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TITLE FORMATTING OF CHEMISTRY DATA

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DATE

SOURCE LANGUAGE

1. IDENTIFICATION

1.1 Number: OCDA-8-10 (P-10-01)
1.2 Title: FORMATTING OF CHEMISTRY DATA
1.3 Date: May 1968
1.4 Computer: PDP-8
1.5 Language: PAL III

2. ABSTRACT

The program accepts the raw chemistry data which consists of the salinity, oxygen titre and optical density for the determination of silicate concentration. The oxygen and silicate concentrations are calculated, the data are O/T in a fixed format.

3. REQUIREMENTS

3.1 Storage: 5 - 7, 40 - 107, 200 - 377, 5400 - 7577
3.2 Subprograms and/or Subroutines:
3.2.1 F.P. Package (Digital 8-5B-S)
3.2.2 Modification to Fixed Point O/T (Decus No. 8 - 44)
3.3 Equipment: H.S. paper tape reader/punch.

4. USAGE

4.1 Loading: Binary loader (Digital 8-2-U) is used to load the F.P. Package, followed by the rounding modification program, then the program.
4.2 Calling Sequence: N/A
4.3 Swtich Settings: N/A
4.4 Start up and/or Entry: The starting address for the program is loc. 200_8.
4.5 Errors in Usage and Recovery: If in any record, an error in typing is made before the carriage return is typed, typing a "Back Arrow" may be used to delete the entire record. It is important to continue typing data without first typing a carriage return and line-feed. If "Back Arrows" are used, it is necessary to feed the tape through the symbolic editor (Digital 8-1-S) before using in this program.

5. RESTRICTIONS: N/A

6. DESCRIPTION

6.1 Discussion: The program reads the raw chemistry data, applies the calibration corrections and converts to the proper units as required. The I/T format was chosen so that the tapes could be typed as quickly and easily as possible. The O/T is in a fixed format. All I/O are on the H.S. reader/punch.

```
0267 66
OXY=5.38 SIL=.043 62.4
1 617 113 35230
100 604 115 35230
150 603 115 35236
300 601 119 35238
400 538 146 35301
600 473 226 35091
800 539 224 35024
900 561 222 34976
1000 583 216 34961
1100 602 215 34937
1200 613 210 34927
1300 624 206 34918
1630 626 226 34929
2030 617 247 34955
2230 613 257 34966
2530 603 335 34978
2730 602 335 34982
2780 615 288
2830 0 0 34999
0$
```

```
+0267+066
+0001+646+044+35230
+0100+632+045+35230
+0150+631+045+35236
+0300+629+047+35238
+0400+563+064+35301
+0600+495+114+35091
+0800+564+113+35024
+0900+587+112+34976
+1000+610+108+34961
+1100+630+107+34937
+1200+642+104+34927
+1300+653+102+34918
+1630+655+114+34929
+2030+646+127+34955
+2230+642+134+34966
+2530+631+182+34978
+2730+630+182+34982
+2780+644+153+00000
+2830+000+000+34999
$
```

Figure 1

6.2 Examples and/or Applications: Given in Fig. 1

7. METHODS

7.1 Discussion: The formulation of the method of calibration of the instruments used to measure the oxygen and silicate concentration were obtained from 'A Manual of Sea Water Analysis' by J.P.H. Strickland and T.R. Parson (FRB Bulletin # 125).

7.2 Algorithm's: The oxygen factor (f) is given by:

$$f = \frac{1.1267 \times 500}{\text{TITRE}}$$

where the TITRE is the mean of several titrations for one calibration (in millilitres). The oxygen value is given by:

$$\text{ml } O_2/L = V \times f$$

where V is the titre for the sample. The value of V also includes the blank correction.

