COMPUTERISED VERSION OF ECHO-SOUNDING CORRECTION TABLES (THIRD EDITION)

Introduction

In 1980 a Third Edition of Echo-Sounding Correction Tables was published by the U.K. Hydrographic department to replace Matthews Tables. The tables were extensively revised to incorporate the large number of temperature and salinity measurements obtained since 1939 and use an improved formula for the speed of sound in sea water derived in recent years. Computations for the revised tables were carried out by D.J.T. Carter of the Institute of Oceanographic Sciences, Wormley, Surrey using oceanographic station data provided by the United States National Oceanographic Data Centre, Washington. The revised tables, together with a detailed description of their preparation, are contained in:

> Echo-Sounding Correction Tables,
> 3rd Edition. N.P. 139
> Hydrographic Department,
> Ministry of Defence, 1980.
>
> Available from Admiralty Chart Agents.

In 1982 the Twelfth International Hydrographic Conference at Monaco decided to adopt the Third Edition Tables in place of Matthews Tables.

The Third Edition Tables are applicable for use throughout the world in water depths greater than 200 metres, and cover depth to the sea bed in each of 85 echo-sounding correction areas. The tables are expressed in metres only, and assume an echo-sounder velocity of 1500 metres/second. As the boundaries between echo-sounding correction areas lie along exact degrees of latitude and longitude, the tables are particularly suited for automatic use on computerised systems. Although the published tables are listed at 10 metre intervals, values between 100 metre intervals were derived by linear interpolation, so only 100 metre values need be stored for access by a computer program.

A computerised version of the tables (third edition), originally written for the IBM 1800 computer on RRS Discovery, and also implemented on the NERC shipborne PDP/11 computers, enables echo-soundings to be corrected automatically given the ship position. A copy of the FORTRAN subroutines necessary to produce these corrections are provided, together with the requisite data, i.e. the computerised echo-sounding correction area definitions and correction tables.

DIRECTORY DESCRIPTION

The zip file contains seven files. All files are standard IBM PC ASCII text files with variable length records, each record being terminated by the carriage-return/linefeed characters.

The file contents are as follows:

README.TXT	-	(this text) contains documentation of the contents of the directory.
BOUNDARY.DAT	-	contains echo-sounding correction area boundary definitions expressed in latitudinal bands.
CORRECTN.DAT	-	contains echo-sounding correction tables (1500 metres/second) for each correction area.
BOUNDARY.IDX	-	contains indexed echo-sounding correction area boundary definitions in an expanded form suitable for loading to a direct access file for use in automatic application of correction factors by computer.
CORRECTN.IDX	-	contains indexed echo-sounding correction tables in an expanded form suitable for loading to a direct access file.
FINAR.FTN	-	contains a listing of a FORTRAN subroutine (subroutine FINAR) which will return the appropriate correction area from supplied values of latitude and longitude when used in conjunction with a direct access file generated from the data in BOUNDARY.IDX.
DCORR.FTN	-	contains a listing of a FORTRAN subroutine (subroutine DCORR) which will return the corrected sounding from values of observed depth and correction area number when used in conjunction with a direct access file generated from the data in CORRECTN.IDX.

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*                                                                    *
*                     FILE FORMAT DESCRIPTIONS                       *
*                                                                    *
*                                                                    *
*====================================================================*
*                                                                    *
*    README.TXT      -   plain language text records                 *
*                                                                    *
*    FINAR.FTN       -   FORTRAN statement records                   *
*    DCORR.FTN                                                       *
*                                                                    *
*    BOUNDARY.DAT    -   data records as described below             *
*    CORRECTN.DAT                                                    *
*    BOUNDARY.IDX                                                    *
*    CORRECTN.IDX                                                    *
*                                                                    *
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BOUNDARY.DAT : Echo-sounding correction area boundary definitions expressed in latitudinal bands

File contains 579 logical records.

The area boundary information for each degree of latitude is contained in a group of two or more records. The first record identifies the latitude band and indicates the number of longitude band/area number data pairs to be found on the following record(s). The second and subsequent records hold longitude band and area number information.

Data record formats (for each group of records):-

Record	Columns	Format	Contents
0	1 - 2	I2	File identifier (always set to ' 1').
0	3 - 6	I4	Latitude in degrees of Southern boundary of 1 degree latitude band (North positive, South negative).
0	7 - 8	I2	Record sequence number within group (always set to ' 0' on first record).
0	9 - 11	I3	Number of pairs of longitude band/correction area data values to be found on the following records of the group (9 pairs per record).
1 - n	1 - 2	I2	File identifier (always set to ' 1').
1 - n	4 - 6	I4	Latitude in degrees (as on record 0).
1 - n	7 - 8	I2	Record sequence number within group.
1 - n	9 - 80	9(I5,I3)	Longitude (I5) / correction area number (I3) data pairs, 9 pairs per record. The longitude expressed in degrees from -180 (i.e. 180 degrees West) to +179 (i.e. 179 degrees East) represents the Western boundary of the correction area within the 1 degree latitude band.

The record groups are arranged in descending order of latitude.

To determine the correction area number for an observed latitude and longitude:-

Round the latitude value down to the nearest integer value of degrees of latitude, and identify the group of records which apply to that latitude band. Within each group of records, the longitude/correction area data pairs are arranged in ascending order of longitude, starting at 180 degrees West (-180 degrees) and progressing Eastwards in irregular multiples of whole degrees throughout the group. The last longitude value given in a group indicates a longitude band which extends Eastwards from that value to 180 degrees East. Round the observed longitude value down to the nearest integer value of degrees, and identify the longitude band in which the observed value is greater than or equal to the Western boundary, but less than the Eastern boundary. The correction area number associated with the Western boundary of that longitude band is the one which applies to the observed latitude and longitude values.

