



NATIONAL OCEANOGRAPHIC DATA CENTER

MANUAL SERIES

MANUAL FOR PROCESSING BATHYTHERMOGRAPH DATA

PART 1

**INSTRUCTIONS FOR MANUALLY DIGITIZING
BATHYTHERMOGRAPH DATA**

**PUBLICATION M-3
(PROVISIONAL)**

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FOREWORD

The National Oceanographic Data Center (NODC), after investigating the overall requirements of the users of bathythermograph (BT) data, has developed a provisional system for the storage and retrieval of digitized BT data. At present the BT data in the NODC archives are being digitized manually; it is hopefully anticipated that an automated method of digitization will eventually be developed.

The prime purpose of this publication is to describe the method and format used by the NODC for the systematic reduction of nearly 1,000,000 BT analog observations in its archives to a digital format that can be accepted by modern computers. The secondary purpose of this publication is to encourage the collectors of BT data to digitize these data prior to forwarding them to the NODC for archiving. All contributors will routinely receive printouts of their data if it is submitted in digitized form. Several of the first users of the digitized BT data report sufficient detail for analog reconstruction for their purposes and excellent usability for statistical manipulation by the computer.

Your comments on any aspect of the procedures described herein or on the usability of the final data product described will be welcome.



W. C. JACOBS

Director

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TABLE OF CONTENTS

	<u>Page</u>
FOREWORD	III
LIST OF TABLES	VII
INTRODUCTION	1
GENERAL INSTRUCTIONS	3
CODING AND KEYPUNCHING THE MASTER CARD (Card Type 01) INFORMATION	5
CODING AND KEYPUNCHING THE REFERENCE CARD (Card Type 02) INFORMATION	13
CODING AND KEYPUNCHING THE DETAIL CARD (Card Types 03 through 07 and 50) INFORMATION	15
KEYPUNCHING INSTRUCTIONS FOR THE BATHYTHERMOGRAPH DIGITIZATION CARD	17
APPENDIX I - SAMPLE OF BATHYTHERMOGRAPH DIGITIZATION FORM	31
APPENDIX II - BATHYTHERMOGRAPH DATA CARD	33

LIST OF TABLES

<u>Table No.</u>		<u>Page</u>
I.	QUALITY CODE	19
II.	COUNTRY CODE	20
III.	INSTITUTION CODE	22
IV.	BT GRID CODE	25
V.	DIRECTION CODE	26
VI.	CLOUD TYPE (Genus) CODE	27
VII.	CLOUD AMOUNT CODE	28
VIII.	BT REFERENCE TEMPERATURE CODE	29
IX.	UNIT CODE	30

INTRODUCTION

In spite of the many technological advancements made over the recent years in the development of oceanographic instrumentation, the instrument providing the greatest volume of data on the thermal structure of the oceans is still the mechanical bathythermograph (BT). Although its analog temperature-depth record is a useful and popular data format for operational purposes, its curvilinear, analog record is a difficult form for the researcher and analyst to deal with statistically especially when considering sizeable ocean areas, long-time series, or large numbers of observations on diverse grids. Many analysis problems involving these data should utilize the potential of computers.

Undoubtedly, the idea of digitizing BT data occurred to many in the past;* however, it remained for the 1962 meeting of the Eastern Pacific Oceanic Conference (EPOC) to give the idea the needed impetus.

The provisional format proposed by the NODC retains the basic EPOC recommendations; however, an additional card--the Reference Card--has been added and the temperatures are read using a constant depth increment method rather than the EPOC flexure point method initially recommended. Additionally, the NODC system does permit the recording of up to 10 flexure points if the originator feels that these data are necessary to fully and more precisely describe the thermal structure.

The system is comprised of three basic card types--a Master Card (Card Type 01), a Reference Card (Card Type 02), and one or more Detail

*In the early 1950's, the U. S. Naval Oceanographic Office punched BT data from an area of the North Atlantic selected by the U. S. Navy Underwater Sound Laboratory using the standard oceanographic station depths. Although the data were useful for the intended purpose, they were found to be inadequate for statistical studies.

