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BREAD:
A CDC 7600 PROGRAM THAT PROCESSES
SPENT FUEL TEST-CLIMAX DATA

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ABSTRACT

BREAD will process a family of files copied from a data tape made by Hewlett-Packard equipment employed for data acquisition on the Spent Fuel Test-Climax at NTS. Tapes are delivered to Livermore approximately monthly. The process at this stage consists of four steps: read the binary files and convert from H-P 16-bit words to CDC 7600 60-bit words; check identification and data ranges; write the data in 6-bit ASCII (BCD) format, one data point per line; then sort the file by identifier and time.

USE

BREAD will process a "family" of data files made by TAPECOPY¹ from a tape made by Hewlett-Packard equipment employed for data acquisition on the Spent Fuel Test-Climax at NTS. The filenames are of the form TnnBfff, where the tape number (nn) is entered by the user (usually the number on the tape label) and the file number (fff) is one of a sequence starting with 001.

Start BREAD with control on the execute line in the form of three numbers: the tape number, first file and last file. BREAD will calculate if all of the files will fit in a BCD (ASCII) file less than 4240000 octal words long. If the complete list will not fit, BREAD will type out the last file in the processed and merged set; also typed are the files missing from the sequence, but such files do not otherwise affect the operation.

If the execute line message is incomplete, the following four-line message will be typed out, then BREAD will wait for the three-item response described above.

```
FOR DATA FILES TNNBFFF THROUGH TNNBLLL
ENTER NN FFF LLL
LAST FILE-NO (LLL) MAY BE 'SORT'
TAPE-NO (NN) MAY BE AN ASCII FILENAME
```

Sorting the BCD (ASCII) output file is the last (optional) step in the BREAD process. If the user rejected the opportunity during a previous run, or if some text-editing was done on licenses or times, the file may be sorted ONLY by identifying the output file TNNAFFF with its numbers. For example, T29A001 may be sorted by typing 29 1 SORT.

In this iterative process, the output file eventually gets renamed manually to a form SFnnnL/V, where nnn is the same tape-number as before, L is an A, B, or C designating one of the ASCII files derived from that tape, and V is a revision letter. This single filename on the execute line or as a response will cause BREAD to reprocess an ASCII output file. This path through BREAD presently does not have the sort option, but the user may rename the ASCII file in the TnnAfff form to accomplish a sort.

---

¹See the TAPECOPY section for an example.

In response to the next question from BREAD,

ENTER FIRST, LAST JULIAN DAYS EXPECTED (OR 0.0)

one should enter a pair of Julian dates without the leading 24. Each number should be terminated with a comma. For example, the month of May, 1982 would be entered as '45091., 45122.,'. A 'RETURN' without input, or 0.0 substituted for either the first or last day, will enable the default values 44300. and 47000. Entering such dates does not imply that the T option (below) is in effect.

The last questions the user must answer before BREAD starts are in response to the following messages:

SWITCHES F, L, C, T (OR HELP):

and, when HELP is typed-in:

FOUR OPTIONS ARE TURNED ON BY TYPING THEIR INITIALS:
F - FULL STATISTICS, OR ONLY A SUMMARY OF ALL FILES
L - REPLACE BAD LICENSES WITH ORIGINAL IN INTERFACE
C - CORRECT BAD CHANNELS, USING LICENSE IN INTERFACE
T - DISCARD DATA AT OUT-OF-RANGE TIMES
USE PROPER POSITIONS: ---T, FL--, ETC.

BREAD expects a four-character line at this time. Only by typing FLCT can the user turn all four options "ON". The RETURN key alone will turn all options "OFF".

The F option: Statistics are written into a printable file in two ways. Each binary file processed can be independently listed in a 256-line, 4-column tabulation of channel number, license in interface, license found in data (if different), and number of data points for each of the 1024 possible channels. A summary (total number of points over all files) is always output, so the F just enables the former table(s). This option is inoperative if input is a single, ASCII file.

The L option: The interface file, SFTINT, is a text file that contains the standards against which the data are tested. It will be described later. The section on DATA SIEVE will explain the conditions causing the need for this switch. It is best left OFF until the results of one pass over the data are examined.

The T option: Data that are questionable for some reason are tagged with special symbols at the right end of their lines in the ASCII output file. One reason is that the time value was out-of-range. This option allows the discarding of such data. This switch also enables the truncation of the output file within any time-range typed in, as described above.

After a set of files has been processed, one last option allows the user to sort the output file in the present execution. In response to the message "SORT?...(Y/N)", a Y or YES will do it. Hit the RETURN key to skip the sort and end.

DATA SIEVE

All data points are examined in a compact section of BREAD called the DATA SIEVE, where there is a single entry point and only two exit paths that will produce a line in the ASCII output file. Each step will be described in the order executed. Use of the flowcharts (Figures 1,2) and Table 1 will be helpful. Each data point should consist of a logical channel number (LC), license (LN), time (TIME), converted data value (CON), and raw data value (RAW).

STEP	TEST OR ACTION

1.	Update earliest time. Current TIME replaces the earliest time (TOT), if its absolute value is less than the earliest time stored before the current data point time.
2.	Update latest time. Current TIME replaces the latest time (TNT), if its absolute value is greater than the latest time stored before the current data point time.
3.	Channel number is compared with 1512; if greater go to step CNG.
4.	Channel number is compared with 1000; if greater go to step DSO.
5.	Channel number is compared with 512; if greater go to step CNG.
6.	Channel number is compared with 1; if less than 1 go to step CNG.
7.	(DSO) Use channel number as index in table MARK; if MARK(LC) is non-zero (a D in the interface file) go to step DISC.
8.	License is compared with table value from the interface file (SFTINT), using channel number as index; if the first entry in the table for the given channel is not the current license, go to step DSL.
9.	(DSL) Time is compared with the maximum time typed in earlier (TN), or 47000 if none was entered; if the absolute value of time is greater than TN, go to step TNG. This step is also entered from step DSL4.
10.	Time is compared with the minimum time typed in earlier (TO), or 44300 if none was entered; if the absolute value of time is less than TO, go to step TNG.

---

¹These constitute the time-range found on the binary data files. Earliest time (TOT) is primed with 1×10^{10} ; latest time (TNT) is primed with 0. See also steps 17 and 18, which store the time-range as sent to ASCII output file.

