \geq 5 first word in array is pointer
to characters in form: -number words \rightarrow address of
   string.

2 MESSAGE ASCII string (input).
   An ASCII character string to be displayed for the user.
   The MESSAGE is small characters at left side of screen
   unless ASCII control characters are in MESSAGE string.
   i.e., @X0000, @Y0000, @C, @F, @E characters will change
   MESSAGE size and position.

3 KFLAG Optional (input integer).
   Maximum number of characters to accept from operator.
   (range = ± 1-132)
   If KFLAG argument is neg. prior MESSAGE(s) is not cleared.
   If KFLAG argument is omitted, prior MESSAGE(s) is cleared,
   and 10 set as maximum output characters.

ERROR CONDITIONS

All errors are properly handled internally.
YESNO

YESNO is a FORTRAN function designed to display a message for the operator on the AGT screen and accept the first character of operator type in string as a YES/NO answer.

I.e. Yes..."Y", "C/R", or "C/R".

No...anything else.

Calling program can branch on the returned function value.

If an image is being displayed prior to calling YESNO a subimage link is formed to enable the image to remain on the screen with message display, this link is removed on return from subroutine.

CALLING SEQUENCE

IF ( YESNO("MESSAGE",NFLAG)) 10,20  
or  LLL=YESNO("MESSAGE",NFLAG))

ARGUMENTS

1. MESSAGE  ASCII string (input).
   An ASCII character string to be displayed for the user. The MESSAGE is small characters at left side of screen unless ASCII control characters are in MESSAGE string.
   i.e., 9X0000,9Y0000,9C,9F,9E characters will change MESSAGE size and position.

2. NFLAG  (input integer).
   If positive, clear prior MESSAGE(s) before displaying MESSAGE. Else add this MESSAGE to any previous MESSAGE(s).

EXAMPLE

LOGICAL YESNO
EXTERNAL YESNO

IF ( YESNO("IS EVERYTHING OK",NFLAG) ) 10,20

If the typed response is "Y" C/R" or "C/R", the function value will be true, and statement 10 will be executed. Otherwise statement 20 will result from the false function value.
PROGRAM TEST
LOGICAL YESNO
IVAL = RVAL = 0.0
IMIN = RMIN = -9999.0
IMAX = RMAX = 9999.0
IOCTHL = 101B; MINOCTHL = 101B; MAXOCTHL = 2337B
C PUT UP MESSAGE ON SCREEN AND ACCEPT TYPEIN IN RANGE RMIN TO RMAX

10 CALL RGET(RVAL ,RMIN, RMAX, " @THIS MESSAGE WILL APPEAR AS A SMALL CHARACTERS, AT*GEOFFUP LEFT OF SCREEN, A 10GEOGOTYPE IN A REAL VALUE : @S", 1)

C ADD ANOTHER MESSAGE, ACCEPT INTEGER TYPE IN
CALL IGET (IVAL,IMIN,IMAX," @GEOGOTHE MESSAGE IS ADDED ALSO, @ THIS TIME WE ARE CALLING THE INTEGER ROUTINE, IF FRACTIONS @GEOGOF 
ARE TYPED IN, ONLY THE INTEGER PORTION IS RETURNED, S@GEOGOF 
INTEGER VALUE = : @S", -1)

C ADD ANOTHER MESSAGE
CALL IGET (IVAL,IMIN,IMAX," @GEOGOSIMPLE MATH MAYBE INCLUDED & 
IN TYPEIN, @GEOGOF HOWEVER IT MUST BE IN POLISH STRING FORMAT, @ 
I.E. NO ( ) AND SOLUTION IS FROM LEFT TO RIGHT, @ 
10GEOGOGEOGOF 
ONLY + - * / X ARE ALLOWED. S@GEOGOF 
ANY OTHER CHARACTERS CAUSE THE TTY BELL TO RING AND A NEW @ 
INPUT REQUESTED. S@GEOGOF 
I.E. 100/25+25-50+50 EQUALS 100@GEOGOF @ 
10GEOGOF 
100/2.5+60 IS ALSO 100@GEOGOF @ 
10GEOGOF 
1 100 + 50X + 50 EQUALS 100 (X = CHANGE SIGN)@ 
10GEOGOFIFTEIN FOLLOWED BY AN '=' SIGN WILL CAUSE THE SUM TO@ 
10GEOGOFPLACE TYPEIN, THIS SUM MAY BE ACCEPTED WITH A C/R @ 
10GEOGOFOR A NEW VALUE MAY BE TYPED IN. @ 
10GEOGOFinteger value = : @S", -1)