Cards, as needed (Card Types 03 through 07). Detail Cards 08 through 49 may be used when digitizing temperatures for depths exceeding those of the present mechanical BT. An optional Flexure Point Card (Card Type 50) may be used by those wishing to code more data points than would be available by using the standard 10-foot, 5-meter, or 2-fathom depth increment. Actually, one multi-purpose card (Appendix II) is used. Card type indicators are punched in Columns 79 and 80 to distinguish the various card types.

The final NODC archive file, now under development, will be on magnetic tape, in metric units, with temperatures reported in 5-meter intervals. Until the final archive format is developed, digital BT data are available from the NODC as follows:

1. Punch cards and/or listing of the data as originally recorded.
2. Magnetic tape in a provisional format and/or listing of the data converted to metric units with temperatures in 5-meter intervals.

GENERAL INSTRUCTIONS

The following general instructions are to be applied in BT digitization.

a. With few exceptions, values are recorded on the Bathythermograph Digitization Form (Appendix I) as read from the BT print regardless of the reporting units used. Units for these items are identified by the Unit Code entered in Columns 77 and 78 of the Master Card. Exceptions to this rule are pointed out in the instructions for coding the specific fields.

b. In general, environmental data marked as doubtful or questionable are not to be recorded. Do not digitize prints with questionable degrees of position and/or questionable month notations.

c. Rounding of values is not required in this system; unused digits are dropped.

d. Analog prints which require many estimated depth-temperature readings because of poor photography or grid reproduction are not to be digitized.

e. BT temperature values are read with an attempted precision of $\pm 0.1^{\circ}\text{F}$. or C.

f. Temperature values are generally read at the middle of trace; however, special procedures are to be used for the following types of traces.

1. Double trace in the thermocline only - read value halfway between the dual lines.

2. Double traces throughout the record - read center of the righthand trace.

3. Double traces which cross several times - read the value halfway between dual lines and center of crossover point.

g. When surface "noise" obliterates the top of a trace taken in isothermal water, it is permissible to extrapolate temperature readings to the surface in order to provide a continuous temperature record.

h. When a trace becomes illegible over a great enough distance so that interpolated values would be questionable, do not code beyond the last legible point.

i. There will be historical BT data that may need supplemental instructions for correct digitization. These instructions will be provided by the NODC.

CODING AND KEYPUNCHING THE MASTER CARD (CARD TYPE 01) INFORMATION

Columns 1-5

NODC REFERENCE IDENTITY NUMBER

The NODC Reference Identity Number is assigned by the National Oceanographic Data Center to identify BT data taken during a particular cruise. Enter this number in Columns 1-5 so that the unit digit is entered in Column 5. Prefix zeros to fill the field. (The NODC may assign a block of reference numbers to an institution to assign to data being coded for the NODC.)

Columns 6-8

CONSECUTIVE PRINT NUMBER

For historical data (ozalid prints) enter the slide number as given on the print. When complex numbering systems are employed which require more than three columns to record, substitute a suitable 3-digit numbering system. Do not enter alphabetic entries in this field. Enter this number in Columns 6-8 so that the unit digit is entered in Column 8; prefix zeros to fill the field. To code consecutive numbers 1000 to 1999, enter a red dash over the numeral in Column 8. Enter the hundreds, tens, and units digits in Columns 6-8. If a red dash is entered over Column 8, x overpunch that column. When coding from glass slides, number all observations from a given cruise consecutively beginning with 001.

Renumbering may be necessary when two or more stations have the same number, or the same number suffixed with letters (for example, 126, 126A, 126B, etc.).

Column 9

QUALITY CODE

Enter the estimated quality of the BT data in accordance with code given in Table I. [Determination of the quality of the BT data, especially

historical data read from the analog prints, is highly subjective. It is intended to give the user some idea of how closely the BT values approach absolute values.] BT prints on which the traces are very thick ($>1^{\circ}\text{F. or C.}$) or the grid lines are barely legible receive a red dash over the numeral in Column 9 to indicate that the coded data probably do not approach the required $\pm 0.1^{\circ}\text{F. or C.}$ precision. If red dash is entered over Column 9, X overpunch Column 9.