STEP   TEST OR ACTION (DATA SIEVE, continued)

11. Raw data value (RAW) is compared with minimum value (LOW) from the interface file SFTINT, using channel number (LC) as index in table LOW; if RAW is less than the table value LOW(LC), go to step DSR.
12. Raw data value (RAW) is compared with maximum value (HIGH) from the interface file SFTINT, using channel number (LC) as index in table HIGH; if RAW is greater than the table value HIGH(LC), go to step DSR.
13. (DS2) The absolute value of time (|TIME|) is compared with table value last stored in DAY, using channel number (LC) as index in table DAY; if |TIME| is greater than DAY(LC)+1, go to step DST.
14. (OUTR) This is the normal output step, where this current data point is added to the packed ASCII (BCD) file. The values of LC, LN, TIME, CON and RAW are written in the FORTRAN FORMAT (I5, A6, F12.5, 2E13.6).
15. (OUTC) A counter is incremented by one in the table NPTS, using the current channel number LC as an index.¹
16. The table DAY is updated, using the absolute value of time (|TIME|) and the channel number as an index. (This value is used in step 13.)
17. Update earliest time. Current |TIME| replaces the earliest time (TOD), if its absolute value is less than the earliest time stored before the current data point time.²
18. Update latest time. Current |TIME| replaces the latest time (TND), if its absolute value is greater than the latest time stored before the current data point time.²
19. The total number of data points stored on the ASCII output file is incremented by one.
20. (SCAN) This step collects all paths through the DATA SIEVE for a single file.

---

¹The table is printed in the statistics file; if full statistics are requested, the totals are for each binary data file, otherwise the totals are added to the totals for all files and printed from the summary table.

²These constitute the time-range sent to the ASCII output file. Earliest time (TOD) is primed with 1×10^{10} ; latest time is primed with 0. See also steps 1 and 2, which store the time-range from binary data files.

The following steps are not on the shortest path through the data sieve. Their order is immaterial, since they are executed only as exceptions to the normal path. They are all named here as they appear in the BREAD FORTRAN source file of 9/28/82.

STEP   TEST OR ACTION {DATA SIEVE, continued}

BAD CHANNEL

CNG Entered from steps 3, 5, and 6 only. The current license (LN) is tested for being blank, which it could be if the data file is an ASCII output file being reprocessed. In this case control goes to DSC4. Otherwise, control goes to subroutine VERIFY to determine which of four conditions this bad-channel-license combination best matches:

If condition 1, control goes to step DSC1.

If condition 2 or 3, control goes to step DSC2.

If condition 4, control goes to step DSC4.

Condition 1 a) The alphabetic part of the license is in table NAMES, or LEX which are made from the first field of the second section of the interface file. NAMES contains an alphabetized list of each of the 3-letter combinations. LEX is a table of those licenses that do not conform to the 3-letter, 3-number form of most licenses. See Note after condition 4.

b) The 6-characters are also found in the table of all licenses from the first part of the interface, indexed by channel number. That index "channel" is returned by VERIFY.

Condition 2 Part a) above, but not part b). This means the license is a new device number of a known instrument. (The 6-character license is added to the list of licenses for this channel in a later step.)

Condition 3 Not part a) above, but the 6-character license is of the form AAANNN. (If it is in LEX, the exception table of licenses not of the normal form, the condition will be 1 or 2.) This means the license may be a legitimate new alphabetic code.

Condition 4 Not part a) above, the AAA part does not consist of all letters, or the NNN part is not all numbers and not in LEX, the exception table. NOTE: There are no exceptions to the rule that the first three characters of a license must be all letters!

DSC1 Entered from step CNG only. The CORRECT BAD CHANNEL switch is tested. (See USE section.) If the switch is not set to "C" control goes to step DSC2; otherwise, the location in the table of licenses where the license was found is used for the channel number (LC), and control goes to step DSC0.

STEP TEST OR ACTION (DATA SIEVE, continued)

DSC2 Entered from step CNG only. The binary file number and record number in that file (or the record number in an ASCII output file being reprocessed) is listed in the message file along with LC, LN, TIME, CON, and RAW as in step 14 (OUTR), plus the 6-digit octal value of the channel number as extracted by the subroutine GETRCO from the binary data file.

The message file format is:

("BAD CHANNEL ",R9,I8,I8,2XA6,F13.5,2E13.6,3X,06).

The special tag is "C?". The "Number of bad channels" counter is incremented by one, and control goes to step OUTX.

DSC4 Entered from step CNG only. The "number of channel-license bad" counter is incremented by one, and control goes to step DISC.

TIME OUT-OF-RANGE

TNG Entered from steps 9 and 10, only. The "number of bad times" counter is incremented by one. The TIME-RANGE switch is tested (see USE section). If the switch is set to "T", control goes to step DISC, otherwise, the binary file number and record number in that file (or the record number in an ASCII output file being reprocessed) is listed in the message file along with LC, LN, TIME, CON, and RAW as in step 14 (OUTR).

The message file format is:

("TIME OUT-OF-RANGE ",R9,I8,I8,2XA6,F13.5,2E13.6).

The special tag is "TR?". Control goes to step OUTX.

QUESTIONABLE LICENSE

DSL Entered from step 8 only. The current license (LN) is tested for being blank, which it could be if the data file is an ASCII output file being reprocessed. In this case control goes to step DSL4. Otherwise, LN is tested against an alternate license from an earlier data point in this run, or a second entry for this channel in the interface file SFTINT. Channel number LC is used as an index. If the license is at this point in the table, control goes to step 9 (DS1). Otherwise, control goes to subroutine VERIFY to determine which of four conditions this channel-number/license combination best matches: (conditions are described above, at step CNG).

STEP   TEST OR ACTION (DATA SIEVE, continued)

If condition 1, control goes to step DSL1.
If condition 2, control goes to step DSL2.
If condition 3, control goes to step DSL3.
If condition 4, control goes to step DSL4.

CHANNEL CHANGED

DSL1 Entered from step DSL only. The binary file number and record number in that file (or the record number in an ASCII output file being reprocessed) is listed in the message file along with LC, LN, TIME, CON, and RAW as in step 14 (OUTR), plus the index (or new channel number with which this license may be associated).

