

FILE.

INTERNAL DOCUMENT 154

I.O.S.

A USER GUIDE TO IOS
DIGITAL WAVE DATA TIME SERIES

R GLEASON

[This document should not be cited in a published bibliography, and is supplied for the use of the recipient only].

NATURAL ENVIRONMENT
INSTITUTE OF
OCEANOGRAPHIC
SCIENCES
RESEARCH COUNCIL

INSTITUTE OF OCEANOGRAPHIC SCIENCES

Wormley, Godalming,
Surrey GU8 5UB
(042-879-4141)

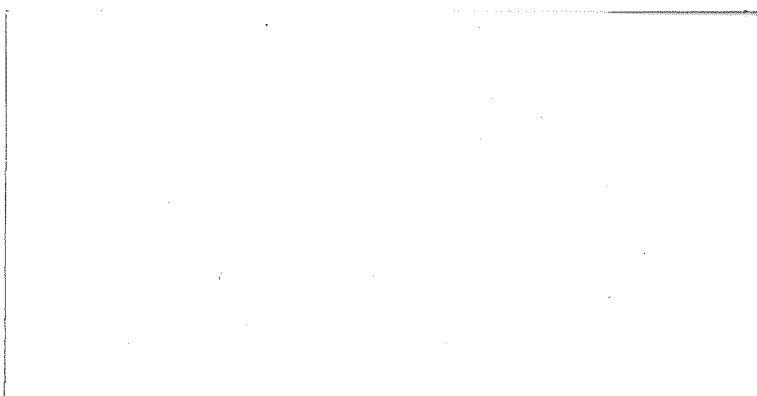
(Director: Dr. A. S. Laughton)

Bidston Observatory,
Birkenhead,
Merseyside L43 7RA
(051-653-8633)

(Assistant Director: Dr. D. E. Cartwright)

Crossway,
Taunton,
Somerset TA1 2DW
(0823-86211)

(Assistant Director: M. J. Tucker)



Wormley 2 of 2

MEMORANDUM

From: R GLEASON

Institute of Oceanographic Sciences
Crossway, Taunton, Somerset TA1 2DW

To: IOS LIBRARIES

MIAS

APPROPRIATE IOS STAFF

Our Ref: RG/MR

Your Ref:

Date: 10 January 1983

IOS Int. Doc. 154 - A User Guide to IOS Digital wave data time series

Please find attached an addendum to the document and a new contents page. This means that ID 154 now covers all buoy calibrations and site closures up to the end of 1982.

CONTENTS	page
SUMMARY	
INTRODUCTION	4
PRELIMINARY PROCESSING AND QUALITY CHECKS	4
FILENAME CONVENTION	5
1. RAPCO FORMAT:	7
(i) File header	
(ii) Data Record: record header and data	
2. MICRODATA FORMAT:	9
(i) File header	
(ii) Data Record: record header and data	
3. INFILL DATA	11
RELATED IOS REPORTS	13
FIGURES	
1-4: Examples of file types	
5: Rapco file replay and validation run sheets	
6: Microdata cartridge replay and validation run sheet	
7: Calendar to Julian day table	
APPENDIX I	
Time series scaling factors	
(i) South Uist Offshore	
(ii) South Uist Inshore	
(iii) South Uist Deepwater	
(iv) Eddystone	
(v) Kinnairds Head	
(vi) Isles of Scilly	
(vii) Foula	
APPENDIX II: Time series scaling factors for calendar year 1982	
APPENDIX III: Termination dates for data series and sites to the end of 1982	

APPENDIX II: Time series scaling factors for calendar year 1982

SOUTH UIST OFFSHORE WAVERIDER

Buoy number	Date deployed	Time of first record GMT	System calibration data values to metres
67042	11.07.82	1500	-0.008392

SOUTH UIST DEEPWATER WAVERIDER

Buoy number	Date deployed	Time of first record GMT	System calibration data values to metres
67749	11.07.82	1500	-0.008320

EDDYSTONE DEEPWATER WAVERIDER

Buoy number	Date deployed	Time of first record GMT	System calibration data values to metres
67041	20.01.82	1500	-0.008347

ISLES OF SCILLY WAVERIDER

Buoy number	Date deployed	Time of first record GMT	System calibration data values to metres
67407	18.03.82	2100	-0.008302

APPENDIX III: Termination dates for data series and sites to the end of 1982

SOUTH UIST INSHORE WAVERIDER (III)

Last valid data	Site closed
6.07.82 (2100)	11.07.82

EDDYSTONE WAVERIDERS

Last valid data	Site closed
7.04.82 (0900)	7.04.82

DEEPWATER WAVERIDER

12.02.82 (0001)	16.02.82
-----------------	----------

KINNAIRDS HEAD WAVERIDER

Last valid data	Site closed
31.01.82 (0300)	8.03.82

FOULA WAVERIDER

Last valid data	Site closed
23.10.79 (0600)	20.11.79

A USER GUIDE TO IOS
DIGITAL WAVE DATA TIME SERIES

R GLEASON

Internal Document No 154

Institute of Oceanographic Sciences
Crossway
Taunton
Somerset

February 1982

CONTENTS	page
SUMMARY	
INTRODUCTION	4
PRELIMINARY PROCESSING AND QUALITY CHECKS	4
FILENAME CONVENTION	5
1. RAPCO FORMAT:	7
(i) File header	
(ii) Data Record: record header and data	
2. MICRODATA FORMAT:	9
(i) File header	
(ii) Data Record: record header and data	
3. INFILL DATA	11
RELATED IOS REPORTS	13
FIGURES	
1-4: examples of file types	
5: Rapco file replay and validation run sheets	
6: Microdata cartridge replay and validation run sheet	
7: Calendar to Julian day table	
APPENDIX	
Time series scaling factors	
(i) South Uist Offshore	
(ii) South Uist Inshore	
(iii) South Uist Deepwater	
(iv) Eddystone	
(v) Kinnairds Head	
(vi) Isles of Scilly	
(vii) Foula	