Columns 10-11

COUNTRY CODE

Enter the country code as given in Table II. Regardless of the ship's registry, country code should reflect the nationality of the agency sponsoring or operating the vessel for the particular cruise being coded.

Columns 12-13

INSTITUTION CODE

Enter the institution code as given in Table III. When coding historical data, if the institution responsible for taking the data is not known, leave blank.

Column 14

OCEAN STATION VESSEL (OSV)

Enter the Ocean Station Vessel's station letter designator (i.e. B for BRAVO, E for ECHO, etc.) when the observation has been taken by an ocean station vessel ON STATION. Otherwise, leave blank.

Columns 15-16

DAY

Enter day of month as determined by Greenwich Mean Time (GMT). Prefix zero if necessary. Convert from local time if necessary.

Columns 17-18

MONTH

Enter month as determined by Greenwich Mean Time (GMT) using the numerals 01 through 12. (If month is marked doubtful, do not code the BT record.)

Columns 19-20

YEAR

Enter tens and units digits of year as determined by GMT.

Columns 21-24

TIME

Enter time of observation determined by GMT. Enter hours according to the 24-hour clock in Columns 21 and 22, and minutes in Columns 23 and 24. If GMT time is reported to tenths of hours, enter a red decimal point in Column 23 and tenths value in Column 24.

Columns 25-27

MARSDEN SQUARE

Not to be coded; Marsden squares are generated by the computer from the positional information.

Columns 28-36

LATITUDE AND LONGITUDE

Enter degrees and minutes of latitude and longitude in Columns 28-31, and 32-36, respectively. Disregard seconds or tenths of minutes when reported. If minutes are indicated as being doubtful, crossed out, or omitted, leave Columns 30 and 31, and/or 35 and 36, blank. When tenths of degrees are reported, enter a red decimal point in Column 30 and/or 35 and the tenths values in Column 31 and/or 36. Enter N or S for North or South and E or W for East or West in columns provided for hemisphere following Columns 31 and 36, respectively. If S and/or E is entered, X overpunch Column 28 and/or 32, respectively. (If degrees are marked doubtful, do not code the BT record.)

Columns 37-40

DEPTH TO BOTTOM

Enter the depth to bottom as reported on the BT prints.

Columns 41-42

MAXIMUM TRACE DEPTH

Divide the greatest depth attained by the BT trace by ten, disregard the tenths, and enter the whole number in Columns 41-42. Prefix a zero when the maximum trace depth is less than 100 feet, meters, or fathoms. Do not digitize any portion of the trace that falls below the last numbered depth line of the grid.

Column 43

DEPTH OF GRID

Enter the numerical designator for the nearest equivalent depth range of the BT grid (not the trace) as given in Table IV.

Columns 44-45

WIND DIRECTION

Enter the value reported on the BT print if reported according to the 36-point compass or WMO Code 0877. If the word "variable" appears, enter 99 in Columns 44 through 45. When the direction is reported in degrees, divide by ten, drop the decimal, and enter the whole number, prefixing a zero when necessary to fill the field. Use Table V for converting other systems used for reporting wind direction to the 36-point code.

Columns 46-47

WIND SPEED OR FORCE

Enter S for speed or F for force in Column B preceding Column 46. Enter the reported numerical value in Columns 46 and 47; prefix a zero if necessary to fill the field. Speed must be in knots. If F is entered, x overpunch Column 46.

Columns 48-53

DRY AND WET BULB TEMPERATURES

Enter the dry and wet bulb temperatures to tenths of degrees in Columns 48 through 50 and 51 through 53, respectively. Dry and wet bulb temperature values greater than 100 in °F. are indicated by entering a red dash over the numeral in Column 49 and/or 52, respectively. Negative temperatures are indicated by entering a red negative sign in the columns labeled B preceding Columns 48 and 51. Leave Columns 50 and 53 blank if tenths are not reported. If a red dash is entered over numeral in Column 49 and/or 52, x overpunch those columns respectively. If a negative sign precedes Column 48 and/or 51, x overpunch Columns 50 and 53, respectively.

