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INTERNAL DOCUMENT 104

I.O.S.

USER GUIDE TO THE SOUTH UIST
SYNTHESIZED DIRECTIONAL WAVE SPECTRA

Internal Document 104

J A Crabb
August 1980

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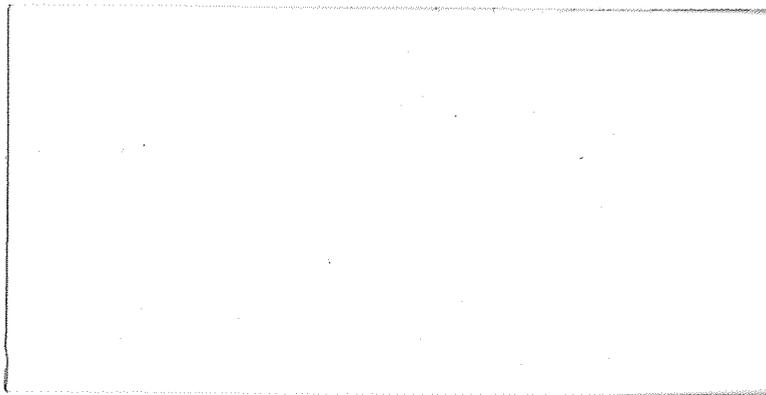
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Institute of Oceanographic Sciences
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1. INTRODUCTION

The wave data described and catalogued in this report are available separately on computer compatible magnetic tape to users requirements. The data comprise 399 directional wave spectra which have been derived from a combination of measured wave and meteorological data. The procedure used to estimate the spectra is outlined in section 2 and has been described in greater detail in references 1 and 2.

The one-dimensional wave measurements which form the basis of the estimates were made at a location 15 km to the west of the island of South Uist in the Outer Hebrides in some 42 m of water.

The report contains an index to the wave spectra listing some relevant characteristics of each. Spectra in this index are set out in the same order as previously used in reference 1. Two sub-indexes allowing spectra to be referenced by either total power or by the direction of the most powerful component are also included.

In this report all wave directions are those from which wave energy approaches.

2. OUTLINE OF THE METHOD FOR THE ESTIMATION OF THE DIRECTIONAL SPECTRA

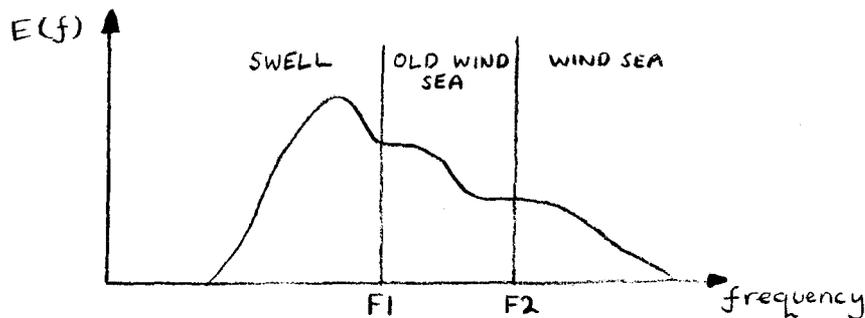
A series of digital wave recordings covering the period March 1976 to February 1977 with only a few gaps, was available at the South Uist site. Each record was 1044 seconds long and comprised samples of instantaneous water surface elevation taken at 0.5 second intervals. One such record was taken every 3 hours.

Records of hourly mean wind speed and direction were available from the Meteorological Office for the nearby Benbecula Anemograph Station, as well as the long term frequency distributions of these quantities.

In an attempt to overcome the bias inherent in one year's wave measurements, a sub-set of records more representative of the long term conditions was extracted from the available data. This was effected by choosing records whose associated wind records were distributed in approximately the same way as the long term winds. A total of 399 records were selected in this way and a fast fouier transform routine used to calculate the one-dimensional energy spectrum of each. This set of records and associated spectra were then considered as statistically representative of the long-term one-dimensional wave climate and were made available to users, as well as being analysed to give various statistical parameters of the wave climate (Ref 1).

A procedure was then developed by which directional characteristics could be estimated for each of these one-dimensional spectra, thus converting them to directional or two-dimensional spectra.