The message file format is:

("CHANNEL CHANGED   ",R9,I8,I8,2XA6,F13.5,2E13.6,I6)

The special tag is "NC?". The new channel counter is incremented by one, and this license is stored in the alternate license table using the channel number (LC) as an index. Control goes to step OUTX.

DSL2 Entered from step DSL only. The binary file number and record number in that file (or the record number in an ASCII output file being reprocessed) is listed in the message file along with LC, LN, TIME, CON, and RAW as in step 14 (OUTR).

The message file format is:

("NEW LICENSE NUMERIC ",R9,I8,I8,2XA6,F13.5,2E13.6)

The special tag is "NL?". The new license numeric counter is incremented by one, and this license is stored in the alternate license table using the channel number (LC) as an index. Control goes to step OUTX.

NEW LICENSE ALPHA

DSL3 Entered from step DSL only. The binary file number and record number in that file (or the record number in an ASCII output file being reprocessed) is listed in the message file along with LC, LN, TIME, CON, and RAW as in step 14 (OUTR).

The message file format is:

("NEW LICENSE ALPHA   ",R9,I8,I8,2XA6,F13.5,2E13.6)

The special tag is "ND?". The new license alpha counter is incremented by one, and this license is stored in the alternate license table using the channel number (LC) as an index. Control goes to step OUTX.

STEP   TEST OR ACTION (DATA SIEVE, continued)

DSL4 Entered from step DSL, before or after using subroutine VERIFY. The number of bad licenses counter is incremented by one. The REPLACE LICENSE switch is tested. (See USE section.) If the switch is not set to "L" control goes to step DSLX; otherwise, the license (LN) is replaced by the table value from the interface file, using the channel number (LC) as an index. Control goes to step DS1.

DSLX Entered from step DSL4 only. The binary file number and record number in that file (or the record number in an ASCII output file being reprocessed) is listed in the message file along with LC, LN, TIME, CON, and RAW as in step 14 (OUTR), plus a replacement license candidate from the interface file table and the 16-digit octal value of the license as extracted by the subroutine GETRCD from the binary data file.

The message file format is:

("LICENSE NOT NORMAL   ",R9,I8,I8,8XF13.5,2E13.6,2XA6,2X016)

The license (LN) is made blank. The special tag is "L?". Control goes to step OUTX.

RANGE EXCEEDED

DSR Entered from steps 11 and 12 only. If the range values LOW and HIGH from the interface file tables, using the channel number (LC) as an index, are equal to zero control goes to step DS2. Otherwise, the binary file number and record number in that file (or the record number in an ASCII output file being reprocessed) is listed in the message file along with LC, LN, TIME, CON, and RAW as in step 14 (OUTR).

The message file format is:

("RANGE EXCEEDED   ",R9,I8,I8,2XA6,F13.5,2E13.6)

The number of range errors counter is incremented by one. Control goes to DISC.

TIME GAP

DST Entered from step 13 (DS2) only. The first entry in the DAY table, using channel number (LC) as an index, causes this path and the error is ignored. Otherwise, the binary file number and record number in that file (or the record number in an ASCII output file being reprocessed) is listed in the message file along with LC, LN, TIME, CON, and RAW as in step 14 (OUTR).

The message file format is:

("TIME GAP   ",R9,I8,I8,2XA6,F13.5,2E13.6)

STEP   TEST OR ACTION (DATA SIEVE, continued)

The number of time gaps counter is incremented by one. Control goes to step 14 (OUTR) in either case.

DISCARD

DISC Entered from steps 7 (DSO), TNG, and DSR only. The number of data points discarded counter is incremented by one. Control goes to step 20 (SCAN).

TAGGED OUTPUT

OUTX Entered from steps CHG, TNG, DSL1, DSL2, DSL3, and DSLX only. The current data point is added to the packed ASCII (BCD) output file; the values LC, LN, TIME, CON, RAW, and the special tag are written in the FORTRAN FORMAT (15,A6,F12.5,2E13.6,2X,A3). Control goes to step 15 (CJTC).

Figure 1b
Flowchart of DATA SIEVE, continued

Figure 1c
Flowchart of DATA SIEVE, continued

VERIFY Subroutine

VERIFY Subroutine

Table 1

<u>SYMBOL</u>	<u>DEFINITION</u>	<u>OCCURRENCE</u>
LC	logical channel number 1-512, 1001-1512	data
LN	license, usually AAANN, but also AAAANN and AAAAAN	data
TIME	Julian day w/o lending 2400000, + 5-digit fraction	data
CON	data value converted to engineering units (e.g.: mm, °C, m ³ /S) on H-P2176A	data
RAW	data value, in electrical units of measure (e.g.: dcv, ohms, amps)	data
TO	lower and upper	program
TN	time limits	constant or option
TOT	earliest and	calculated
TNT	latest times seen in data	
TOD	earliest and	calculated
TND	latest times output	
NFIN	binary data file no.	calculated
NERR	data point (record) no.	calculated
LC8	channel no. (octal)	data
MARK	table of discard "D" or use (blank) marks, one/channel	interface
NBCH	number of bad channel numbers	calculated
XC	tag character for output data lines	calculated
LIC1	table of licenses, one per channel	interface
LIC2	alternate LIC1 filled-in when found	interface or data
LOW	table of minimum raw data values, one per channel	interface
HIGH	table of maximum raw data values, one per channel	interface
DAY	table of last [TIME(LC)] in data	calculated
XC	special tag char. for output data line	calculated
INDX	location in LIC1 or LIC2 found by VERIFY subroutine	calculated
NTNG	number of data points outside time range TO, TN	calculated
NBCH	number of bad channel numbers	calculated
NEWC	number of new channel numbers for existing licenses	calculated
NEWL	number of new licenses (numeric part)	calculated
NEWD	number of new licenses (alpha part)	calculated
TRSW	switch to discard data with time out-of-range T = yes	type-in
RLSW	switch to replace licenses in data with interface copy L = yes	type-in
LN8	license, in octal	data
NLNG	number of licenses "not normal"	calculated
NRNG	number of data points with RAW out-of-range	calculated
NDTX	number of time gaps	calculated

INTERFACE FILE

To accomodate periodically changing ranges of acceptable data, addition and deletion of instrumentation, and long-term ease of recall by users, a text file design was chosen. It is directly printable and easily changed with any text-editing utility routine. Properly maintained, it gives the latest parameters on all channels and licenses in a single document. Properly filed, the collection yields an historical record for quality assurance purposes.