Columns 54-56

BAROMETRIC PRESSURE

Enter tens, units, and tenths digits of values reported. Leave Column 56 blank if tenths are not reported.

Column 57

WEATHER

Enter WMO Code 4501 when given as code or word equivalent; otherwise, leave blank.

Columns 58-59

CLOUD TYPE AND AMOUNT

Enter as given type (Genus) of cloud in Column 58 if reported according to WMO Code 0500 (formerly WMO Code 10). Convert other codes to WMO Code 0500 using Table VI only if other code is positively known. Leave Columns 58-59 blank if cloud type code is unknown.

Enter cloud amount (fraction of the sky covered by clouds) in eighths according to WMO Code 2700 as shown in Table VII.

Columns 60-63

WAVE HEIGHT AND PERIOD, OR SEA AMOUNT

Enter the height of the wind waves in Columns 60-61 in whole feet or meters (see NOTE), and the period in Columns 62 and 63 in whole seconds. If sea is reported in code instead of wave height and period, enter an x in Column 60 and the sea state code in Column 61. Do not enter height and period values derived from swell observations. If x is entered in Column 60, punch an alphabetic x in Column 60.

NOTE: When height is reported in meters, code a red dash in Column 61 of the coding form and x overpunch Column 61 on the card.

Columns 64-65

TCS

Enter the applied TCS in Columns 64 through 65 prefixing a zero in Column 64 if necessary to fill the field. Negative TCS values are indicated by entering a red dash in column labeled B preceding Column 64. If a red dash precedes Column 64, x overpunch Column 65.

See instructions for "REFERENCE TEMPERATURE" (Columns 69-71) if the TCS was computed from temperatures other than those reported as "reference temperatures."

If an applied TSP value is given on the print in addition to a TCS value, add the TSP to the TCS and enter the combined value in Columns 64-65. No overpunch is required.

Columns 64-65 also may be used to code special corrections to be applied to the BT traces already corrected with a TCS, or to apply a TCS to previously unadjusted traces. Enter the correction to be applied to each observation in Columns 64-65, prefixing a zero in Column 64 if necessary to fill the field. Additionally, enter a red dash over the numeral in Column 64 and x overpunch the same column on the IBM card. Negative values

are indicated by entering an additional red dash in column labeled B preceding Column 64. If a red dash precedes Column 64, x overpunch Column 65.

Columns 66-67

DSP

Most historical data (ozalid prints) do not contain this information. However, when coding from recent NODC processed BT ozalid prints (or directly from glass slides), enter the actual correction (DSP) applied to make the initial point of the BT trace coincide with the zero depth line of the grid. If DSP is negative, enter a red dash over the numeral in Column 67 and x overpunch Column 67.

Column 68

REFERENCE TEMPERATURE CODE

Enter the reference temperature code as given in Table VIII.

Columns 69-71

REFERENCE TEMPERATURE

Enter reference temperature to tenths of a degree in Columns 69-71. If tenths are not reported, leave Column 71 blank. The TCS for some historical data was computed from temperatures other than those recorded in this field (for example, the 10-meter reversing thermometer value). Code temperatures actually used as reference temperatures whenever available; otherwise, leave this field blank. Make the necessary modification to entry in Column 68. Negative reference temperatures are indicated by entering a red dash in column labeled B preceding Column 69. If a red dash precedes Column 69, x overpunch Column 71.

Column 72

CONTROL

This column is used to relate the observations with the BT used to obtain them. If all observations were obtained by a single BT instrument, code the letter A in Column 72. If two instruments were used, code the

letter A in Column 72 for all observations taken by the one BT and the letter B for all the observations taken by the other. If three instruments were used, the letters A, B, and C would be coded, etc. (The assignment of the letters to the BT instrument is purely arbitrary.)

Columns 73-74

INSTRUMENT TYPE

Enter 01 for mechanical BT. Code will be developed and expanded as required.

Columns 75-76

CARD COUNT

Enter the number appearing in Columns 79 through 80 of the last detail card on which entries are made.