SUMMARY

IOS has routinely collected digital wave data for several years. The result of this work has been the production of a considerable quantity of validated digital time series stored on computer compatible magnetic tape. This document is intended to act as a guide for a user of these data to enable ease of reading and further analysis. Therefore, information is provided concerning the file naming convention, the file structure and the data collection system calibrations. These calibrations are necessary to convert the data values to sea level elevations in metres and are provided for all Waverider buoys deployed by or for IOS until the end of 1981.

INTRODUCTION

IOS have been routinely collecting digital wave data records on magnetic tape for several years with the first good data being returned in 1976. For several years the only means of recording these data were the Rapco data loggers which held about four weeks records on standard reel to reel $1/4$ in tape.

This system was gradually superseded from about mid-1978 by Microdata loggers which recorded on to 3M cartridges. Each cartridge held approximately 2 site weeks of data. Both systems could vary the amount of data held depending on whether the logger was in single or multiple channel mode and depending on the record length taken.

To avoid confusion and a proliferation of computer programs all raw data from the Microdata during the transition period were written to files in the same format as the Rapco data. Each tape full of data is translated to a single file. However, from the beginning of 1981 all data were recorded on Microdata loggers and a new system of reading and validation programs was implemented, although the validation criteria were not altered.

PRELIMINARY PROCESSING AND QUALITY CHECKS

Magnetic tapes from the loggers are returned to the laboratory at regular intervals where they are translated and processed by a computer program designed to check for timing or tape formatting errors. In addition the program subjects each wave record to a number of tests to check for characteristics not normally associated with wave records of this type. The tests are based on the assumptions that a wave record should display certain simple properties consistent with the behaviour of a random process with an approximately normal distribution, and that the water surface should conform to certain well established steepness criteria.

The tests are for the following fault conditions:

- (1) Test for lost data points due to format errors or telemetry failure (the latter indicated by a special signal derived from the receiver).
- (2) Check for the occurrence of ten consecutive points of equal value (instrument failure test).

- (3) Check for an interval between successive up-crossings of the record mean level of greater than twenty-five seconds (wandering mean test).
- (4) Comparison of the difference in magnitude between successive data points with a test value based on maximum probable water slope.
- (5) Comparison of absolute magnitude of data points with a test value equal to four times the record standard deviation.

Actions taken by the program are:

Single lost data points, up to a maximum number of thirty-six per record, identified by the first test are replaced by the average value of the two neighbouring points. Two or more adjacent lost points cause the record to be rejected.

Failure of either test (2) or (3) causes the record to be rejected.

Faulty points, up to a maximum number of five, identified by test (4), are replaced by the average value of the two neighbouring points. Two or more adjacent faulty points causes the record to be rejected.

No alterations to the record are made on failures of test (5). Six failures, up to three of which could be consecutive, are allowed before rejecting the record.

The results of these validation checks are returned as a line printer listing. The only way that this procedure manifests itself in the data file is by changing the appropriate record error flag to 1 if the record is rejected (but see later).

FILENAMES

Filenames are intended to convey enough information to allow easy identification of the contents of the file. All names have a six letter root followed by a dot and a single letter extension. This structure is a legacy of the early analysis work carried out on the PDP11/20's.

The first letter is either 'R' for Rapco or 'M' for Microdata and refers to the logging device. (But for 'F' see infill data section).

The second letter is one of a variety of code letters used to specify the data receiving site. They are:

- 'A' - All Eddystone Waveriders and Wavecrest.
- 'B' - All South Uist Waveriders.
- 'C' - Foula Waverider.
- 'E' - Isles of Scilly Waverider.
- 'L' - OWS Lima Shipborne Wave Recorder.
- 'Q' - Quarry Head for Kinnairds Head Waverider.

These codes are further clarified in the case of multiple buoy sites by the extension letter at the end of the filename. This also serves to reinforce the site code for single buoy sites.

- 'B' - Eddystone Waverider; data collected at Fort Bovisand.
- 'C' - Eddystone Waverider; data collected at HMS Cambridge.
- 'E' - Deepwater Eddystone Waverider.
- 'T' - Eddystone Wavecrest.
- 'N' - South Uist Nearshore Waveriders (I, II and III).
- 'H' - South Uist Offshore Waverider.
- 'D' - South Uist Deepwater Waverider.
- 'F' - Foula Waverider and Marex Data Buoy.
- 'P' - Lima Pressure Channel (SBWR).
- 'A' - Lima Accelerometer Channel (SBWR).
- 'K' - Kinnairds Head Waverider.
- 'S' - Isles of Scilly Waverider.

Of the remaining four characters of the filename root the first two specify the year and the remaining two the sequential tape number in the year.

eg

- (i) RA7605.B is a Rapco tape from the Eddystone Waverider received in 1976.
It is the fifth in the year and was logged at Bovisand.
- (ii) MB8134.D is a Microdata cartridge from the South Uist site received
in 1981, and is the 34th in the year for the Deepwater buoy.

The format of the validated time series file will be consistent with the following forms regardless of the original recording medium. Early data recorded on Microdata cartridges was written in Rapco format. However up until the present no data from a Rapco tape have ever been put into Microdata format.