The first step in the estimation procedure was to divide each one-dimensional spectrum into regions according to the source of the wave energy present. The regions, in descending order of frequency, were:- wind sea, waves under active generation by the local wind; old wind sea, waves still propagating through the site after the local wind responsible for their generation had changed speed or direction; swell, waves not generated by local winds but propagated in from other generating centres. The boundary between swell and old wind sea occurs at a frequency F_1 , and that between old wind sea and wind sea at F_2 .



It was relatively uncommon to find all these categories present in the same spectrum. The number of categories present in a particular instance may be inferred from the values of F_1 and F_2 ; for example if $F_1 = 0$ no swell was present, if $F_1 = F_2$ there was no old wind sea energy and if $F_2 \geq 0.64$ no wind sea energy. The directional distribution of energy within each of these regions was modelled as the product of the measured one-dimensional spectrum and an angular spreading function $h(\theta)$ or $h'(f, \theta)$ (normalised to preserve the original energy). Each of these spreading functions had the form $\cos^{2S} \frac{1}{2} (\theta - \bar{\theta})$, where $\bar{\theta}$ was the estimated mean direction of the waves. The parameter S , which controls the width of the distribution was calculated in a manner appropriate to each region. In the wind sea region S was calculated according to an empirical formula due to Mitsuyasu (Ref 3) which is a function of frequency as well as the angle, and has wind speed as a parameter. In this region $\bar{\theta}$ was taken to be the mean wind direction. In the old windsea region S was given a fixed value of 6 (approximately equivalent to $n = 2$ in the alternative $\cos^n (\theta - \bar{\theta})$ model), $\bar{\theta}$ was again the mean direction of the wind responsible for generating the waves. In the swell region S was set so as to force the width of the resulting distribution to be equal to the angle subtended at the site by the swell generating wind field. This latter required that the distance and width of the generating windfield for each observed swell be identified on the meteorological charts, $\bar{\theta}$ was then taken to be the great circle bearing of the wind field centre.

The identification of these wind fields was accomplished (Ref 2) by presenting the routinely collected wave data as a contoured time series of spectral densities.

In this representation an arriving swell train was manifest as a ridge feature in the energy contours; such a ridge has positive slope indicating, in accordance with the dispersion relation, the arrival of low frequency energy followed by progressively higher frequencies. The slope of this line is inversely proportional to the distance of the generating wind field, and the intercept on the time axis indicates the time of generation. This information allowed (in most cases) the swell generating wind field to be identified.

Having thus estimated the directional distribution for each region of the spectrum the estimated directional spectrum was formed by recombining the separate regions and evaluating the angular spreading functions at ten degree intervals.

The reliability of this estimation procedure was investigated in a separate study (Ref 4) and it was concluded that, given the level of uncertainty in both mean directions and directional spreads, a directional resolution of 30° was more appropriate than the original 10° . Consequently the spectra presented have been modified by averaging over 30° bands.

3. FILE FORMAT DESCRIPTION

All 399 directional spectra are contained in one file, each spectrum occupying 135 records. All records are 72 characters long and padded with spaces where necessary. A portion of the file is reproduced in table 1 as an example.

The records pertaining to each spectrum are written to the following formats.

Record 1

Alphanumeric header (33A1, I3) of the form:-

SOUTH UIST DIRECTIONAL SPECTRUM NNN. Where NNN is the serial number by which the spectrum is identified in the index.

Record 2

HS - Significant wave height in metres.
TZ - Zero crossing period in seconds.
MAXD - Direction (to 30° resolution) of the most powerful spectral component.

POWER - Total power in frequency range 0.0444 to 0.6401 H_z in kW/m.
 (corrected for depth effect)
FORMAT - (2F6.2, I4, E12.4)

Record 3

WSPF - Frequency at which the peak of the wind sea portion of the spectrum occurs.
F2 - Frequency marking the division between old wind sea and wind sea.
IWDIR - Wind sea direction (to 10° resolution).
F1 - Frequency marking the division between swell and old wind sea.
IOWDIR - Old wind sea direction (to 10° resolution).
FORMAT - (2F6.2, I4, F6.2, I4).

Record 4 (refers to first swell source)

NSWDIR - Mean swell direction (to 10° resolution).
NDIST - Distance to swell generating centre in nautical miles.
NWIDTH - Width of swell generating centre in nautical miles.
USW - Wind speed in generating region in knots.
FORMAT - (3I5, F5.1).