Columns 77-78

UNIT CODE

Enter unit code as determined from Table IX. Whenever a combination of units occurs which is not covered by Table IX, it is permissible, under certain conditions, for the originator to generate a new code to cover the situation. New codes must not be generated without prior arrangements with the NODC.

Columns 79-80

CARD NUMBER

No entry required on coding form; punch 01 on card. (For EAM control, x overpunch Column 80.)

CODING AND KEYPUNCHING THE REFERENCE CARD (CARD TYPE 02) INFORMATION

Columns 1-8

Columns 1-8 are duplicated from the Master Card during card punching.

Columns 15-19

SHIP NUMBER

Optional; entry can be made if desired. If this field is used, code 00005 in Columns 15-19 if ship name is unknown to distinguish from non-entry.

Columns 20-27

ORIGINATOR'S CRUISE NUMBER*

Enter the originator's BT cruise number or alpha-numeric designator so that the first digit or letter is coded in Column 20. Do not suffix zeros to fill the field.

Columns 28-31

ORIGINATOR'S SLIDE NUMBER*

Enter the number or alpha-numeric designator assigned to the BT slide by the originator so that the last digit or letter is entered in Column 31. Prefix zeros to fill the field.

Columns 32-52

OCEANOGRAPHIC STATION REFERENCE

Code the originator's ocean cruise and station number in Columns 32-45; enter the last letter or number of each item in Columns 37 and 45, respectively. Do not prefix zeros. Columns 46-52 can be filled in only if this information has been obtained from NODC prior to coding.

*NOTE: If the information appearing in Columns 20 through 31 was assigned by the NODC rather than by an "originator," enter a red dash in Column 79 of the coding form and x overpunch the same column on the EAM Card.

Columns 53-78

SHIP'S NAME

Enter the ship's name in Columns 53-78 beginning with Column 53; leave all unused columns blank. Leave one column between each part of ship's name and/or initials.

Columns 79-80

CARD NUMBER

No entry required on coding form; punch 02 on card. (If the NODC BT cruise number is entered in Columns 20-27 instead of the originator's cruise number, place a red dash in Column 79 and x overpunch the same column on the EAM card.)

CODING AND KEYPUNCHING THE DETAIL CARD
(CARD TYPES 03 THROUGH 07 AND 50) INFORMATION

Columns 1-8

Columns 1-8 are duplicated from the Master Card during card punching.

Column 10

TYPE OF BT VALUE CODE

Enter 1 for temperatures read at standard depth increments from BT prints; enter 2 for temperatures read at standard depth increments from unprocessed BT glass slides and grid. Enter 3 for temperatures read at flexure points from ozalid prints. (See instructions for Columns 79-80, CARD NUMBER, for additional information.)

Columns 11-70

BT TEMPERATURE VALUES

Enter the BT temperature values, as read with an attempted precision of $\pm 0.1^{\circ}\text{F.}$ or C. at 10-foot, 5-meter, or 2-fathom intervals (depending on the grid calibration) in consecutive order of descending depths. Negative temperatures are indicated by placing a red dash in the upper portion of the last temperature column of each field having a negative value; x over-punch the same column to indicate negative temperatures in the card.

Columns 79-80

CARD NUMBER

No entry is required. However, flexure points may be recorded by those who are coding their own BT data. After the trace has been read using the constant depth interval method, record both the depth and temperature value for each flexure point in Card Type 50. Coding forms have space provided for recording these values. Up to ten (10) flexure points can be coded. Make certain that the proper code (Code 3 for flexure points read from an

ozalid print, code 4 for flexure points read from unprocessed BT glass slides and grid) appears in Column 10. Punch the number 50 in Columns 79-80 of the EAM card to identify the flexure point card.

KEYPUNCHING INSTRUCTIONS FOR THE BATHYTHERMOGRAPH DIGITIZATION CARD

In general the bathythermograph digitization form is arranged in such a manner that most of the numeric and alphabetic entries can be punched directly into the corresponding columns of the punch card. The entries on the coding form are arranged in the same general order as they appear on the punch card. The correct column entries for certain overpunches, however, cannot readily be determined from the digitization form. The correct entries for these overpunches are given below.