1) RAPCO FORMAT VALIDATED TIME SERIES (Figures 1 and 2)

(i) File header

Four lines of general header information start each file.

Line 1: Blank line.

Line 2: The field length of raw data points (04 for single channel and 05 for multi channel logger).

Line 3: Nominal scale factor

Year

Julian-day number

Start time

Logger number

Site code

Data channels

(F5.3, I2, I3, I4, I2, 1X, A1, I2)

Line 4: General tape and site description.

Although line 3 has an internal format which is consistent with line 3 of the run documentation (see Figure 5) the four header lines are each nominally written as

FORMAT (40A2)

(ii) Data record

Each 3-hourly record has a header followed by 2088 digital wave data values. In the case of Microdata cartridges written to Rapco format each record contains 2048 values and therefore the last 40 values for each record are repeated in order to pack the record out to 2088 values. For all further analysis these last data must be ignored.

These data points are all in millivolts and need a scaling factor to convert them to metres. This is not necessarily the nominal scaling applied in header line 3 as this value can be affected by difference in buoy calibration and receiver sensitivity.

Record header: Logger Number
Rapco block count
Year
Julian-day number (see Figure 7)
Time - hours (GMT)
Time - minutes
Sequential record number on the tape
Finally 10 flags giving information about the record and whether it was accepted or rejected.

This record header line is written as
FORMAT (7I4, 90X, 10I1)

The ten record flags are all zero unless they are set to 1 in which case they mean:

flag 1 : (not used for time series)
flag 2 : infill data from digitised analogue source
flag 3 : (not used for time series)
flag 4 : (not used for time series)
flag 5 : record does not start on nominal 3 hourly time ie 0300, 0600 etc
flag 6 : interrecord gap is not 3 hours
flag 7 : (not used for time series)
flag 8 : steaming record from SBWR
flag 9 : record rejected by validation checks
flag 10: record length incorrect.

Data: The data are written in line pairs corresponding to one Rapco block; the second line has an additional letter followed by ten error flags. The data correspond to half second digitised samples with a maximum fluctuation of ± 999 millivolts usually corresponding to ± 10 metres. On several sites the receiver was wired to give a +999 value if the buoy was out of lock.

A full record should consist of 36 line pairs each written with
FORMAT (29I4/29I4, 1X, A1, 10I1).

The additional letter can be ignored as it was an internal Rapco check which never worked. The remaining ten flags are all zero unless they are set to 1 in which case they mean:

- flag 1 : parity failure (this flag is ignored in the light of the comment made above)
- flag 2 : header format (of the Rapco block) incorrect or illegal character in this header
- flag 3 : (not used)
- flag 4 : Rapco block start time incorrect. A check to see that the Rapco block start time was consistent with the time of adjacent blocks.
- flag 5 : (not used)
- flag 6 : (not used)
- flag 7 : illegal character in the data
- flag 8 : Rapco block length incorrect
- flag 9 : data format incorrect
- flag 10: day number does not advance.

2) MICRODATA FORMAT VALIDATED TIME SERIES (Figures 3 and 4)

(i) File header

The 10 lines of header data for these files are designed to give extra information about the raw data file and echo similar lines written to the front of the raw field tape file. These lines contain the input parameters required to automatically run the validation programs. This facility provides a more flexible system of processing the data. An example of this is that tapes can be analysed which have logged digitised voltage values (referred to as analogue-derived) and those which have logged frequency - a new system implemented during 1981 (referred to as digital).

The analogue-derived values require a scaling factor similar to those used for the Rapco formatted data. However for frequency logged data an increase in frequency is proportional to a fall in water elevation and particularly for time series work it is important to remember that the scaling factor is negative.

Frequency logger SF = $-\frac{1}{64 \times C}$; where C is the buoy calibration in Hz m⁻¹.

The header data echo the information contained in the appropriate documentation run sheet for the file concerned (see Figure 6) and are:

Line 1: Site

Tape number

Filename

Logger number

FORMAT (120A1)

Line 2: Whether data are frequency logged

Whether the record headers are non-standard

Whether there are channel identifiers

Whether the data are derived from fm infill sources

If the answer is yes then the value is 1, and if no the value is zero

FORMAT (4I1)

Line 3: Number of values per record

Number of channels

Data field width

FORMAT (I6, 2I3)

Line 4: Interval between headers in hours (not necessarily the interval between records)

Sampling intervals in seconds

FORMAT (2F6.2)

Line 5: Offset for up to a maximum of 15 channels for analogue-derived data only. These can be used to discriminate between channels but usually are zero.

FORMAT (15I5)

Line 6-10: Free format information about the data source and from which channel it was derived.

FORMAT (5(120A1))

(ii) Data Record

Each record has a header followed by a number of data values (specified in header line 3) at a sampling interval as specified in header line 4. Usually there are 2048 samples at 0.5 sec intervals. However notable exceptions are the double length records of 4096 samples every 0.5 sec taken at the Isles of Scilly from March 1981.