Record 5 (refers to second swell source)

Record format as record 4

NB: If no swell is present in the spectrum record 4 appears as:-

999 9999 9999 99.9

If only one swell source is present, record 5 appears as:-

0 0 0 0.

Record 6

IYR - Last two digits of year.
IDAY - Day number (January 1st = 1)
IHR - Hour
MIN - Minute
FORMAT - (4I4)

NB: Above times refer to start of wave recording period.

Record 7

NUDIR - Local wind direction (to 10° resolution) divided by 10.
NU - Local wind speed in knots.
FORMAT - (2I2).

Records 8-135

Values of spectral density in metres²/Hz/rad written as (6E12.5).

Values at each frequency are given at 30° intervals in direction and occupy two successive records. The first record of each pair gives values for direction bands centred on 0°, 30°, 60°, 90°, 120° and 150° and the second record for 180°, 210°, 240°, 270°, 300° and 330°. Frequency values corresponding to successive pairs of records are given in table 2. The interval between spectral density estimates is 0.00976 Hz.

4. THE INDEXES

The main index (Index 1) entry for each spectrum gives the following information.

- SERIAL No - Serial number from 1 to 399, identical to that by which the spectrum was originally labelled in reference 1.
- HS - Significant wave height ($4\sqrt{m_0}$) in seconds (identical to HS above).
- TZ - Zero crossing period ($\sqrt{m_2/m_1}$) in seconds (identical to Tz above).
- TE - Energy period (m_1/m_0) in seconds.
- DMAX - The direction (to 30° resolution) of the most powerful spectral component (identical to MAXD above).
- POWER - Total wave power in kW/m (identical to POWER above).
- F1 - Frequency dividing swell and old wind sea (identical to F1 above).
- F2 - Frequency dividing old wind sea and wind sea (identical to F2 above).

In addition to the main index of spectra in their original order two further indexes are included.

Index 2 lists the serial numbers of spectra with total power in the indicated ranges. Note that the power figures heading the columns in this index are upper limits to the class. The spectra corresponding to serial numbers listed in column 3, for example, have powers in the range 10 to 15 kW/m.

Index 3 list the serial numbers of spectra with the most powerful spectral component in the indicated directions.

REFERENCES

1. CRABB J A 'Report No 1 Selected wave records and one-dimensional spectra for South Uist' IOS Internal Document 33. January 1978.
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3. MITSUYASU H, TASAI F, SUHARA T, MIZUNO S, OHKUSU M, HONDA T and RIKIISHI K 'Observations of the directional spectrum of ocean waves using a cloverleaf buoy'. J Phys ocean 5 1975 pp 750-760.
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SOUTH UIST DIRECTIONAL SPECTRUM 55

1.16 5.40 270 0.5060E 01

0.46 0.41 30 0.17 350

270 2400 400 25.0

0 0 0 0.