MASTER CARD (Card Type 01)

<u>Entry on Digitization Form</u>	<u>Explanation</u>	<u>Entry on Punch Card</u>
Red dash in Column 8	Add 1000 to Consecutive Number	<u>x</u> overpunch Column 8
Red dash in Column 9	Data may not approach the required precision	<u>x</u> overpunch Column 9
Red decimal point in Column 23	Tenth of hour given in Column 24	Decimal point punched in Column 23
Red decimal point in Column(s) 30 and/or 35	Tenths of degrees Latitude and/or Longitude given in Column(s) 31 and/or 36	Decimal point punched in Columns 30 and/or 35, respectively
<u>S</u> and/or <u>E</u> entry in Column following Column(s) 31 and/or 36	South Latitude and/or East Longitude reported.	<u>x</u> overpunch Column 28 and/or 32, respectively
Letter <u>F</u> between Columns 45 and 46	Wind force reported	<u>x</u> overpunch Column 46
Negative sign preceding Columns 48 and/or 51	Negative air temperatures	<u>x</u> overpunch Columns 50 and/or 53
Red dash in Columns 49 and/or 52	Add 100 to dry and/or wet bulb temperatures	<u>x</u> overpunch Columns 49 and/or 52

<u>Entry on Digitization Form</u>	<u>Explanation</u>	<u>Entry on Punch Card</u>
Letter <u>X</u> in Column 60	Sea State Code reported	Alphabetic X in Column 60
Red dash in Column 61	Height reported in meters	<u>x</u> overpunch Column 61
Red dash preceding Column 64	Negative value	<u>x</u> overpunch Column 65
Red dash in Column 64	TCS value to be applied to the trace	<u>x</u> overpunch Column 64
Red dash in Column 67	Negative DSP value	<u>x</u> overpunch Column 67
Red dash preceding Column 69	Negative reference temperature	<u>x</u> overpunch Column 71
1 in Column 80		<u>x</u> overpunch Column 80 and punch numeral 1 in Column 80

REFERENCE CARD (Card Type 02)

Red dash in Column 79	Cruise number assigned by NODC instead of originator	<u>x</u> overpunch Column 79
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DETAIL CARD (Types 03-07 and 50)

Columns 11-70

Red dash in last column of temperature fields	negative temperature	<u>x</u> overpunch corresponding columns
---	----------------------	--

TABLE I

QUALITY CODE

<u>Code</u>	<u>Description</u>
1	Digitized temperatures estimated to be within $\pm 0.4^{\circ}\text{F}$. ($\pm 0.2^{\circ}\text{C}$.) of true temperatures.
2	Digitized temperatures estimated to be within $\pm 2.0^{\circ}\text{F}$. ($\pm 1.0^{\circ}\text{C}$.) of true temperatures.
3	BT print temperature adjustment based on temperature information obtained by statistical procedures, from synoptic charts, etc. Accuracy presumed to be equivalent to Quality Code 2 or better.
4	Digitized temperatures probably are within $\pm \approx 3^{\circ}\text{F}$. ($\pm \approx 1.5^{\circ}\text{C}$.) of true temperatures.
5	Digitized temperatures may, or are known to, deviate by more than 3°F . (1.5°C .) from true temperatures. At NODC these records will be used for thermal gradient studies only.

NOTE: The code is based on a subjective estimate of the reliability of the temperatures indicated on the BT trace at any depth. The quality code does not apply to the change in temperature with depth; all BT's accepted for digitization are presumed to be accurate (within the limitations of the BT system) in respect to the vertical temperature structure.