The silicate value is given by:

$$\text{ug - at Sil/L} = (OD-BL)\ F$$

where

OD: the optical density of the sample
BL: the blank determination
F: the calibration factor

8. FORMAT

8.1 Input Data: The I/T data is not based on any fixed length field, hence only the significant digits need be typed. The decimal points are not typed for the data field but are typed for the calibration fields. It is important in the data fields to have the correct number of digits typed after the inferred decimal points.
The I/T data tape consists of three types of records: (a) The Identification Record. This record contains the cruise and station numbers. This must be the first record for any station.
(b) The Observed Chemistry Data Record: This record contains the oxygen titre value, the optical density for the determination of the silicate concentration, the salinity followed by a second salinity if it exists. If any of the parameters, except the second salinity were not obtained, a zero must be typed for its' value.
(c) The End of the Station Record: This record contains a zero and a dollar code (0$).
The calibration data for oxygen and silicate can be placed anywhere in the station data and applies to all the data which follows until the next calibration value. The new oxygen calibration is identified by the letter 'O' (code = 317_8), after which any letters may be typed except an 'S' (code = 323_8), followed by the calibration titre. The silicate calibration is identified by the letter 'S' after which any letter may be typed except 'O', followed by the blank determination

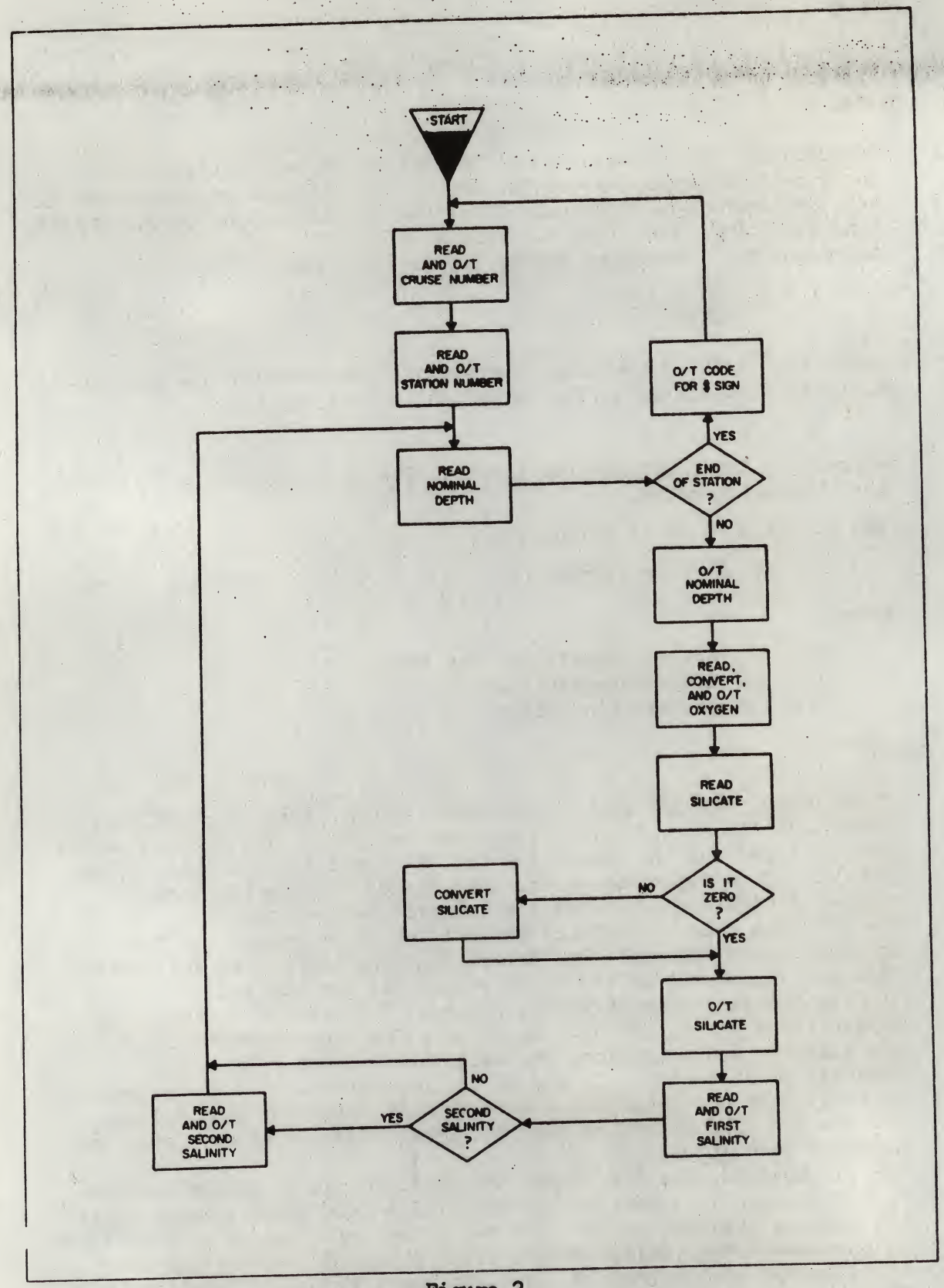

START
READ AND O/T CRUISE NUMBER
READ AND O/T STATION NUMBER
READ NOMINAL DEPTH
O/T CODE FOR $ SIGN
YES
END OF STATION ?
NO
O/T NOMINAL DEPTH
READ, CONVERT, AND O/T OXYGEN
READ SILICATE
IS IT ZERO ?
NO
CONVERT SILICATE
YES
O/T SILICATE
READ AND O/T FIRST SALINITY
SECOND SALINITY ?
NO
YES
READ AND O/T SECOND SALINITY

Figure 2

and the conversion factor.

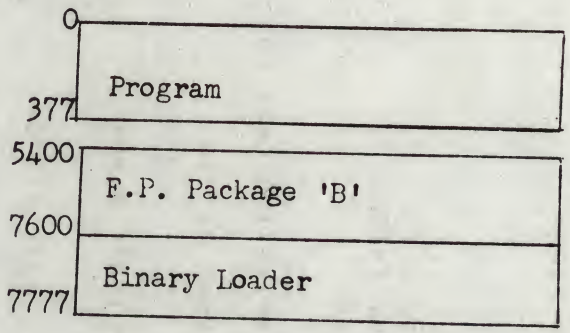
8.2 Core Data: N/A

8.3 Output Data: The O/T records are in fixed format with no decimal points. The first record consists of: a cruise and a station number (+xxxx +xxx↵). The following records consist of: nominal depth, oxygen concentration, silicate concentration, salinity and a second salinity if it exists (+xxxx+xxx+xxx+xxxxx+xxxxx↵). The last record of a station consists of only a dollar sign ($).