76 188 23 59

3 5

0.	0.	0.	0.	0.	0.
0.	0.15061E-18	0.40588E-04	0.26581E-01	0.40588E-04	0.15061E-18
0.	0.	0.	0.	0.	0.
0.	0.33159E-19	0.89362E-05	0.58523E-02	0.89362E-05	0.33159E-19
0.	0.	0.	0.	0.	0.
0.	0.26560E-19	0.71581E-05	0.46877E-02	0.71581E-05	0.26560E-19
0.	0.	0.	0.	0.	0.
0.	0.15307E-18	0.41251E-04	0.27015E-01	0.41251E-04	0.15307E-18
0.	0.	0.	0.	0.	0.
0.	0.47167E-19	0.12711E-04	0.83243E-02	0.12711E-04	0.47167E-19
0.	0.	0.	0.	0.	0.
0.	0.11060E-18	0.29808E-04	0.19521E-01	0.29808E-04	0.11060E-18
0.	0.	0.	0.	0.	0.
0.	0.33813E-18	0.91129E-04	0.59681E-01	0.91129E-04	0.33813E-18
0.	0.	0.	0.	0.	0.
0.	0.21483E-17	0.57898E-03	0.37916E 00	0.57898E-03	0.21483E-17
0.	0.	0.	0.	0.	0.
0.	0.76033E-17	0.20491E-02	0.13419E 01	0.20491E-02	0.76033E-17
0.	0.	0.	0.	0.	0.
0.	0.18226E-16	0.49118E-02	0.32167E 01	0.49118E-02	0.18226E-16
0.	0.	0.	0.	0.	0.
0.	0.20474E-16	0.55177E-02	0.36134E 01	0.55177E-02	0.20474E-16
0.	0.	0.	0.	0.	0.
0.	0.88407E-17	0.23825E-02	0.15603E 01	0.23825E-02	0.88407E-17
0.	0.	0.	0.	0.	0.
0.	0.38733E-17	0.10439E-02	0.68360E 00	0.10439E-02	0.38733E-17
0.	0.	0.	0.	0.	0.
0.	0.67537E-17	0.18201E-02	0.11920E 01	0.18201E-02	0.67537E-17
0.	0.	0.	0.	0.	0.
0.	0.15514E-17	0.41811E-03	0.27381E 00	0.41811E-03	0.15514E-17
0.79226E-01	0.40953E-01	0.88139E-02	0.62159E-03	0.79353E-05	0.25900E-08
0.21365E-10	0.99795E-06	0.53576E-03	0.23432E 00	0.27612E-01	0.69552E-01
0.26936E 00	0.13924E 00	0.29967E-01	0.21133E-02	0.26980E-04	0.88057E-08
0.72642E-10	0.33930E-05	0.62688E-03	0.14277E-01	0.92687E-01	0.23648E 00
0.71310E-01	0.36861E-01	0.79334E-02	0.55949E-Q3	0.71425E-05	0.23312E-08
0.19231E-10	0.89825E-06	0.16595E-03	0.37795E-02	0.24537E-01	0.62603E-01
0.48185E-01	0.24907E-01	0.53607E-02	0.37805E-03	0.48262E-05	0.15752E-08
0.12994E-10	0.60695E-06	0.11214E-03	0.25539E-02	0.16580E-01	0.42302E-01
0.33869E-01	0.17507E-01	0.37679E-02	0.26572E-03	0.33923E-05	0.11072E-08
0.91337E-11	0.42663E-06	0.78821E-04	0.17951E-02	0.11654E-01	0.29733E-01

ETC.

TABLE 1

0.0249	0.3374
0.0347	0.3472
0.0444	0.3569
0.0542	0.3667
0.0640	0.3765
0.0737	0.3862
0.0835	0.3960
0.0933	0.4058
0.1030	0.4155
0.1128	0.4253
0.1226	0.4351
0.1323	0.4448
0.1421	0.4546
0.1519	0.4644
0.1616	0.4741
0.1714	0.4839
0.1812	0.4937
0.1909	0.5034
0.2007	0.5132
0.2104	0.5229
0.2202	0.5327
0.2300	0.5425
0.2397	0.5522
0.2495	0.5620
0.2593	0.5718
0.2690	0.5815
0.2788	0.5913
0.2886	0.6011
0.2983	0.6108
0.3081	0.6206
0.3179	0.6304
0.3276	0.6401

TABLE 2. MID BAND FREQUENCIES IN Hz CORRESPONDING TO SUCCESSIVE SPECTRAL ESTIMATES.

Due to the possible presence of spurious instrumental noise at low frequencies the first two spectral estimates should be disregarded. The lowest frequency for which a valid spectral estimate exists is therefore 0.0444 Hz.