Record Header: Year
Site number, acts as a check on logging site
Logger number
Julian-day number (see Figure 7)
Time - hours (GMT)
Time - minutes
Sequential record number on the tape
Channel number
10 flags as for the Rapco records each flag having the
same meaning as before
FORMAT (7I4, 78X, I3, 1X, 10I1)

Data: The data are written twenty-four values per line until the
data are exhausted. Care must be taken when reading the
files to ensure that the correct number of data values is
specified as indicated in header line 3. Frequency-logged
data will all be positive but tend to oscillate about
an approximate mean of 1984. Whilst an out-of-lock buoy
will be indicated by sampling points of zero.
FORMAT (24I5)

3) INFILL DATA

Over the years there has also been the gradual introduction of a backup system which records an analogue frequency-modulated signal onto C90 cassettes. The cassettes can be replayed in the laboratory and digitised to give a pseudo-digital record. Data from this process can be distinguished by the second record flag being set to 1. In general these data cover long periods such as when a cartridge or tape has been damaged or incorrectly loaded. Under these circumstances the data form a complete file which can be told by the first letter of the filename being an 'F'. It is also reinforced by the details of the appropriate file header line.

These files exist in both types of format and must be treated with extreme caution. The scale factor for these data is not the same as that for the routine data being gathered at the same time as they depend on the characteristics of the voltage to frequency converter used to obtain the analogue records from the voltages recorded by the routine logger. The

correct calibration to apply can be found in the comments section of the replay and validation run sheets which act as documentation for these files.

However, once a site changed to frequency logging during early 1981 the corresponding digitised fm records do have the same scale factor as the routine data.

A minor inconsistency occurs in these files where the file headers will give the logger number in use at the site but the record headers contain the number from the digitising system logger which is 0987.

FURTHER ANALYSIS

These time series data are routinely spectrally analysed by IOS using procedures fully described in Spectral Analysis of Wave Data by E G Pitt. More detailed information is available concerning the South Uist data in a series of IOS reports. Various reports also exist covering further analysis of the wave conditions at this and other sites.

RELATED IOS REPORTS

FORTNUM, B C H; HUMPHERY, J D and PITT, E G, 1979. Contoured Wave Data off South Uist, IOS Report No 71.

FORTNUM, B C H, 1981. Waves Recorded off South Uist in the Hebrides. March 1976-February 1978, IOS Report No 115.

FORTNUM, B C H, 1982. Waves Recorded off the Eddystone Lighthouse. September 1978-August 1981, IOS Report No 132 (in press).

HUMPHERY, J D, 1981. The Hebrides Waverider Installations. IOS Int Doc No 103.

PITT, E G and CRABB, J A, 1978. User Guide to South Uist Spectral Wave Data. March 1976-February 1978, IOS Int Doc No 34.