C PLACE ANSWER IN RVAL AS CURRENT VALUE
RVAL = IVAL

C ASK USER FOR A DATA PACK-VOLUME
CALL OGET (IOCTHL,MNOCTHL,MAXOCTHL," @GEOGOF 
TYPE IN PACK-VOLUME FOR DATA, @ 
10GEOGOFPPV = : @", -1)

C DO NOT CLEAR SCREEN, ASK IF OPERATOR WANTS TO REPEAT,
IF (YESNO (" @GEOGOFWANT TO GO THRU AGAIN ? @", -1) ) 10,20

C C/R OR Y C/R RETURN TO 10, ANYTHING ELSE RETURNS FROM PROGRAM

20 CALL EXIT
END
MLIST is a collection of FORTRAN callable subroutines which allow convenient access to the Adage monitor listing device routines.

CALLING SEQUENCE

Select and initialize listing device,
   CALL INLIST (ICODE)
   or
   CALL INLIST (ICODE, 'NAME', IPVY)

Output an AMOS string with 0 to NCR carriage returns prior to string,
   CALL FHMOS ('AA', NCR)

Output date.
   CALL IODATE (date)

Output an ASCII string (listing device 1 only (ICODE =1)).
   CALL FHSCI1("BB")

Tab to specified column of listing device.
   CALL TABTO (ICOL)

Output a carriage return and line feed,
   CALL OSCR

Eject current page.
   CALL EJECT

Unselect listing device.
   CALL UNSELECT

Output decimal integer.
   CALL IDDEC (VALUE, ID1nITS)

Output floating point number.
   CALL R2DEC (VALUE, ITOTAL, IFRAC)

After initial call to INLIST, the following parameters, may be accessed at:  (use FORTRAN equivalence statement).

70007_n = current character position in line.
70010_n = current line count.
70011_n = maximum lines/page for selected device.
70012_n = busy flag (negative if busy).
### ARGUMENTS

<table>
<thead>
<tr>
<th>ARGUMENT</th>
<th>TYPE</th>
<th>FUNCTION</th>
</tr>
</thead>
</table>
| ICODE    | input integer      | Desired listing device.  
|          |                    | 0  = TTY  
|          |                    | 1  = SCREEN  
|          |                    | 2  = PPL  
|          |                    | 3  = ATEXT disk file  
| NAME     | input AMOS string  | If ICODE = 3, the output disk file name is set = NAME  
| PVV      | input octal        | Output pack-volume for disk file.  
| AA       | input AMOS string  | String for output.  
| NCR      | input integer      | Number of carriage returns to output prior to AA.  
| DATE     | input date         | Address of a cell containing a date in AMOS format, usually DATE or FILEDATE  
| BB       | input ASCII string | String for output.  
| ICOL     | input integer      | Desired character column.  
| IVALUE   | input integer      | Integer value to be output.  
| IDIGITS  | integer input      | Total digits, range = ±10.  
|          |                    | If positive ...right justify.  
|          |                    | If negative ...left justify.  
|          |                    | Round off will occur if value exceeds number of digits specified.  

**NOTE**: If ICODE = 3, and arguments NAME and PVV are omitted, file is output to PVV 101, with name DEBUG1. If more than 1 argument to INLIST all are required.
<table>
<thead>
<tr>
<th>ARGUMENT</th>
<th>TYPE</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>VALUE</td>
<td>(input real)</td>
<td>Real value to be output.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If VALUE exceeds 536,870,656, 'E' format is used.</td>
</tr>
<tr>
<td>ITOTAL</td>
<td>(integer input)</td>
<td>Total digits, range = 110.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If positive, right justify (integer part).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If negative, left justify (integer part).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Round off will occur if value exceeds number of digits specified.</td>
</tr>
<tr>
<td>IFRAC</td>
<td>(input integer)</td>
<td>Fractional digits.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Round off will occur if value exceeds number of digits specified.</td>
</tr>
</tbody>
</table>