SERIAL NO.	HS METRES	TZ SECS	TE SECS	DMAX	POWER KW/M	F1	F2
1	0.49	8.74	12.42	270	0.1661E 01	0.63	0.63
2	0.33	6.17	9.46	270	0.5553E 00	0.64	0.64
3	0.48	5.64	7.08	240	0.8569E 00	0.27	0.63
4	0.43	4.07	6.45	270	0.6139E 00	0.38	0.38
5	0.65	7.06	8.75	270	0.2026E 01	0.47	0.47
6	0.58	6.60	7.87	240	0.1384E 01	0.38	0.38
7	0.96	6.53	8.05	240	0.3942E 01	0.32	0.64
8	0.94	6.35	8.69	270	0.4151E 01	0.37	0.37
9	0.57	6.24	8.29	270	0.1465E 01	0.64	0.64
10	0.53	6.22	7.76	270	0.1119E 01	0.19	0.64
11	0.77	6.20	8.15	240	0.2554E 01	0.64	0.64
12	0.57	5.81	8.68	270	0.1550E 01	0.40	0.40
13	0.74	5.47	6.63	270	0.1827E 01	0.31	0.31
14	0.99	5.37	7.01	240	0.3524E 01	0.24	0.24
15	0.81	5.32	7.76	270	0.2720E 01	0.16	0.16
16	0.78	5.29	6.87	240	0.2143E 01	0.35	0.64
17	0.66	4.93	10.12	270	0.2449E 01	0.35	0.35
18	0.62	4.91	8.93	270	0.1911E 01	0.40	0.40
19	0.83	4.79	8.43	270	0.3217E 01	0.30	0.30
20	0.66	4.56	7.71	270	0.1768E 01	0.35	0.35
21	0.82	4.53	7.40	270	0.2667E 01	0.25	0.25
22	0.59	4.49	7.00	240	0.1282E 01	0.22	0.22
23	0.94	4.43	7.71	270	0.3748E 01	0.28	0.28
24	0.67	4.27	6.62	300	0.1561E 01	0.30	0.64
25	0.51	4.18	7.11	210	0.9819E 00	0.37	0.37
26	0.98	4.00	5.57	210	0.2700E 01	0.20	0.20
27	0.95	3.90	6.32	210	0.3097E 01	0.22	0.22
28	0.78	3.65	5.87	270	0.1848E 01	0.28	0.28
29	0.87	3.54	5.16	270	0.2002E 01	0.26	0.26
30	0.84	3.27	4.44	210	0.1600E 01	0.23	0.23
31	1.45	8.37	10.28	270	0.1227E 02	0.64	0.64
32	1.30	7.97	10.75	270	0.1040E 02	0.30	0.30
33	1.30	7.19	8.14	240	0.7240E 01	0.38	0.64
34	1.07	7.10	8.85	270	0.5549E 01	0.38	0.38
35	1.25	7.09	8.03	300	0.6614E 01	0.31	0.31
36	1.24	7.07	8.45	270	0.7004E 01	0.27	0.64
37	1.32	6.88	7.70	240	0.7005E 01	0.35	0.35
38	1.01	6.72	9.04	270	0.5046E 01	0.43	0.43
39	1.42	6.60	8.15	300	0.8765E 01	0.20	0.20
40	1.25	6.48	7.64	240	0.6193E 01	0.38	0.38
41	1.27	6.43	7.70	240	0.6502E 01	0.24	0.64
42	1.40	6.41	9.06	240	0.9601E 01	0.15	0.49
43	1.36	6.27	9.34	270	0.9630E 01	0.27	0.35
44	1.27	6.27	7.88	240	0.6682E 01	0.35	0.35
45	1.41	6.23	10.24	210	0.1147E 02	0.26	0.26
46	1.11	5.84	6.88	210	0.4285E 01	0.27	0.64
47	1.37	5.83	7.12	270	0.6919E 01	0.16	0.56
48	1.35	5.80	7.21	210	0.6747E 01	0.27	0.27
49	1.11	5.80	11.92	240	0.8320E 01	0.32	0.32
50	1.37	5.71	7.59	0	0.7482E 01	0.07	0.17