9. EXECUTION TIME N/A

10. PROGRAM

10.1 Core Map:



10.2 Dimension List: N/A

10.3 Marco, Parameter, and Variable Lists: This is included with the listing of the program.

10.4 Program Listing: Attached at the end of the program write-up.

11. DIAGRAMS

11.1 Flow Chart: Shown in Fig. 2

12.. REFERENCES

12.1 Other Library Programs:

12.1.1 Symbolic Tape Editor (Digital-8-1-S)

12.2 Digital Manuals

12.2.1 Symbolic Editor Manual (Digital 8-1-S)

12.2.2 F.P. System (Digital 8-5-S)

```
                    /***** OCDA-8-10 *****
                    /
                    /    FORMATING OF CHEMISTRY DATA
                    /
                    /*******P-10-01******
                    /
                    /FORMAT THE CHEMISTRY TO BE USED AS INPUT INTO THE CDC3100 COMPUTER
                    /
                    /STARTING ADDRESS *200*
                    /
                    /NOTE.  THERE MUST BE A TERMINATING CHARACTER BEFORE CONTROL CHARACTER FOR
                       /INPUT OF A NEW OXYGEN(O) OR SILICATE (S) FACTORS
                    /IN THE OXYGEN AND SILICATE FACTORS DECIMAL POINTS ARE TO BE PUT IN
                    /
                    /F.P. PACKAGE *B* WITH ROUNDING IS TO BE USED
                    /
                    /THE END OF STATION IS TERMINATED BY A DOLLAR SIGN.
                              /
                              /NOTE IF BACK ARROWS APPEAR ANYWHERE IN THE INPUT TAPE FEED THROUGH
                              /SYMBOLIC TAPE EDITOR PROGRAM FIRST
                              /
                    /
0005                *5
0005    7400                7400                /F.P. I/T
0006    7200                7200                /F.P. O/T
0007    5600                5600                /F.P. INTER.
0055                *55
0055    0000                0
0057                *57
0057    0000        CHAR,   0                   /TERMINATING CHAR FOR F.P.
0063                *63
0063    0000        OXYF,   0                   /OXYGEN FACTOR
0064    0000                0
0065    0000                0
0066    0000        SILBL,  0                   /SILICATE BLANK
0067    0000                0
0070    0000                0
0071    0000        SILF,   0                   /SILICATE FACTOR
0072    0000                0
0073    0000                0
0074    0345        RED,    READ                /READ A NUMBER
0075    7563        MCR,    -215
0076    7534        MDDL,   -244
```

```
0077  0212  LF,     212
0100  7344  OCHAR,  7344
0101  0240  SPACE,  240
0102  0207  BELL,   207
0103  0004  F10,    4
0104  2400        2400                  /CONST=10
0105  0000        0
0106  0007  F100,   7
0107  3100        3100                  /CONST=100
0110  0000        0
0200        *200
0200  7300        CLA CLL               /INITIALIZE
0201  6026        PLS
0202  6021        PSF
0203  5202        JMP .-1
0204  4335  START,  JMS CRLF
0205  1101        TAD SPACE
0206  4500        JMS I OCHAR           /O/P SPACE AT BEGIN OF LINE
0207  4474        JMS I RED             /READ CRUISE NO.
0210  4353        JMS OUT               / O/P CRUISE NO
0211  0004        4                     /NO. OF DIGITS
0212  4474        JMS I RED             /READ STATION NO.
0213  4353        JMS OUT               / O/P STATION NO
0214  0003        3                     /NO. OF DIGITS
0215  4335        JMS CRLF              / O/P CR AND LF
0216  4474  ADEP,  JMS I RED           /READ NOMINAL DEPTH
0217  1057        TAD S7
0220  1076        TAD MDOL
0221  7650        SNA CLA               /CHECK IF THE END OF TAPE
0222  5266        JMP FINISH            / O/P A SPACE AT BEGINNING OF LINE
0223  1101        TAD SPACE
0224  4500        JMS I OCHAR
0225  4353        JMS OUT               / O/P NOMINAL DEPTH
0226  0004        4                     /NO. OF DIGITS
0227  4474        JMS I RED             /READ OXYGEN
0230  4407        JMS I 7
0231  3063        EMPY OXYF             /APPLY CORRECTION
0232  0000        FEXT
0233  4353        JMS OUT               / O/P OXYGEN
0234  0003        3                     /NO. OF DIGITS
0235  4474        JMS I RED             /READ SILICATE
0236  1045        TAD 45                /CHECK IF SILICATE = 0
0237  7650        SNA CLA
```

```
0240    5245            JMP SIOT
0241    4407            JMS I 7
0242    2066            FSUB SILBL              /APPLY CORRECTION
0243    3071            FMPY SILF
0244    0000            FEXT
0245    4353    SIOT,   JMS OUT                 / O/P SILICATE
0246    0003            3                       /NO. OF DIGITS
0247    4474            JMS I RED               /READ FIRST SALINITY
0250    4353            JMS OUT                 / O/P FIRST SALINITY
0251    0005            5                       /NO. OF DIGITS
0252    1057    CHECK,  TAD 57
0253    1075            TAD MCR
0254    7650            SNA CLA                 /CHECK IF A SECOND SALINITY
0255    5264            JMP END