**ERROR CONDITIONS**

If ICODE is invalid or incorrect number of arguments default is to TTY. ASCII output is legal to device 1 only.
PROGRAM TESTI
REAL INBUFF(100), OBUFF1(100), OBUFF2(100)
A = B = 10.0
C GET DESIRED LISTING DEVICE FROM USER.
IDevice = 1
CALL IGET (IDevice, 0, 3, "OUTPUT DEVICE OPTIONS: ", 1)
DEVICES:
10 = TTY
11 = SCREEN
12 = PPL
13 = DISK FILE
I TYPE IN DESIRED OPTION : ", 1)
C INITIALIZE INBUFF
DO 10 J = 1, 100
INBUFF(J) = A
A = A + B
IF (A .LE. 250.0) B = -10.0
IF (A .GE. -250.0) B = 10.0
10 CONTINUE
C CLEAR OBUFF 1 & 2
DO 11 J = 1, 100
OBUFF1(J) = OBUFF2(J) = 0.0
11 CONTINUE
C PLACE SAMPLES IN OBUFF1 AT 2 TIMES SAMPLE RATE OF INBUFF
CALL NTRPULATE (INBUFF(1), OBUFF1(1), 50, 0.5)
C PLACE SAMPLES IN OBUFF2 AT 1/2 SAMPLE RATE OF INBUFF
CALL NTRPULATE (INBUFF(1), OBUFF2(1), 50, 2.0)
C INITIALIZE LISTING DEVICE
CALL INLIST (IDevice)
C OUTPUT HEADER FOR LISTING
CALL FAMOS ("BUFFER LISTING OF INTERPOLATION RESULTS", 0)
CALL FAMOS ("INBUFF", 2)
CALL TABTO (20)
CALL FAMOS ("OBUFF1", 0)
CALL TABTO (40)
CALL FAMOS ("OBUFF2", 0)
CALL OSTCR
C LIST CONTENTS OF BUFFERS
DO 20 J = 1, 50
CALL R2DEC (INBUFF(J), 8, 3)
CALL TABTO (20)
CALL R2DEC (OBUFF1(J), 8, 3)
CALL TABTO (40)
CALL R2DEC (OBUFF2(J), 8, 3)
CALL OSTCR
20 CONTINUE
C EJECT PAGE, AND UNSELECT DEVICE
CALL EJECT
CALL UNSELECT
RETURN
END

TN 76-123 -15-
IDELAY

IDELAY is a FORTRAN callable Subroutine which causes a time delay.

CALLING SEQUENCE

Call IDELAY (ICOUNT)

ARGUMENTS

ICOUNT (input integer) Number of milliseconds of desired delay, range 1 to 4095.

ERROR CONDITIONS

Out of range number defaults to a one second delay.

RBELL

RBELL is a FORTRAN callable routine to ring the TTY bell.

CALLING SEQUENCE

CALL RBELL

ERROR CONDITIONS

None
ROLIN

RDLIN is a FORTRAN callable routine designed to allow free format input from the ANK/TTY.

RDLIN will unconditionally load the LABEL segment into monitor overlay buffer 1 (unless already loaded).

Typein is stored in Global array 'PLIST' as left justified 'PADKR' filled AMOS characters.

Typein is also stored in Global array 'ULIST', right justified, one character per word.

Global variable 'NICH' contains the number of typed characters.

Global variable 'MXKAR' controls the maximum number of typed characters allowed (range 1-132).

Global variable 'PADKR' (normally 40_ (space)) is used as pad character for left justified strings.
If 'PADKR' is changed by calling program it should be restored to 40_.

Global flag 'NOOSP', if negative assumes external display of monitor label buffer (BUFF).

Cursor appears on screen 2 spaces to the right of last output to label buffer, i.e. a write to unit 25 or SUTIL routine MLIST.

Calling Sequence

CALL RDLIN

Error Conditions

After number of typed characters .EQ. 'MXKAR' no further characters are accepted.
LANGUAGE

ADEPT (Adage machine language)

SUBROUTINE LENGTH

Approximately 1500 words.

EQUIPMENT

AGT-10 through AGT-340

AUTHORSHIP

D. HARPER, Sigma Corp.