PITT, E G, 1981. Spectral Analysis of Wave Data. A description of the computer programs developed for use in wave climate studies at IOS. IOS Int Doc No 120.

```

"BLANK LINE"
04
0.01076065115903 B01
TAPE 101 HEBRIDES FILE RB7603.HEB
3 0 76 65 11 59 1
201 232 182 120 55 19 3 -23 -23 -41 -49 8 39 24 -37-113-100 -46 16 72 90 57 15 -29 -45 -7 50 90 96 0000000011
79 74 64 57 43 -24 -41 -10 28 90 105 81 6 -97-118 -92 -68 -49 6 47 43 39 75 116 135 100 -28 -82 -98 C00000000000
-63 39 136 190 194 171 124 63 -2 -70-110-132-165-195-165-131 -65 54 146 238 265 227 153 76 20 -37 -62 -53 -28
-55 -99-130-147 -94 -21 98 205 226 178 106 56 -7 -85-102 -65 27 99 107 18 -75 -97 -92 -28 18 46 30 1 -18 F00000000000
-39 -50 -33 41 144 202 193 168 121 8 -92 -92 -90 -31 7 -17 5 41 14 2 20 43 18 -23 -29 -70 -47 15 86
161 200 201 124 19 5 -18 -39 -66 -89 -75 -76 -39 28 66 73 59 40 21 2 -14 -12 3 5 13 54 99 145 150 B00000000000
95 46 20 -29 -28 -32 -52 -73 -81 -72 -30 69 126 114 66 34 44 42 62 60 54 68 60 34 -12 -92-110 -69 -73
-30 41 95 77 62 44 26 73 132 137 87 26 -30 -53 -49 -15 -10 -28 -45 -75 -63 -17 30 36 21 28 56 81 145 F00000000000
167 142 114 64 38 -10 -83 -52 -50 -49 -68 -49 19 19 -9 -3 6 -5 1 33 52 45 18 39 66 70 86 125 119
54 22 1 -28 -52 -46 -14 -46 -55 -41 6 68 84 57 21 2 0 18 37 25 10 6 25 33 42 18 42 103 63 300000000000
-14 -29 -40 -42 -39 -11 13 18 37 67 68 58 59 76 90 105 92 53 29 -18-113-137-145-101 -19 11 55 106 117
98 57 -2 -39 -21 2 42 137 161 131 135 108 50 -50-106-142-122 -76 -38 -38 -17 31 63 65 31 36 43 60 74 400000000000
85 65 57 7 -70 -73 8 66 118 138 135 87 5 -42-143-162-135-110 -70 -33 41 101 143 125 84 83 74 71 76
36 18 -3 -34 -25 -27 -50 -60 -4 33 66 93 99 28 -85-132-140 -72 13 76 124 113 122 123 122 97 38 19 -26 A00000000000
7 64 60 -11 -66 -58 -50 -26 -41 -65 -44 -27 -17 -22 10 61 68 97 174 199 165 92 -43 -98 -92 -49 4 53 110
127 94 41 -20 -70-116-195-197-159-100 -37 14 44 114 186 199 216 216 183 134 66 -7 -61 -93 -94 -98 -94 -90-104 F00000000000
-103 -47 30 90 116 81 30 20 -24 -82 -22 46 108 158 164 151 171 156 41 -62-100-108-122-168-145 -36 89 160 133
84 49 -49-119-100 -81 -57 3 86 161 170 125 75 56 20 27 55 50 26 23 35 8 -65-104-134-161-125 -58 34 B00000000000
99 150 197 198 129 9 -34 -38 -17 9 44 95 126 111 78 42 -21 -85-143-137-127 -63 -5 15 68 84 147 189 129
44 6 14 -24 -55 -21 -9 -5 -3 -21 -23 -14 -8 10 57 111 115 87 53 41 -19 -84 -58 -21 18 51 84 122 145 E00000000000
146 125 -4-158-239-201 -85 33 134 169 166 115 59 20 -31 -65 -77 -92 -73 -17 60 124 136 108 63 -2 -35 -85-121
-113-102 -49 38 104 103 97 99 96 82 63 21 -4 -29 -74 -65 -43 -20 -34 -19 55 108 148 182 182 91 4 -50 -81 200000000000
21 35 56 49 58 54 63 113 126 116 111 82 44 49 50 -26 -57 -65-131-100 -81 -59 -39 -76 -8 42 39 -40 -61
-43 -2 36 -8 -24 17 76 65 71 110 84 -13 -37 -88 -76 -68 -17 -22 -20 19 29 -12 -69-103 -81 -42 6 85 128 800000000000
177 185 172 133 66 34 -26 -86-122-120 -41 40 70 30 15 -6 -34 -38 -1 50 73 44 33 12 12 34 -5 -12 -7
-7 0 -15 42 105 105 76 89 98 40 -46 -18 26 27 -18 -50 -89-121 -86 -45 -15 30 60 62 77 70 94 129 135 A00000000000
123 151 172 156 103 -13-125-141-158-159-148-120 -82 -49 -14 42 124 151 126 110 79 25 24 12 10 22 52 67 46
14 22 41 40 -17 -57 -43 -33 -30 -35 -49 -36 -46 -61 -61 -39 36 107 181 246 240 187 114 30 -54 -84 -50 -24 13 000000000000
28 8 -3 -6 -26 -44 -55 -97-146-133 -82 9 92 135 158 161 150 124 92 47 36 82 66 40 11 -17 -49 -94 -74
-45 -17 -10 -38 -88 -84 -52 -32 30 67 73 98 118 126 118 105 106 89 44 29 28 17 -27 -23 19 9 -49 -60 -66 D00000000000
-87-108-108 -97 -50 47 130 198 184 84 53 30 82 131 134 82 58 27 -9 -12 -44 -94 -94 -67 -17 13 -5 -66-106
-105 -91 -65 10 108 185 241 236 177 81 17 -30 -20 23 55 44 13 8 -17 -29 -53-113-111 -93 -58 4 37 65 87 200000000000
102 128 117 87 52 -31-104-112 -82 -35 57 100 152 203 182 122 74 -23 -76-107-119 -69 -50 2 35 22 -24 -47 -95
-104 -60 -35 45 123 201 225 201 135 44 1 2 28 8 -38 -93-118-107 -56 -19 -7 -14 -27 -49 -70 3 101 187 197 800000000000
164 109 69 50 -30 -60 -21 9 51 86 101 85 42 -26 -72 -85-131-155-115 -68 25 105 113 78 64 62 85 108 93
60 65 76 89 32 -23 -54 -56 -25 -7 11 29 22 0 10 -4 -23 -17 8 28 -5 -41 -43 -55 -22 36 68 97 101 300000000000
70 88 145 161 97 41 74 84 54 -49-117-138-133-124-105 -80 -38 42 91 98 89 89 97 116 95 25 -12 -50 -60
-19 108 204 207 132 59 -9 -33 -36-111-185-168-166-122 -38 59 111 138 125 91 86 72 61 55 70 76 -5 -5 37 A00000000000
30 23 14 13 -12 -62 -89 -72 -54 -14 -11 -11 30 12 -26 29 71 126 142 126 122 62 7 28 -12 -12 42 71 63
46 39 -24 -73 -94-111 -87 -53 -6 25 44 71 77 76 93 117 108 106 95 43 -22 -76-126 -79 -71 -63 -38 64 155 400000000000
203 200 133 28 -63-118 -60 -55 -59 -54 -62 -55 -25 -5 13 4 6 47 76 85 94 123 127 119 127 82 -19-108-164
-134 -81 20 106 156 173 99 -39 -85-120 -91 -54 0 65 93 128 97 34 -9 -41 -26 0 9 32 39 27 41 85 92 800000000000
54 33 4 -35 -39 -30 -31 15 78 115 76 -26-108-134-113 -34 52 108 119 152 150 113 71 26 7 -55 -22 45 58
-5 -94-106 -68 5 62 67 37 44 40 44 47 14 -43-100 -71 -28 -4 29 49 40 55 103 134 97 74 82 73 57 E00000000000

```

Figure 1: Rapco tape data in Rapco format.

04

TAPE 1008.ISLES OF SCILLY.FILE ME8009.SCI

[illegible]

(Note: All block flags are set to zero.

Small positive offset to data mean line in this case.)

READ BY MICRED 19-FEB-81

[illegible]

Large positive offset to data mean line in this case.)

100
4096 1 5
1.50 0.50
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
CHANNEL 1=WAVERIDER.