0256    4405            JMS I 5                 /READ SECOND SALINITY
0257    1060            TAD 60
0260    7650            SNA CLA                 /CHECK IF 2ND SAL WAS READ
0261    5252            JMP CHECK
0262    4353            JMS OUT                 / O/P SECOND SALINITY
0263    0005            5                       /NO OF DIGITS
0264    4335    END,    JMS CRLF                / O/P CR AND LF
0265    5216            JMP ADEP
0266    1076    FINISH, TAD MDOL
0267    7041            CIA
0270    4500            JMS I OCHAR             / O/P A DOLLAR AT END OF STN
0271    1102            TAD BELL
0272    6046            TLS
0273    5204            JMP START
                /READ AND STORE OXYGEN FACTOR
0274    7200    OXYFAC, CLA
0275    1474            TAD I RED               /RETURN ADDRESS
0276    3331            DCA STORI
0277    4474            JMS I RED               /READ FACTOR
0300    4407            JMS I 7                 /STORE
0301    6063            FPUT OXYF
0302    5332            FGET CONST
0303    4063            FDIV OXYF               /1.1267X5.00/TITRE
0304    6063            FPUT OXYF
0305    0000            FEXT
0306    1331    A,      TAD STORI
0307    3474            DCA I RED
0310    3060            DCA 60
0311    5730            JMP I RETURN
```

```
                        /READ AND STORE SILICATE FACTOR
0312    1474    SILFAC, TAD I RED               /RETURN ADDRESS
0313    3331            DCA STORI
0314    4474            JMS I RED               /READ BLANK
0315    4407            JMS I 7                 /STORE
0316    3103            FMPY F10
0317    3106            FMPY F100
0320    6066            FPUT SILBL
0321    0000            FEXT
0322    4474            JMS I RED               /READ FACTOR
0323    4407            JMS I 7                 /STORE
0324    4106            FDIV F100
0325    6071            FPUT SILF
0326    0000            FEXT
0327    5306            JMP A
0330    0346    RETURN, READ+1
0331    0000    STORI,  0                       /DUMMY STORAGE
0332    0003    CONST,  0003                    /1.1267*5.00=5.6335
0333    2642            2642
0334    1321            1321
                        /SUBROUTINES
                        /SUB. TO OUTPUT A CARRIAGE RETURN AND LINE FEED
0335    0000    CRLF,   0
0336    7300            CLA CLL
0337    1075            TAD MCR
0340    7041            CIA
0341    4500            JMS I OCHAR             / O/P A CARRIAGE RETURN
0342    1077            TAD LF
0343    4500            JMS I OCHAR             / O/P A LINE FEED
0344    5735            JMP I CRLF
                        /SUB.  TO READ IN A NUMBER
0345    0000    READ,   0
0346    4405            JMS I 5
0347    1060            TAD 60
0350    7650            SNA CLA                 /CHECK IF LEGAL INPUT
0351    5346            JMP .-3
0352    5745            JMP I READ
                        /OUTPUT A NUMBER
0353    0000    OUT,    0
0354    7300            CLA CLL
0355    1753            TAD I OUT               /OBTAIN NO. OF DIGITS
0356    3062            DCA 62
0357    2353            ISZ OUT                 /SET RETURN JMP
```

```
0360  4406            JMS I 6                         /OUTPUT
0361  5753            JMP I OUT
5562                  *5562
5562  0000            0                               /LEADING ZERO,S
                      /INPUT ROUTINE CONTAINED IN F.P. PACKAGE
7142                  *7142
7142  0000  INPUT,    0
7143  7200            CLA
7144  6014            RFC
7145  6011            RSF
7146  5345            JMP .-1
7147  6012            RRB
7150  3057            DCA CHAR
7151  1057            TAD CHAR
7152  7450            SNA                             /CHECK IF FEED HOLE
7153  5343            JMP INPUT+1
7154  1371            TAD MRBOUT
7155  7450            SNA                             /CHECK IF RUBOUT
7156  5343            JMP INPUT+1
7157  1372            TAD LETO
7160  7450            SNA                             /CHECK IF THE LETTER O
7161  5767            JMP I O2
7162  1373            TAD LETS
7163  7650            SNA CLA                         /CHECK IF THE LETTER S
7164  5770            JMP I SI
7165  1057            TAD CHAR
7166  5742            JMP I INPUT
7167  0274  O2,       OXYFAC
7170  0312  SI,       SILFAC
7171  7401  MRBOUT,   -377
7172  0060  LETO,     377-317
7173  7774  LETS,     +317-323
                      /CHANGE O/P PACKAGE OF F.P. PACKAGE TO HIGH SPEED PUNCH.
7345                  *7345
7345  6021            PSF
7347                  *7347
7347  6026            PLS
                      $
```

ADEP	0216
A	0306
BELL	0102
CHAR	0057
CHECK	0252
CONST	0332
CRLF	0335
END	0264
FIDO	0106
FIN	0103
FINISH	0266
INPUT	7142
LETO	7172
LETS	7173
LF	0077
MCR	0075
MODL	0076
MRBOUT	7171
O2	7167
OCHAR	0100
OUT	0353
OXYFAC	0274
OXYF	0053
READ	0345
RED	0074
RETURN	0330
SILBL	0066
SILFAC	0312
SILF	0071
SIOT	0245
SI	7170
SPACE	0101
START	0204
STORI	0331