TABLE II

NODC COUNTRY CODE

<u>Code</u>	<u>Name</u>
08	Argentina
09	Australia
10	Austria
11	Belgium
14	Brazil
18	Canada
19	Ceylon
20	Chile
21	China
22	Colombia
RC	Congo (BRAZZAVILLE)
26	Denmark
34	Finland
35	France
06	Germany
GH	Ghana
36	Greece
46	Iceland
41	India
42	Indonesia
45	Ireland
47	Israel
48	Italy
IC	Ivory Coast
49	Japan
24	Korea
64	Netherlands
59	New Caledonia
61	New Zealand
NI	Nigeria
58	Norway

TABLE II (Cont'd)

<u>Code</u>	<u>Name</u>
62	Pakistan
65	Peru
66	Philippines
67	Poland
68	Portugal
91	South Africa
90	Soviet Union
29	Spain
77	Sweden
86	Thailand
89	Turkey
27	United Arab Republic
74	United Kingdom
31	United States
93	Venezuela
95	Yugoslavia

NOTE: Other country codes will be added to this list as needed.

TABLE III

INSTITUTION CODE

<u>Institution</u>	<u>Code</u>
AUSTRALIA	
Australian Navy	01
CANADA	
Atlantic Ocean Group	11
Pacific Ocean Group	10
CHILE	
Chilean Navy	01
COLOMBIA	
Colombian Navy	01
INDIA	
University of Madras (INS)	01
INDONESIA	
Indonesian Navy	01
JAPAN	
Central Meteorological Observatory	03
Hakodate Marine Observatory	04
Japan Hydrographic Office	01
Kobe Marine Observatory	06
Nagasaki Marine Observatory	05
Tokai Regional Fisheries Research Laboratory	07
Tokyo University of Fisheries	02
NEW CALEDONIA	
French Institute of Oceania, Oceanographic Center	01

TABLE III (Cont'd)

PERU	
<u>Institution</u>	<u>Code</u>
Peruvian Government	02
Peruvian Navy	01
THAILAND	
Thai Navy Hydrographic Office	01
UNITED KINGDOM	
British Navy	01
UNITED STATES	
California Fish and Game	17
California Maritime Academy	13
Chesapeake Bay Institute	21
Coast and Geodetic Survey	10
Coast Guard	06
College of Pacific	14
Fish and Wildlife Service	11
Gulf Coast Research Laboratory	32
Hancock Foundation	19
Hopkins Maritime Institute	16
Hudson Laboratories, Columbia University	26
Lamont Geological Observatory	12
Miami, University of	25
National Science Foundation	29
Naval Oceanographic Office (NAVOCEANO)	07
Naval Ordnance Laboratory (NOL)	22
Naval Underwater Ordnance Station (NUOS)	15
Navy Electronics Laboratory (NEL); Naval Sound School, San Diego	20
Navy, Scientific	04
Navy, Ships of opportunity	05
Navy Underwater Sound Laboratory (USNUSL)	08
Oregon Fish Commission	23
Oregon State (College or University)	03
Rhode Island, University of	30
Scripps Institution of Oceanography (SCRIPPS); University of California, Division of War Research	01
State University of New York, Maritime College	27

TABLE III (Cont'd)

UNITED STATES

<u>Institution</u>	<u>Code</u>
Texas A & M University	24
Tiburon Marine Laboratory	31
Virginia Institute of Marine Sciences	28
Washington, University of	09
Woods Hole Oceanographic Institution (WHOI)	02
Yale University	18

TABLE IV

BT GRID CODE

(Code nearest equivalent BT depth range)

<u>Code</u>	
1	Up to 200 feet (60 m)
2	450 feet (70 fms or 140 m)
3	900 feet (275 m)
4	Greater than 1,000 feet (>300 m)
5	Rectilinear or digital output

TABLE V

DIRECTION CODE

Conversion from points, quarter points, or a scale of 32, to a scale of 36 points