SERIAL	HS	TZ	TE	DMAX	POWER	F1	F2
NO.	METRES	SECS	SECS		KW/M		
51	1.29	5.67	6.84	270	0.5858E 01	0.13	0.64
52	1.18	5.61	8.83	240	0.6793E 01	0.30	0.30
53	1.44	5.58	7.02	0	0.7469E 01	0.	0.25
54	1.28	5.49	6.90	270	0.5871E 01	0.13	0.23
55	1.16	5.40	7.28	270	0.5060E 01	0.17	0.41
56	1.42	5.36	7.75	240	0.8411E 01	0.23	0.23
57	1.05	5.35	9.60	270	0.5971E 01	0.27	0.27
58	1.21	5.30	7.55	270	0.5804E 01	0.32	0.32
59	1.03	5.26	7.30	210	0.4117E 01	0.30	0.34
60	1.14	5.14	7.17	240	0.4764E 01	0.25	0.25
61	1.12	5.07	8.62	240	0.6013E 01	0.22	0.22
62	1.46	4.96	8.05	240	0.9372E 01	0.35	0.35
63	1.41	4.86	7.61	270	0.8189E 01	0.20	0.33
64	1.34	4.85	7.48	210	0.7259E 01	0.29	0.29
65	1.38	4.72	6.76	270	0.6807E 01	0.18	0.18
66	1.40	4.68	6.05	240	0.5996E 01	0.20	0.20
67	1.17	4.65	6.98	270	0.4933E 01	0.13	0.35
68	1.42	4.62	6.70	240	0.7059E 01	0.22	0.22
69	1.26	4.59	7.92	270	0.6889E 01	0.22	0.22
70	1.46	4.55	5.98	300	0.6531E 01	0.20	0.20
71	1.11	4.49	5.94	270	0.3705E 01	0.23	0.23
72	1.16	4.45	8.25	240	0.6039E 01	0.27	0.30
73	1.07	4.43	7.11	270	0.4375E 01	0.20	0.20
74	1.49	4.40	6.30	270	0.7347E 01	0.13	0.22
75	1.36	4.39	5.69	270	0.5320E 01	0.15	0.15
76	1.23	4.36	6.23	300	0.4878E 01	0.21	0.21
77	1.40	4.33	6.08	300	0.6132E 01	0.22	0.22
78	1.16	4.32	7.14	270	0.5187E 01	0.20	0.20
79	1.13	4.24	6.20	270	0.4031E 01	0.28	0.28
80	1.19	4.15	5.23	270	0.3763E 01	0.18	0.18
81	1.11	3.97	5.30	270	0.3284E 01	0.16	0.16
82	1.08	3.85	5.50	240	0.3302E 01	0.30	0.30
83	1.17	3.79	4.70	210	0.3235E 01	0.20	0.20
84	1.11	3.76	6.13	240	0.3905E 01	0.28	0.28
85	1.39	3.74	4.42	210	0.4259E 01	0.21	0.21
86	1.17	3.68	5.08	270	0.3512E 01	0.22	0.22
87	1.95	10.86	12.98	270	0.2847E 02	0.64	0.64
88	1.57	8.73	9.63	270	0.1307E 02	0.64	0.64
89	1.59	8.51	9.75	270	0.1374E 02	0.45	0.64
90	1.86	8.14	9.83	270	0.1894E 02	0.64	0.64
91	1.76	8.12	9.78	270	0.1687E 02	0.64	0.64
92	1.95	7.98	11.01	210	0.2382E 02	0.25	0.25
93	1.56	7.65	9.93	270	0.1348E 02	0.41	0.41
94	1.53	7.65	11.68	270	0.1483E 02	0.15	0.64
95	1.91	7.32	9.07	270	0.1818E 02	0.26	0.26
96	1.85	7.30	9.20	300	0.1735E 02	0.25	0.59
97	1.88	7.11	8.66	270	0.1650E 02	0.16	0.53
98	1.77	6.93	8.58	270	0.1450E 02	0.17	0.28
99	1.59	6.84	9.06	270	0.1260E 02	0.15	0.64
100	1.69	6.78	7.95	270	0.1192E 02	0.45	0.47