The file is read and organized into several tables in BREAD with the subroutine TABLMAK, using standard FORTRAN FORMatted reads, which demand fixed fields and sometimes yield cryptic¹ error messages. See figure 3 for parts of an early interface.

Section one (8A10/)

This is the first line, which is simply an 80-character label that is printed with the statistics and message output files and typed at the user's terminal to confirm the file's identity. A second, blank line is read (and ignored) to allow the printed copy to be more readable.

Section two (I5, X, A6, X, A6, X, A1)

This section sets-up the channel-number/license plate tables LIC1, LIC2, and MARK. The first field (see the FORMAT, above) is a right-justified channel number, which is tested for being in the ranges 1 to 512 or 1001 to 1512. The license plate(s), fields two and three, are stored in their tables indexed by channel number. Note that there is empty space in all such tables between 513 and 1000 inclusively, to eliminate address arithmetic throughout the remainder of BREAD. The fourth field marks the channels to be eliminated, or deleted, with a "D" in the MARK table using the same index as above. If this field is not a "D", it is ignored.

Running over 14 pages, this section is somewhat awkward to read or view on a TMD5 screen. Its origin was the statistics output file from an earlier version of BREAD, saving considerable typing and associated input errors.

A blank line terminates this section.

Section three (R6, " N ", 4A10) (R6, " R ", 2F10.0, 1015) (R6, " D ", 1415)

---

¹See the first error message, page 21.

o An N in the second field stores the 40-character description of the 3-letter code in the first field. The 3-letter code is stored in the next-available location in table NAMES, right justified; the same index stores the description in table DESCR. If the numeric part of the license in the first field is not blank, the full 6-character license is stored also in the exception table LEX. CAUTION: The N-lines must be in alphabetical order (by the first three letters of the first field).

These descriptions are not used by the code but were included to provide a user recognizable description of the individual instrumentation associated with these licenses.

o An R in the second field defines the line as containing range data. The first value is the minimum, the second is the maximum. They are placed in tables LOW and HIGH respectively, in locations determined by all occurrences of the 3-letter code in the first field in the table LIC1, which was made from section two. In other words, ranges are read by license and stored by channel.

Exceptions exist in the form of licenses with the numeric part ending with zero. These are matched in the same manner as just described except with AAAXX0 (ignore x) instead of AAAXXX.

Following the two range values, there may be up to ten integer values representing the NNN part of licenses beginning with the AAA of the first field. These licenses will be marked with a D in the MARK table using the index of the located license. The series of integers is terminated with a blank field.

In the absence of a preceding "N"-line, the 3-letter code from this line will be added to the NAMES table (and LEX table if appropriate).

o A D in the second field defines the line as containing numeric parts of licenses to be marked for deletion. The AAA part from the first field is concatenated with each integer in sequence to make a license. These licenses will be marked with a D in the MARK table using the index of the located license. The series of up to 14 integers is terminated with a blank field.

An alternate use of the D-line is to leave the first field blank and use the integer fields for channel numbers. The MARK table will have D inserted using channel number as an index, eliminating the search by license. This option was made available to facilitate deletion of certain device types which would, through time, have various licenses but unique channel numbers.² Section two of the interface is used for this purpose also.

---

¹W. C. Patrick to Glenn Hage (March 3, 1981), Lawrence Livermore National Laboratory, Livermore, CA, private communication.

²W. C. Patrick and L. B. Ballou to Distribution (April 7, 1981), Lawrence Livermore National Laboratory, Livermore, CA, private communication.

Those licenses that do not conform to the AAANNN pattern (those in LEX, the exception table) may be listed uniquely on D-lines. The integer field is ignored in this case.

In the absence of a preceding N- or R-line, the 3-letter code from this line will be added to the NAMES table (and LEX table if appropriate).

Figure 3 shows parts of an interface file. Most new interfaces will be variations on an earlier one, so the formats can be copied by example at the time changes are being made. It is very important (for the VERIFY subroutine used in the DATA SIEVE) that the 3-letter codes in field one of section three be in alphabetical order.

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(Section one)

```

1 CAM101      D
2 CAM102      D
3 CAM103      D
4 CAM104      D
5 CAM105      D
6 CAM106      D
7 CAM107      D
8 CAM108      D
9 RAM101      D
10 RAM102     D
11 RAM103     D
12 RAM104     D
13 RAM105     D
14 RAM106     D
15 RAM107     D
16 RAM108     D
17 RAM109     D
18 RAM110     D

```

(Section two)

```

1507          D
1508          D
1509          D
1510          D
1511          D
1512          D

```

```

AAP          N AUXILIARY AIR PUMP
AAP          D 2, 3
AET          N "A" EXTENSOMETER THERMOCOUPLE
AET          R -.0008, .004
AFM          N AIR FLOW MONITOR
AFM          R -.1, .2
ATM          N AIR TEMPERATURE MONITOR
ATM          D 4000., 16000.
ATM          D 1, 2, 3, 4, 5
AUP          N ALCOVE UTILITY POWER
AUP          D 1, 2, 3
BET          N "B" EXTENSOMETER THERMOCOUPLE
BET          R -.0008, .004
BWT          N "B" THERMISTORS
BWT          R 149400., 383100.
CAM          N CONTINUOUS AIR MONITOR
CAM          D 101, 102, 103, 104, 105, 106, 107
CAM          D 201, 202, 203, 204, 205, 206
CAT          N CANISTER AIR THERMOCOUPLE
CAT          R -.0008, .002
CCE          N CONVERGANCE GYE
CCE          R -.1, .11
CET          N "CET" FV
CET          R -.0008, .002
CHW          N
CHW          D

```

(Section three)

```

100-WIRE OHMS
100
TALDRIFT REFERENCE THERMOCOUPLE
TALDRIFT R -.0008, .001
UPS          N UNINTERRUPTABLE POWER SUPPLY
UPS          D 1, 2, 3, 4, 5, 6, 7, 8,
UPS          D 9, 10, 11, 12, 13, 14,
TEST01      D
TEST02      D
TEST03      D
TEST04      D
TCOHM1      D
TCOHM2      D

```

Figure 3 Interface file example

ACCESS TO PROGRAMS AND FILES

BREAD and the interface and data files are stored on ATL and/or MASS in a directory shared by 138000, 348500, 393200 and 746394. Programs are stored in directory .SFT:LIBS. The interfaces are stored in directory .SFT:SFTINT. The data files are stored in directories .SFT:S-FILES or .SFT:B-FILES.