81 71037 58 11 26 1 1 0000000010
1816 1884 1986 2080 2116 2156 2169 2168 2138 2073 1952 1836 1771 1767 1805 1822 1830 1880 1992 2046 2088 2135 2212 2274
2277 2169 2004 1860 1781 1712 1657 1682 1765 1815 1881 1979 2089 2202 2290 2327 2254 2137 2025 1934 1877 1863 1877 1874
1943 1996 1959 1894 1852 1843 1874 1929 1970 2022 2066 2090 2131 2153 2122 2071 2014 1950 1931 1914 1901 1892 1871 1887
1928 1937 1961 1973 1958 1924 1908 1959 2025 2073 2102 2041 2005 2016 1993 1980 1975 1949 1942 1983 1990 1957 1949 1933
1901 1913 1913 1908 1927 1952 1962 1952 1972 2022 2111 2182 2216 2205 2158 2057 1936 1814 1718 1661 1651 1674 1761 1920
2064 2171 2256 2288 2232 2153 2114 2068 1990 1953 1945 1939 1926 1914 1893 1860 1818 1814 1855 1909 1976 2076 2194 2258
2221 2200 2178 2132 2029 1857 1714 1632 1631 1672 1765 1874 1981 2097 2166 2226 2275 2250 2232 2202 2134 2034 1940 1844
1753 1676 1644 1696 1786 1880 1992 2063 2108 2147 2164 2148 2125 2083 2074 2033 1977 1950 1965 1988 1994 1958 1897 1884
1880 1831 1792 1816 1828 1850 1924 2038 2142 2208 2249 2264 2175 2015 1859 1775 1785 1842 1916 1980 1968 1962 1949 1956
1995 1989 1976 2016 2151 2221 2157 2051 1948 1837 1755 1769 1814 1866 1920 1956 2009 2065 2127 2162 2187 2181 2131 2030
1923 1870 1862 1863 1882 1910 1917 1898 1882 1893 1878 1902 1976 2032 2084 2135 2166 2173 2122 2058 2003 1956 1977 1993
1977 1929 1852 1778 1732 1734 1806 1904 1997 2039 2087 2170 2191 2172 2161 2128 2055 1968 1935 1894 1834 1819 1840 1905
1968 1978 1973 2002 1988 1960 1959 1975 2025 2075 2092 2091 2049 1960 1894 1887 1933 1967 1973 1954 1974 2022 2038 2051
2029 1987 1956 1932 1908 1908 1938 1951 1897 1864 1944 2030 2122 2217 2199 2126 2005 1894 1850 1811 1786 1804 1844 1920
2003 2023 2067 2103 2118 2123 2096 2064 2028 2034 2049 2012 1969 1915 1877 1811 1752 1780 1829 1836 1859 1969 2100 2187
2225 2198 2166 2108 2058 1996 1939 1944 1967 1951 1920 1873 1857 1876 1897 1920 1956 1999 2025 1996 1968 1981 2026 2065
2092 2169 2204 2120 1995 1875 1829 1800 1772 1814 1856 1889 1948 2028 2092 2119 2140 2132 2142 2107 2009 1896 1841 1877
1908 1914 1898 1886 1946 2012 2022 2010 1981 1958 1956 1996 2011 2039 2077 2115 2116 2071 2032 1972 1900 1828 1796 1805
1782 1807 1924 1992 2068 2114 2120 2147 2162 2133 2019 1886 1830 1864 1918 1980 2038 2034 2003 1957 1916 1903 1897 1909
1950 1972 2032 2124 2143 2104 2088 2064 2028 1986 1931 1880 1808 1773 1803 1885 1986 2085 2101 2091 2055 2006 1981 2012
2077 2105 2066 2018 1954 1883 1832 1828 1816 1824 1849 1928 2067 2148 2195 2191 2180 2140 2023 1953 1924 1886 1827 1797
1794 1796 1853 1929 2040 2154 2161 2120 2049 2006 1979 1992 2060 2094 2045 1974 1908 1864 1860 1884 1903 1922 1951 1960
1968 1968 1952 1971 1972 1982 2063 2138 2160 2130 2062 2013 1976 1963 1919 1867 1807 1775 1794 1884 1969 1989 1998 2008
2071 2114 2083 2079 2089 2107 2096 2062 2016 1950 1869 1781 1704 1693 1747 1846 1954 2073 2124 2189 2199 2162 2159 2166
2151 2099 1947 1789 1709 1702 1722 1780 1866 1936 2002 2107 2184 2140 2092 2040 1991 1998 2074 2157 2150 2098 2026 1896
1796 1798 1860 1906 1943 1953 1925 1897 1923 1991 2016 2049 2072 2059 2063 2104 2136 2131 2094 2018 1925 1843 1773 1772
1828 1874 1965 2086 2107 2106 2031 1963 1940 1937 1951 1970 1964 1976 2018 2071 2063 2029 1996 1988 2014 1994 1994 1999
1991 1973 1961 1936 1934 1943 1937 1907 1864 1834 1864 1924 1983 2054 2107 2150 2188 2169 2134 2013 1868 1805 1838 1911
1963 1993 1982 1966 1939 1882 1859 1876 1904 1923 1969 2025 2019 2038 2108 2228 2321 2264 2122 1924 1766 1682 1692 1745
1832 1883 1918 1966 2001 2054 2120 2163 2170 2142 2134 2101 2028 1965 1929 1907 1888 1880 1853 1845 1846 1868 1930 1990
1991 2036 2081 2111 2140 2150 2133 2106 2025 1938 1877 1812 1765 1772 1803 1868 1934 2019 2079 2083 2047 1999 1997 2040
2073 2081 2069 2052 2015 1964 1902 1857 1870 1924 1937 1937 1951 1990 2030 2058 2048 1977 1880 1881 1961 2020 2010 1971
1969 1971 2023 2104 2146 2140 2108 2020 1890 1820 1791 1786 1781 1790 1811 1927 2061 2130 2

Data mean value is about 1984.)