POINTS	QUARTER POINTS	0-32	CODE	POINTS	QUARTER POINTS	0-32	CODE
N x E	N6E to N14E	1	01	S x W	S6W to S14W	17	19
NNE	N15E to N25E	2	02	SSW	S15W to S25W	18	20
NE x N	N26E to N34E	3	03	SW x S	S26W to S43W	19	21
NE x	N35E to N45E	4	04	SW	S35W to S45W	20	22
	N46E to N54E		05		S46W to S54W		23
NE x E	N55E to N65E	5	06	SW x W	S55W to S65W	21	24
ENE	N66E to N74E	6	07	WSW	S66W to S74W	22	25
E x N	N75E to N85E	7	08	W x S	S75W to S85W	23	26
	N86E to N89E		09		S86W to S89W		27
E	E	8	09	W	W	24	27
	S89E to S86E		09		N89W to N86W		27
E x S	S85E to S75E	9	10	W x N	N85W to N75W	25	28
ESE	S74E to S66E	10	11	WNW	N74W to N66W	26	29
SE x E	S65E to S55E	11	12	NW x W	N65W to N55W	27	30
	S54E to S46E		13		N54W to N46W		31
SE	S45E to S35E	12	14	NW	N45W to N35W	28	32
SE x S	S34E to S26E	13	15	NW x N	N34W to N26W	29	33
SSE	S25E to S15E	14	16	NNW	N25W to N15W	30	34
S x E	S14E to S6E	15	17	N x W	N14W to N6W	31	35
	S5E to S1E		18		N5W to N1W		36
S	S	16	18	N	N	32	36
	S1W to S5W		18		N1E to N5E		36
				Variable			99

TABLE VI

CLOUD TYPE (GENUS) CODE

WMO Code 0500 for Recording Cloud Type (Genus)

<u>Code</u>	
0	Cirrus.....Ci
1	Cirrocumulus.....Ce
2	Cirrostratus.....Cs
3	Alto cumulus.....Ac
4	Altostratus.....As
5	Nimbostratus.....Ns
6	Stratocumulus.....Sc
7	Stratus.....St
8	Cumulus.....Cu
9	Cumulonimbus.....Cb
x	Cloud not visible owing to darkness, fog, duststorm, sandstorm, or other analogous phenomena

TABLE VII

CLOUD AMOUNT CODE

WMO Code 2700 for Recording Cloud Amount

<u>Code</u>		
0	0	0
1	1 okta or less, but not zero	1/10 or less, but not zero
2	2 oktas	2/10-3/10
3	3 oktas	4/10
4	4 oktas	5/10
5	5 oktas	6/10
6	6 oktas	7/10-8/10
7	7 oktas or more, but not 8 oktas	9/10 or more, but not 10/10
8	8 oktas	10/10
9	Sky obscured, or cloud amount cannot be estimated	

TABLE VIII

BT REFERENCE TEMPERATURE CODE

<u>Code</u>	
1	Bucket (Variously indicated on BT print as B, b, BKT, cl*)
2	Injection, or unverified bucket notation, or unknown. (Variously indicated on BT print as K or no suffixed letter.)
3	Nansen cast (reversing thermometer) (Usually indicated on BT card as R.)
4	Thermograph, etc. (Indicated on BT print as TG)
5	Special calibration thermometer or equipment
6	BT

*NOTE: A considerable portion of the present NODC print holdings have been coded as 2 because they have been erroneously identified on the log sheet as cl.

TABLE IX

BT UNIT CODE

GRID UNITS		DEPTH TO BOTTOM	AIR TEMP		BAR	TCS	REF TEMP	CODE
DEPTH	TEMP		DRY	WET				
Feet	°F	FMS	°F	°F	MB	°F	°F	01
Feet	°C	FMS	°F	°F	MB	°C	°C	06
Meters	°C	FMS	°F	°F	MB	°C	°F	05
Meters	°C	FMS	°F	°F	MB	°C	°C	02
FMS	°F	FMS	°F	°F	MB	°F	°F	09
Meters	°C	Meters	°F	°F	MB	°C	°C	10
Meters	°C	FMS	°C	°C	MB	°C	°C	11

NOTE: The entries, 3, 4, 7, and 8, are redundant under the present unit code system. However, since these are valid entries on older digitized data, these numerals cannot be reassigned to future groupings of units.

LIBRARY CARD

- National Oceanographic Data Center
Manual for Processing Bathythermograph
 Data. Part I. Instructions for Manually
 Digitizing Bathythermograph Data
 Publication M-3, Part I in NODC Manual
 Series. 1964.
1. Oceanography-BT data processing.
 1. Title: Manual for Processing
 Bathythermograph Data. Part I.
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