The latest version of BREAD may be loaded onto a CDC 7600 with XPORT:

XPORT RD .SFT:LIBS:SFTC20928!END (: is the line feed key)
then with LIX:

LIX SFTC20928!GR. BREAD10A!END.

The data and interface files (and other program libraries) names may be listed with XPORT: L .SFT:LIBS or L .SFT:B-FILES etc.

TAPECOPY

What follows is not new¹, but is included here in order to make this memo more complete. Data tapes are now stored in the Building 113 tape vault, slots JC101-JC125, JC201-JC225, and FB201-FB225. Dialog with TAPECOPY should follow this pattern:

```
USER:    TAPECOPY 512 30720 / 10 2
          OK
USER:    JC201 T. {90} T26B D. 1000  (That's 9, oh)
          OPTIONS OR CARRIAGE RETURN
USER:    FAM.
          OK
USER:    RETURN key
          TYPE IN OCTAL LENGTH OF DISK FILE TO BE CREATED
USER:    200000
          WAITING ON TAPE ASSIGNMENT
          ALL TAPES ASSIGNED
          DOUBLE END-OF-FILES READ ON INPUT FILE.  CONTINUE?
USER:    NO
          33 END-OF-FILES READ.  TYPE I, O, CARRIAGE RETURN,
          END, OR OPTIONS
USER:    END
          ALL DONE
```

---

¹P. Harben to Distribution, (December 11, 1980), Lawrence Livermore National Laboratory, Livermore, CA, private communication.

ERROR MESSAGES

Error messages to the user's terminal from TABLMAK while reading the interface file, and their probable meanings are listed below:

nnnnnn IS NOT A CHANNEL NUMBER FOR DISCARD

The channel number was out of range. The error may be in either section two (with or without a D in the fourth field) or in section three on a "D" line with a blank license field (see also Fig. 3).

aaaaaa IS NOT IN CHANNEL-LICENSE TABLE FOR RANGE

The search for a matching AAA part of this license failed. Either section two is incomplete or this license is incorrect (see also Fig. 3).

aaaaaa IS NOT IN CHANNEL-LICENSE TABLE FOR DISCARD

The search for this license in section three, made from the first field and an integer listed to the right of the D, failed (see also Fig. 3). Either section two is incomplete or this AAANN combination is incorrect.

INTERFACE FILE IS INCOMPLETE

An end-of-file before the beginning of section three causes this type-out (see also Fig. 3).

INTERFACE FILE -SFTINT- IS MISSING

The various versions of the interface file have names. BREAD recognizes the name "SFTINT" only. Change the name of the version that you want to use and restart. This error is detected before TABLEMAK is used.

INTERFACE FILE -SFTINT- TROUBLE

Various operating system problems, such as no space in the active file index, or access denied, etc. These errors are detected before TABLEMAK is used.

LISTINGS AND MESSAGES

Besides the BCD (ASCII) listing of all data points (within range, etc.) there are two files with information about the data.

A message file, whose name is a concatenation of the Tnn¹ of the data files and "MSGs", lists all anomalies found by the DATA SIEVE. An example is in Figure 4. The single heading line labels the fields of all lines up to the summary. The DATA SIEVE section of this memo describes the source of each message. Following the messages is a summary of the messages and counts of data points discarded and copied. An example is shown in Figure 4.

A statistics file, whose name is a concatenation of the Tnn¹ of the data files and "STAT", lists the contents of tables loaded from the INTERFACE file and supplemented from the data file (second licenses and counts). The first, four-column listing (Figure 5) is forced with the "F" option - full statistics, one for each data file. The last two-column listing (Figure 6) is a summary of all good data points along with the raw data ranges loaded from the INTERFACE file.

Both files end with a summary of work done and the status of the L, C, and T switches set by the user at the start of processing. Note that the two totals, DISCARDED POINTS, and POINTS COPIED, sum to the total of data points read from the binary file(s) (or ASCII reprocessed file), but that the total of TR tagged data lines belong to one or the other bottom-line total depending on the T switch. TIME GAP lines are not tagged; the remainder of the anomalous lines are tagged with the letters shown. (The tags include a "?" for text-editing searches.) See Figure 1 on the DATA SIEVE for a quick verification of where subtotals are collected.

---

¹Reprocessed ASCII filenames have their last four characters replaced.

BREAD 11A 09/29/82R
THIS RUN 14:18:10R 04/07/83

BREAD INTERFACE 17 NOVEMBER 23, 1982
FIRST POINT - 1081SL7044-45292.29872-9.999000E+03 1.896999E-03
LAST POINT - 1005CAM205 45292.34653 3.685082E+00 3.916119E+00
3 RECORDS 522 POINTS