RAPCO REPLAY AND VALIDATION

SITE :

SITE CODE :

TAPE NUMBER:

LOGGER SERIAL

FILENAME :

NUMBER :

	DATE	YEAR DAY NO.	TIME	BLOCK NUMBER ON TAPE
START OF TAPE				
END OF TAPE				
RECEIVED				

RAPCHK

FILE LOCATION DISK :

NOMINAL SCALE FACTOR :

NUMBER OF FILES :

LOGGER NUMBER :

S . F .	YEAR	DAY NO.	START TIME	LOGGER NUMBER	SITE CODE	DATA CHANNEL
F5.3	I2	I3	I4	I2	A1	I2
					▲	
LOGGER NUMBER	LAST BLOCK NUMBER	YEAR	DAY NO.	FINISH TIME		
I2	I4	I2	I3	I4		
		▲	▲	▲		

LAST REC START TIME :

GLANCED : Y/N

COMMENTS :

MICRODATA CARTRIDGE REPLAY AND VALIDATION

	SITE	TAPE NUMBER	FILENAME	LOGGER NUMBER
1				
	FREQUENCY LOGGED? (I1)	NON-STANDARD HEADER? (I1)	CHANNEL IDENTS? (I1)	F.M. INFILL? (I6)
2				
	NO. VALUES PER RECORD (I6)	NUMBER OF CHANNELS (I3)	DATA FIELD LENGTH (I3)	
3				
	HEADER INTERVAL (HRS.) (F6.2)	SAMPLING INTERVAL (SEC.) (F6.2)		
4				
	CHANNEL 1 OFFSET (I5)	CHANNEL 2 OFFSET (I5)	OFFSETS FOR A MAXIMUM OF 15 CHANNELS	
5				
	FURTHER DESCRIPTIVE INFORMATION INCLUDING CHANNEL ALLOCATIONS AND MEASURING INSTRUMENT (80A1)			
6				
7				
8				
9				
10				

NOTE:
YES = 1
NO = ϕ

FIELD TAPE

RECEIVED	START		END	
	DATE	TIME	DATE	TIME
YEAR DAY NO.				

READ TO DISK No.	IOSTAP COPY TO MAGTAPE	COPY TO 66/60		VALIDATION	
		DATE	SNUMB	DATE	SNUMB

RECORDS REJECTED

CHAN
CHAN 2

WHEN FIELD TAPE RELEASED: TICK HERE

COMMENTS:

Figure 6

day of the month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	day of the month	day of the month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	day of the month
1	1	32	60	91	121	152	182	213	244	274	305	335	1	1	1	32	61	92	122	153	183	214	245	275	306	336	1
2	2	33	61	92	122	153	183	214	245	275	306	336	2	2	2	33	62	93	123	154	184	215	246	276	307	337	2
3	3	34	62	93	123	154	184	215	246	276	307	337	3	3	3	34	63	94	124	155	185	216	247	277	308	338	3
4	4	35	63	94	124	155	185	216	247	277	308	338	4	4	4	35	64	95	125	156	186	217	248	278	309	339	4
5	5	36	64	95	125	156	186	217	248	278	309	339	5	5	5	36	65	96	126	157	187	218	249	279	310	340	5
6	6	37	65	96	126	157	187	218	249	279	310	340	6	6	6	37	66	97	127	158	188	219	250	280	311	341	6
7	7	38	66	97	127	158	188	219	250	280	311	341	7	7	7	38	67	98	128	159	189	220	251	281	312	342	7
8	8	39	67	98	128	159	189	220	251	281	312	342	8	8	8	39	68	99	129	160	190	221	252	282	313	343	8
9	9	40	68	99	129	160	190	221	252	282	313	343	9	9	9	40	69	100	130	161	191	222	253	283	314	344	9
10	10	41	69	100	130	161	191	222	253	283	314	344	10	10	10	41	70	101	131	162	192	223	254	284	315	345	10
11	11	42	70	101	131	162	192	223	254	284	315	345	11	11	11	42	71	102	132	163	193	224	255	285	316	346	11
12	12	43	71	102	132	163	193	224	255	285	316	346	12	12	12	43	72	103	133	164	194	225	256	286	317	347	12
13	13	44	72	103	133	164	194	225	256	286	327	347	13	13	13	44	73	104	134	165	195	226	257	287	318	348	13
14	14	45	73	104	134	165	195	226	257	287	318	348	14	14	14	45	74	105	135	166	196	227	258	288	319	349	14
15	15	46	74	105	135	166	196	227	258	288	319	349	15	15	15	46	75	106	136	167	197	228	259	289	320	350	15
16	16	47	75	106	136	167	197	228	259	289	320	350	16	16	16	47	76	107	137	168	198	229	260	290	321	351	16
17	17	48	76	107	137	168	198	229	260	290	321	351	17	17	17	48	77	108	138	169	199	230	261	291	322	352	17
18	18	49	77	108	138	169	199	230	261	291	322	352	18	18	18	49	78	109	139	170	200	231	262	292	323	353	18
19	19	50	78	109	139	170	200	231	262	292	323	353	19	19	19	50	79	110	140	171	201	232	263	293	324	354	19
20	20	51	79	110	140	171	201	232	263	293	324	354	20	20	20	51	80	111	141	172	202	233	264	294	325	355	20
21	21	52	80	111	141	172	202	233	264	294	325	355	21	21	21	52	81	112	142	173	203	234	265	295	326	356	21
22	22	53	81	112	142	173	203	234	265	295	326	356	22	22	22	53	82	113	143	174	204	235	266	296	327	357	22
23	23	54	82	113	143	174	204	235	266	296	327	357	23	23	23	54	83	114	144	175	205	236	267	297	328	358	23
24	24	55	83	114	144	175	205	236	267	297	328	358	24	24	24	55	84	115	145	176	206	237	268	298	329	359	24
25	25	56	84	115	145	176	206	237	268	298	329	359	25	25	25	56	85	116	146	177	207	238	269	299	330	360	25
26	26	57	85	116	146	177	207	238	269	299	330	360	26	26	26	57	86	117	147	178	208	239	270	300	331	361	26
27	27	58	86	117	147	178	208	239	270	300	331	361	27	27	27	58	87	118	148	179	209	240	271	301	332	362	27
28	28	59	87	118	148	179	209	240	271	301	332	362	28	28	28	59	88	119	149	180	210	241	272	302	333	363	28
29	29	-	88	119	149	180	210	241	272	302	333	363	29	29	29	60	89	120	150	181	211	242	273	303	334	364	29
30	30	-	89	120	150	181	211	242	273	303	334	364	30	30	30	-	90	121	151	182	212	243	274	304	335	365	30
31	31	-	90	-	151	-	212	243	-	304	-	365	31	31	31	-	91	-	152	-	213	244	-	305	-	366	31