CORRECTN.DAT : Echo-sounding correction tables (1500 metres/second)

File contains 584 logical records.

For each of the 85 correction areas, the corrected sounding values at 100 metre intervals (starting at 200 metres) are contained in a group of two or more records. The first record identifies the correction area and indicates the number of corrected sounding values to be found on the following record(s). The second and subsequent records hold corrected sounding values.

Data record formats (for each group of records):-

Record	Columns	Format	Contents
0	1 - 2	I2	File identifier (always set to ' 2').
0	3 - 5	I3	Correction area number.
0	6 - 7	I2	Record sequence number within group.
0	8 - 11	I4	Number of corrected sounding data values to be found on the following records of the group (12 values per record).
1 - n	1 - 2	I2	File identifier (always set to ' 2').
1 - n	3 - 5	I3	Correction area number (as on record 0).
1 - n	6 - 7	I2	Record sequence number within group (' 1' for first record, ' 2' for second etc.).
1 - n	8 - 79	12I6	Corrected sounding values in metres at 100 metre intervals starting at 200 metres, 12 values per record.

The record groups are arranged in ascending order of correction area number.

To determine a corrected sounding value:-

Identify the group of records which apply to the correction area number

for that sounding (as determined from BOUNDARY.DAT). If necessary, correct the observed sounding to that which would have been obtained using equipment set for a sound velocity of 1500 metres per second. Locate the pair of 100 metre corrected soundings which bracket the observed value (i.e. for an observed sounding of 437 metres, use the third and fourth corrected sounding values, which correspond to soundings of 400 and 500 metres respectively). Compute the corrected sounding for the precise observed sounding value by linear interpolation between those values. E.g. for an observed sounding of 437 metres:

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corrected sounding = s400 + ( ( s500 - s400 ) * 37 ) / 100
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where s400 and s500 are corrected sounding values for 400 and 500 metres respectively.

BOUNDARY.IDX : Indexed echo-sounding correction area boundary definitions for use in a direct access file

File contains 6128 logical records.

The area boundary information given in BOUNDARY.DAT has been re-arranged into an expanded form suitable for loading into a direct access file. Each record of the file bears an integer number and the record number in the direct access file on which that number should be stored. The direct access file should be capable of storing one integer number of up to 6200 (approximately 1.5 * 2**12) on each record; 6128 records in total. Records 1 to 181 of the file are the index section, records 182 to 6127 are the data section containing area boundary information. The last record in the file (number 6128) is an end of file marker record used by the software described in FINAR.FTN, and bears the value '-999'.

Records in the index section act as pointers, each bearing the record sequence number of the first record of a group of records containing area boundary information for a single one degree latitude band. Record number 1 points to data for 89 degrees (89 degrees North), record number 2 to data for 88 degrees and so on up to record number 180 which points to data for -90 degrees (90 degrees South); record number 181 points to record number 6128. Within each group of records in the data section of the file, the first (pointed to by the index) bears the value of the latitude band in degrees; subsequent records of the group are in pairs, the first of each pair bearing the Western boundary value in degrees and the second bearing the correction area number (in the sequence described for BOUNDARY.DAT above).

Data record formats (for all records):-

Columns	Format	Contents
1 - 2	I2	File identifier (always set to ' 3').
3 - 8	I6	Record number within file (starting at ' 1' for first record in file). This also indicates the record number in the direct access file on which the data value should be stored.
9 - 14	I6	Data value. This may be an index pointer, latitude value, longitude value or correction area number (see description of file format for details).

A subroutine which will scan these data (when they are stored in a direct access file) and return the correction area number relevant to a supplied latitude and longitude is listed in FINAR.FTN.

CORRECTN.IDX : Indexed echo-sounding correction tables (1500 metres/second) for use in a direct access file

File contains 5813 logical records.

The corrected sounding information given in CORRECTN.DAT has been re-arranged into an expanded form suitable for loading into a direct access file. Each record of the file bears an integer number and the record number of the direct access file on which that number should be stored. The direct access file should be capable of storing one integer number of up to 13000 (approximately 1.6 * 2**13) on each record; 5813 records in total. Records 1 to 86 of the file are the index section, records 87 to 5812 are the data section containing corrected sounding information. The last record in the file (number 5813) is an end of file marker record used by the software described in DCORR.FTN, and bears the value '-999'.

Records in the index section act as pointers, each bearing the record sequence number of the first record of a group of records containing corrected sounding information for a single correction area. Record number 1 points to data for correction area number 1, record number 2 to data for correction area number 2 and so on up to record number 85 which points to data for correction area number 85; record number 86 points to record number 5813. Within each group of records in the data section of the file, the first (pointed to by the index) bears the correction area number; subsequent records of the group bear corrected sounding values at 100 metre intervals, starting at 200 metres (in the sequence described for CORRECTN.DAT above).

Data record formats (for all records):-

Columns	Format	Contents
1 - 2	I2	File identifier (always set to ' 4').
3 - 8	I6	Record number within file (starting at ' 1' for first record in file). This also indicates the record number of the direct access file on which the data value should be stored.
9 - 14	I6	Data value. This may be an index pointer, correction area number or corrected sounding value (see description of file format for details).

A subroutine which will scan these data (when they are stored in a direct access file) and return the corrected sounding value from a supplied correction area number and observed sounding value is listed in DCORR.FTN.

These data files were prepared by the

British Oceanographic Data Centre

using data and subroutines provided by

D.J.T. Carter

of the Institute of Oceanographic Sciences, Wormley

and

J. Sherwood

of the Research Vessel Base, Barry.