CHANNEL	LICENSES	POINTS	CHANNEL	LICENSES	POINTS	CH	S	CHANNEL	LICENSES	POINTS
1	CAM101	0	257	NET093	0		1	1259	SET124	1
2	CAM102	0	258	NET094	0		1	1259	SET125	1
3	CAM103	0	259	NET095	0		1	1260	SET126	1
4	CAM104	0	260	NET096	0		1	1261	SET131	2
5	CAM105	0	261	NET101	0		1	1262	SET132	1
6	CAM106	0	262	NET102	0		1	1263	SET133	1
7	CAM107	0	263	NET103	0		1	1264	SET134	1
8	CAM108	0	264	NET104	0		1	1265	SET135	1
9	RAM101	0	265	NET105	0		1	1266	SET136	1
10	RAM102	0	266	NET106	0		1	1267	SET137	1
11	RAM103	0	267	NET131	0		1	1268	SET138	1
12	RAM104	0	268	NET152	0		1	1269	SET139	1
13	RAM105	0	269	NET153	0		1	1270	SET140	1
14	RAM106	0	270	NET154	0		1	1271	SET141	1
15	RAM107	0	271	NET171	0		1	1272	SET142	1
16	RAM108	0	272	NET172	0		1	1273	SET143	1
17	RAM109	0	273	NET173	0		1	1274	SET144	1
18	RAM110	0	274	NET174	0		1	1275	SET145	1
19	RAM111	0	275	NET211	0		1	1276	SET146	1
20	AAP003	0	276	SET231	0		1	1277	SET147	1
21	SC1011	0	277	SET241	0		1	1278	SET148	1
22	SC1012	0	278	SET244	0		1	1279	SET149	1
23	SC1013	0	279	NHW001	0		1	1280	SET150	1
24	SC1021	0	280	NHW002	0		1	1281	SET151	1
25	SC1022	0	281	NHW003	0		1	1282	SET152	1
26	SC1023	0	282	CHW021	0		1	1283	SET153	1
27	SC1031	0	283	CHW041	0		1	1284	SET154	1
28	SC1032	0	284	CHW061	0		1	1285	SET155	1
29	SC1033	0	285	CHW131	0		1	1286	SET156	1
30	SC1041	0	286	CHW151	0		1	1287	SET157	1
31	SC1042	0	287	CHW171	0		1	1288	SET158	1
32	SC1043	0	288	SHW001	0		1	1289	SET159	1
33	SC1051	0	289	SHW002	0		1	1290	SET160	1
34	SC1052	0	290	SHW003	0		1	1291	SET161	1
35	SC1053	0	291	NLW001	0		1	1292	SET162	1
36	SC1061	0	292	NLW002	0		1	1293	SET163	1
37	SC1062	0	293	CLW001	0		1	1294	SET164	1
38	SC1063	0	294	CLW002	0		1	1295	SET165	1
39	SC1071	0	295	CLW003	0		1	1296	SET166	1
40	SC1072	0	296	SLW001	0		1	1297	SET167	1
41	SC1073	0	297	SLW002	0		1	1298	SET168	1
42	SC1081	0	298	MBJ010	0		1	1299	SET169	1
43	SC1082	0	299	MBJ011	0		1	1300	SET170	1
44	SC1083	0	300	MBJ012	0		1	1301	SET171	1
45	SC1091	0	301	MBJ013	0		1	1302	SET172	1
46	SC1092	0	302	MBJ020	0		1	1303	SET173	1
47	SC1093	0	303	MBJ021	0		1	1304	SET174	1