Non-leap year

Leap year

Figure 7

APPENDIX: Time series scaling factors - data values to metres

(i) SOUTH UIST OFFSHORE WAVERIDERS

Buoy number	Date deployed	Time of first record GMT	System calibration Data values to metres
6459	28.02.76	-	0.01020
6242	03.08.76	1500	0.01005
6850	18.04.77	1200	0.01015
6459	10.08.77	1500	0.01040
67042	25.06.78	1200	0.01035
67151	03.12.78	0600	0.00977
	29.03.79	Microdata logger installed	
67144	30.03.79	1500	0.010085
67214	12.01.80	0300	0.010223
67420	10.08.80	1800	0.009945
Frequency logging			
67406	18.01.81	Buoy U/S	0.008324
67041	25.04.81	1500	0.008562
67214	01.08.81	1800	0.008392

(ii) SOUTH UIST INSHORE WAVERIDERS (I, II and III)

Buoy number	Date deployed	Time of first record GMT	System calibration Data values to metres
I. 6851	25.06.78	-	0.01048
	29.03.79	Microdata logger installed	
6851	-	1200	0.01027
II. 67213	16.08.79	1200	0.01014
67043	12.01.80	0300	0.010214
67419	10.08.80	2100	0.009946
	14.01.81	Frequency logging	
67419	-	1500	0.008338
III. 67201	03.03.81	1500	0.008557
67213	01.08.81	1800	0.008351

(iii) SOUTH UIST DEEPWATER WAVERIDERS

Buoy number	Date deployed	Time of first record GMT	System calibration Data values to metres
6851	10.08.80	-	0.010057
	14.01.81		Frequency logging
6851	-	1500	0.008446
67043	01.08.81	1500	0.008483

(iv) EDDYSTONE WAVERIDERS

Buoy number	Date deployed	Time of First record GMT	System calibration Data values to metres
6581	24.11.75	-	0.01037
6850	14.09.77	1800	0.01040
5033	06.02.78	1500	0.01015
	29.06.78		Microdata logger installed
6459	24.01.79	1200	0.01030
67151	19.09.79	1500	0.01011
67144	26.03.80	1200	0.00996
	19.12.80		Frequency logging
67144	-		0.008369
67042	14.02.81	1800	0.008604
67201	04.11.81	1200	0.008436
DEEPWATER BUOY	01.12.81	1200	0.008347

(v) KINNAIRDS HEAD WAVERIDER

Buoy number	Date deployed	Time of first record GMT	System calibration Data values to metres
67191	19.10.79	-	0.00997
67327	16.01.80	1800	0.009844
6710	23.02.80	1200	0.010495
67327	09.06.80	1800	0.009993
6710	25.07.80	1200	0.010470
67327	04.10.80	1500	0.010011
67549	13.12.80	1200	0.010087
	09.01.80	Frequency logging	
67551	09.01.81	1200	0.008444
67550	15.05.81	1500	0.008412
67549	04.06.81	1500	0.008455
67191	08.07.81	1200	0.008376

(vi) ISLES OF SCILLY WAVERIDER

Buoy number	Date deployed	Time of first record GMT	System calibration Data values to metres
67201	.04.79	-	0.010948
67326	10.10.79	1500	0.010246
67191	20.02.80	1200	0.010251
67326	24.06.80	1200	0.010025
67550	22.01.81	1500	0.010025
	01.03.81	Frequency logging double length records	
67550	-	0000	0.008443
67552	02.04.81	1200	0.008466
67327	23.10.81	1500	0.008355

(vii) FOULA WAVERIDERS AND MAREX DATA BUOYS

Buoy number	Start date of data	Time of first record GMT	System calibration Data values to metres
MDB 02	04.12.76	-	0.0162
6679	10.03.77	1800	0.0158
MDB 03	13.04.77	1200	0.0141
6679	25.11.77	1800	0.0158
MDB 03	05.05.78	2100	0.01335
6679	12.07.78	1800	0.01467
6500	01.05.79	0000	0.0149