Figure 5 Statistics file example

SUMMARY FOR ALL FILES: 115760 POINTS

CHANNEL	LICENSES	POINTS	D	LIMITS	CHANNEL	LICENSES	POINTS	D	LIMITS
1	CAM101	0000	0.	0.	1001	CAM201	0000	0.	0.
2	CAM102	0000	0.	0.	1002	CAM202	0000	0.	0.
3	CAM103	0000	0.	0.	1003	CAM203	0000	0.	0.
4	CAM104	0000	0.	0.	1004	CAM204	0000	0.	0.
5	CAM105	0000	0.	0.	1005	CAM205	0000	0.	0.
6	CAM106	0000	0.	0.	1006	CAM206	0000	0.	0.
7	CAM107	0000	0.	0.	1007	CAM207	0000	0.	0.
8	CAM108	0000	0.	0.	1008	CAM208	0000	0.	0.
9	RAM101	0000	0.	0.	1009	RAM201	0000	0.	0.
10	RAM102	0000	0.	0.	1010	RAM202	0000	0.	0.
11	RAM103	0000	0.	0.	1011	RAM203	0000	0.	0.
12	RAM104	0000	0.	0.	1012	RAM204	0000	0.	0.
13	RAM105	0000	0.	0.	1013	RAM205	0000	0.	0.
14	RAM106	0000	0.	0.	1014	RAM206	0000	0.	0.
15	RAM107	0000	0.	0.	1015	RAM207	0000	0.	0.
16	RAM108	0000	0.	0.	1016	RAM208	0000	0.	0.
17	RAM109	0000	0.	0.	1017	RAM209	0000	0.	0.
18	RAM110	0000	0.	0.	1018	RAM210	0000	0.	0.
19	RAM111	0000	0.	0.	1019	RAM211	0000	0.	0.
20	AAP003	0000	0.	0.	1020	RAM212	0000	0.	0.
21	SCT011	127	0.	0.	1021	RAM213	0000	0.	0.
22	SCT012	131	0.	0.	1022	RAM214	0000	0.	0.
23	SCT013	131	0.	0.	1023	RAM215	0000	0.	0.
24	SCT021	131	0.	0.	1024	RAM216	0000	0.	0.
25	SCT022	131	0.	0.	1025	RAM217	0000	0.	0.
26	SCT023	131	0.	0.	1026	RAM218	0000	0.	0.
27	SCT031	131	0.	0.	1027	RAM219	0000	0.	0.
28	SCT032	131	0.	0.	1028	RAM220	0000	0.	0.
29	SCT033	131	0.	0.	1029	RAM221	0000	0.	0.
30	SCT034	131	0.	0.	1030	RAM222	0000	0.	0.
31	SCT035	131	0.	0.	1031	RAM223	0000	0.	0.
32	SCT036	131	0.	0.	1032	RAM224	0000	0.	0.
33	SCT037	131	0.	0.	1033	RAM225	0000	0.	0.
34	SCT038	131	0.	0.	1034	RAM226	0000	0.	0.
35	SCT039	131	0.	0.	1035	RAM227	0000	0.	0.
36	SCT040	131	0.	0.	1036	RAM228	0000	0.	0.
37	SCT041	131	0.	0.	1037	RAM229	0000	0.	0.
38	SCT042	131	0.	0.	1038	RAM230	0000	0.	0.
39	SCT043	131	0.	0.	1039	RAM231	0000	0.	0.
40	SCT044	131	0.	0.	1040	RAM232	0000	0.	0.
41	SCT045	131	0.	0.	1041	RAM233	0000	0.	0.
42	SCT046	131	0.	0.	1042	RAM234	0000	0.	0.
43	SCT047	131	0.	0.	1043	RAM235	0000	0.	0.
44	SCT048	131	0.	0.	1044	RAM236	0000	0.	0.
45	SCT049	131	0.	0.	1045	RAM237	0000	0.	0.
46	SCT050	131	0.	0.	1046	RAM238	0000	0.	0.
47	SCT051	131	0.	0.	1047	RAM239	0000	0.	0.
48	SCT052	131	0.	0.	1048	RAM240	0000	0.	0.
49	SCT053	131	0.	0.	1049	RAM241	0000	0.	0.
50	SCT054	131	0.	0.	1050	RAM242	0000	0.	0.
51	SCT055	131	0.	0.	1051	RAM243	0000	0.	0.
52	SCT056	131	0.	0.	1052	RAM244	0000	0.	0.
53	SCT057	131	0.	0.	1053	RAM245	0000	0.	0.
54	SCT058	131	0.	0.	1054	RAM246	0000	0.	0.
55	SCT059	131	0.	0.	1055	RAM247	0000	0.	0.
56	SCT060	131	0.	0.	1056	RAM248	0000	0.	0.
57	SCT061	131	0.	0.	1057	RAM249	0000	0.	0.
58	SCT062	131	0.	0.	1058	RAM250	0000	0.	0.
59	SCT063	131	0.	0.	1059	RAM251	0000	0.	0.
60	SCT064	131	0.	0.	1060	RAM252	0000	0.	0.
61	SCT065	131	0.	0.	1061	RAM253	0000	0.	0.
62	SCT066	131	0.	0.	1062	RAM254	0000	0.	0.
63	SCT067	131	0.	0.	1063	RAM255	0000	0.	0.
64	SCT068	131	0.	0.	1064	RAM256	0000	0.	0.
65	SCT069	131	0.	0.	1065	RAM257	0000	0.	0.
66	SCT070	131	0.	0.	1066	RAM258	0000	0.	0.
67	SCT071	131	0.	0.	1067	RAM259	0000	0.	0.
68	SCT072	131	0.	0.	1068	RAM260	0000	0.	0.
69	SCT073	131	0.	0.	1069	RAM261	0000	0.	0.
70	SCT074	131	0.	0.	1070	RAM262	0000	0.	0.
71	SCT075	131	0.	0.	1071	RAM263	0000	0.	0.
72	SCT076	131	0.	0.	1072	RAM264	0000	0.	0.
73	SCT077	131	0.	0.	1073	RAM265	0000	0.	0.
74	SCT078	131	0.	0.	1074	RAM266	0000	0.	0.
75	SCT079	131	0.	0.	1075	RAM267	0000	0.	0.
76	SCT080	131	0.	0.	1076	RAM268	0000	0.	0.
77	SCT081	131	0.	0.	1077	RAM269	0000	0.	0.
78	SCT082	131	0.	0.	1078	RAM270	0000	0.	0.
79	SCT083	131	0.	0.	1079	RAM271	0000	0.	0.
80	SCT084	131	0.	0.	1080	RAM272	0000	0.	0.
81	SCT085	131	0.	0.	1081	RAM273	0000	0.	0.
82	SCT086	131	0.	0.	1082	RAM274	0000	0.	0.
83	SCT087	131	0.	0.	1083	RAM275	0000	0.	0.
84	SCT088	131	0.	0.	1084	RAM276	0000	0.	0.
85	SCT089	131	0.	0.	1085	RAM277	0000	0.	0.
86	SCT090	131	0.	0.	1086	RAM278	0000	0.	0.
87	SCT091	131	0.	0.	1087	RAM279	0000	0.	0.
88	SCT092	131	0.	0.	1088	RAM280	0000	0.	0.
89	SCT093	131	0.	0.	1089	RAM281	0000	0.	0.
90	SCT094	131	0.	0.	1090	RAM282	0000	0.	0.
91	SCT095	131	0.	0.	1091	RAM283	0000	0.	0.
92	SCT096	131	0.	0.	1092	RAM284	0000	0.	0.
93	SCT097	131	0.	0.	1093	RAM285	0000	0.	0.
94	SCT098	131	0.	0.	1094	RAM286	0000	0.	0.
95	SCT099	131	0.	0.	1095	RAM287	0000	0.	0.
96	SCT100	131	0.	0.	1096	RAM288	0000	0.	0.
97	SCT101	131	0.	0.	1097	RAM289	0000	0.	0.
98	SCT102	131	0.	0.	1098	RAM290	0000	0.	0.
99	SCT103	131	0.	0.	1099	RAM291	0000	0.	0.
100	SCT104	131	0.	0.	1100	RAM292	0000	0.	0.
101	SCT105	131	0.	0.	1101	RAM293	0000	0.	0.
102	SCT106	131	0.	0.	1102	RAM294	0000	0.	0.
103	SCT107	131	0.	0.	1103	RAM295	0000	0.	0.
104	SCT108	131	0.	0.	1104	RAM296	0000	0.	0.
105	SCT109	131	0.	0.	1105	RAM297	0000	0.	0.
106	SCT110	131	0.	0.	1106	RAM298	0000	0.	0.
107	SCT111	131	0.	0.	1107	RAM299	0000	0.	0.
108	SCT112	131	0.	0.	1108	RAM300	0000	0.	0.
109	SCT113	131	0.	0.	1109	RAM301	0000	0.	0.
110	SCT114	131	0.	0.	1110	RAM302	0000	0.	0.
111	SCT115	131	0.	0.	1111	RAM303	0000	0.	0.
112	SCT116	131	0.	0.	1112	RAM304	0000	0.	0.
113	SCT117	131	0.	0.	1113	RAM305	0000	0.	0.
114	SCT118	131	0.	0.	1114	RAM306	0000	0.	0.
115	SCT119	131	0.	0.	1115	RAM307	0000	0.	0.
116	SCT120	131	0.	0.	1116	RAM308	0000	0.	0.
117	SCT121	131	0.	0.	1117	RAM309	0000	0.	0.
118	SCT122	131	0.	0.	1118	RAM310	0000	0.	0.
119	SCT123	131	0.	0.	1119	RAM311	0000	0.	0.
120	SCT124	131	0.	0.	1120	RAM312	0000	0.	0.
121	SCT125	131	0.	0.	1121	RAM313	0000	0.	0.
122	SCT126	131	0.	0.	1122	RAM314	0000	0.	0.
123	SCT127	131	0.	0.	1123	RAM315	0000	0.	0.
124	SCT128	131	0.	0.	1124	RAM316	0000	0.	0.
125	SCT129	131	0.	0.	1125	RAM317	0000	0.	0.
126	SCT130	131	0.	0.	1126	RAM318	0000	0.	0.
127	SCT131	131	0.	0.	1127	RAM319	0000	0.	0.
128	SCT132	131	0.	0.	1128	RAM320	0000	0.	0.
129	SCT133	131	0.	0.	1129	RAM321	0000	0.	0.
130	SCT134	131	0.	0.	1130	RAM322	0000	0.	0.
131	SCT135	131	0.	0.	1131	RAM323	0000	0.	0.
132	SCT136	131	0.	0.	1132	RAM324	0000	0.	0.
133	SCT137	131	0.	0.	1133	RAM325	0000	0.	0.
134	SCT138	131	0.	0.	1134	RAM326	0000	0.	0.
135	SCT139	131	0.	0.	1135	RAM327	0000	0.	0.
136	SCT140	131	0.	0.	1136	RAM328	0000	0.	0.
137	SCT141	131	0.	0.	1137	RAM329	0000	0.	0.
138	SCT142	131	0.	0.	1138	RAM330	0000	0.	0.
139	SCT143	131	0.	0.	1139	RAM331	0000	0.	0.
140	SCT144	131	0.	0.	1140	RAM332	0000	0.	0.
141	SCT145	131	0.	0.	1141	RAM333	0000	0.	0.
142	SCT146	131	0.	0.	1142	RAM334	0000	0.	0.
143	SCT147	131	0.	0.	1143	RAM335	0000	0.	0.
144	SCT148	131	0.	0.	1144	RAM336	0000	0.	0.
145	SCT149	131	0.	0.	1145	RAM337	0000	0.	0.
146	SCT150	131	0.	0.	1146	RAM338	0000	0.	0.
147	SCT151	131	0.	0.	1147	RAM339	0000	0.	0.
148	SCT152	131	0.	0.	1148	RAM340	0000	0.	0.
149	SCT153	131	0.	0.	1149	RAM341	0000	0.	0.
150	SCT154	131	0.	0.	1150	RAM342	0000	0.	0.
151	SCT155	131	0.	0.	1151	RAM343	0000	0.	0.
152	SCT156	131	0.	0.	1152	RAM344	0000</		

Table 2. Abbreviated calendar showing relationship between Gregorian Calendar date and Julian Day number.

	<u>Date</u>		<u>1st</u>	<u>10th</u>	<u>20th</u>
TUE	1 JAN 1980	1	2444240	2444249	2444259
FRI	1 FEB 1980	32	2444271	2444280	2444290
SAT	1 MAR 1980	61	2444300	2444309	2444319
TUE	1 APR 1980	92	2444331	2444340	2444350
THU	1 MAY 1980	122	2444361	2444370	2444380
SUN	1 JUN 1980	153	2444392	2444401	2444411
TUE	1 JUL 1980	183	2444422	2444431	2444441
FRI	1 AUG 1980	214	2444453	2444462	2444472
MON	1 SEP 1980	245	2444484	2444493	2444503
WED	1 OCT 1980	275	2444514	2444523	2444533
SAT	1 NOV 1980	306	2444545	2444554	2444564
MON	1 DEC 1980	336	2444575	2444584	2444594
THU	1 JAN 1981	1	2444606	2444615	2444625
SUN	1 FEB 1981	32	2444637	2444646	2444656
SUN	1 MAR 1981	60	2444665	2444674	2444684
WED	1 APR 1981	91	2444696	2444705	2444715
FRI	1 MAY 1981	121	2444726	2444735	2444745
MON	1 JUN 1981	152	2444757	2444766	2444776
WED	1 JUL 1981	182	2444787	2444796	2444806
SAT	1 AUG 1981	213	2444818	2444827	2444837
TUE	1 SEP 1981	244	2444849	2444858	2444868
THU	1 OCT 1981	274	2444879	2444888	2444898
SUN	1 NOV 1981	305	2444910	2444919	2444929
TUE	1 DEC 1981	335	2444940	2444949	2444959
FRI	1 JAN 1982	1	2444971	2444980	2444990
MON	1 FEB 1982	32	2445002	2445011	2445021
MON	1 MAR 1982	60	2445030	2445039	2445049
THU	1 APR 1982	91	2445061	2445070	2445080
SAT	1 MAY 1982	121	2445091	2445100	2445110
TUE	1 JUN 1982	152	2445122	2445131	2445141
THU	1 JUL 1982	182	2445152	2445161	2445171
SUN	1 AUG 1982	213	2445183	2445192	2445202
WED	1 SEP 1982	244	2445214	2445223	2445233
FRI	1 OCT 1982	274	2445244	2445253	2445263
MON	1 NOV 1982	305	2445275	2445284	2445294
WED	1 DEC 1982	335	2445305	2445314	2445324
SAT	1 JAN 1983	1	2445336	2445345	2445355
TUE	1 FEB 1983	32	2445367	2445376	2445386
TUE	1 MAR 1983	60	2445395	2445404	2445414
FRI	1 APR 1983	91	2445426	2445435	2445445
SUN	1 MAY 1983	121	2445456	2445465	2445475
WED	1 JUN 1983	152	2445487	2445496	2445506
FRI	1 JUL 1983	182	2445517	2445526	2445536
MON	1 AUG 1983	213	2445548	2445557	2445567
THU	1 SEP 1983	244	2445579	2445588	2445598
SAT	1 OCT 1983	274	2445609	2445618	2445628
TUE	1 NOV 1983	305	2445640	2445649	2445659
THU	1 DEC 1983	335	2445670	2445679	2445689
SUN	1 JAN 1984	1	2445701	2445710	2445720
WED	1 FEB 1984	32	2445732	2445741	2445751
THU	1 MAR 1984	61	2445761	2445770	2445780
SUN	1 APR 1984	92	2445792	2445801	2445811
TUE	1 MAY 1984	122	2445822	2445831	2445841
FRI	1 JUN 1984	153	2445853	2445862	2445872
SUN	1 JUL 1984	183	2445883	2445892	2445902
WED	1 AUG 1984	214	2445914	2445923	2445933
SAT	1 SEP 1984	245	2445945	2445954	2445964
MON	1 OCT 1984	275	2445975	2445984	2445994
THU	1 NOV 1984	306	2446006	2446015	2446025
SAT	1 DEC 1984	336	2446036	2446045	2446055