SERIAL NO.	HS METRES	TZ SECS	TE SECS	DMAX	POWER KW/M	F1	F2
101	1.74	6.66	7.76	270	0.1232E 02	0.17	0.25
102	1.81	6.52	11.39	270	0.2140E 02	0.30	0.30
103	1.66	6.39	8.69	270	0.1298E 02	0.40	0.40
104	1.64	6.36	8.16	270	0.1171E 02	0.27	0.27
105	1.97	6.33	9.05	270	0.1947E 02	0.19	0.19
106	2.00	6.22	10.15	210	0.2282E 02	0.23	0.23
107	1.70	6.05	10.01	210	0.1629E 02	0.25	0.25
108	1.86	6.03	8.07	240	0.1481E 02	0.14	0.22
109	1.79	6.00	9.59	240	0.1704E 02	0.23	0.23
110	1.99	5.96	7.98	240	0.1685E 02	0.17	0.27
111	1.92	5.91	7.92	270	0.1557E 02	0.17	0.17
112	1.67	5.89	10.13	270	0.1577E 02	0.25	0.25
113	1.82	5.80	8.06	240	0.1425E 02	0.29	0.29
114	1.84	5.77	7.40	240	0.1321E 02	0.19	0.19
115	1.97	5.77	8.30	330	0.1746E 02	0.10	0.10
116	1.65	5.76	9.43	270	0.1423E 02	0.25	0.25
117	1.77	5.60	7.36	330	0.1216E 02	0.17	0.17
118	1.93	5.53	7.61	210	0.1517E 02	0.18	0.24
119	1.55	5.43	7.40	270	0.9447E 01	0.13	0.35
120	1.69	5.38	8.86	270	0.1411E 02	0.32	0.32
121	1.55	5.26	7.07	270	0.8786E 01	0.12	0.22
122	1.82	5.24	7.16	240	0.1245E 02	0.12	0.24
123	1.70	5.19	7.69	270	0.1208E 02	0.17	0.17
124	1.59	5.18	8.47	330	0.1197E 02	0.21	0.21
125	1.81	5.15	7.34	270	0.1250E 02	0.17	0.22
126	1.96	5.12	7.26	270	0.1480E 02	0.10	0.10
127	1.80	5.09	7.64	270	0.1330E 02	0.28	0.28
128	1.87	5.04	7.05	240	0.1294E 02	0.13	0.23
129	1.99	5.02	6.30	270	0.1267E 02	0.15	0.15
130	1.55	5.02	7.84	270	0.1036E 02	0.25	0.25
131	1.82	5.02	6.42	270	0.1087E 02	0.13	0.13
132	1.57	4.90	7.17	270	0.9365E 01	0.13	0.29
133	1.76	4.90	6.67	270	0.1082E 02	0.14	0.43
134	1.58	4.89	6.39	0	0.8070E 01	0.	0.16
135	1.71	4.87	7.02	210	0.1092E 02	0.25	0.25
136	1.77	4.83	7.02	240	0.1176E 02	0.18	0.18
137	1.79	4.80	5.89	270	0.9501E 01	0.	0.
138	1.77	4.79	6.70	240	0.1098E 02	0.22	0.22
139	1.86	4.78	6.56	240	0.1167E 02	0.13	0.19
140	1.90	4.75	6.92	240	0.1335E 02	0.17	0.17
141	1.81	4.73	7.14	270	0.1261E 02	0.20	0.20
142	1.83	4.71	6.14	240	0.1057E 02	0.15	0.15
143	1.80	4.62	6.02	240	0.9989E 01	0.16	0.16
144	1.74	4.62	6.77	240	0.1089E 02	0.28	0.28
145	1.59	4.58	6.50	270	0.8614E 01	0.19	0.19
146	1.73	4.52	6.01	270	0.9188E 01	0.18	0.18
147	1.94	4.49	6.05	270	0.1190E 02	0.21	0.21
148	2.20	10.69	12.42	270	0.3468E 02	0.64	0.64
149	2.40	9.72	12.19	270	0.4010E 02	0.19	0.35
150	2.06	8.98	11.31	270	0.2724E 02	0.20	0.43

SERIAL NO.	HS METRES	TZ SECS	TE SECS	DMAX	POWER KW/M	F1	F2
151	2.32	8.78	11.86	210	0.3715E 02	0.40	0.40
152	2.13	8.18	10.89	240	0.2754E 02	0.17	0.64
153	2.11	7.93	9.98	270	0.2494E 02	0.29	0.29
154	2.05	7.56	10.26	240	0.2439E 02	0.27	0.27
155	2.43	7.49	8.79	300	0.2823E 02	0.25	0.64
156	2.30	7.28	9.29	270	0.2740E 02	0.15	0.15
157	2.25	7.23	9.21	270	0.2577E 02	0.29	0.39
158	2.41	7.17	8.70	300	0.2744E 02	0.13	0.25
159	2.32	7.13	8.86	240	0.2615E 02	0.16	0.25
160	2.46	7.05	9.53	240	0.3223E 02	0.12	0.17
161	2.36	7.02	8.59	270	0.2592E 02	0.22	0.22
162	2.40	7.01	9.42	270	0.3010E 02	0.26	0.26
163	2.28	6.93	8.78	210	0.2480E 02	0.22	0.22
164	2.03	6.81	11.09	210	0.2613E 02	0.25	0.25
165	2.39	6.79	10.29	270	0.3215E 02	0.21	0.21
166	2.05	6.77	9.74	210	0.2310E 02	0.19	0.23
167	2.20	6.76	11.46	270	0.3186E 02	0.30	0.30
168	2.23	6.64	8.63	240	0.2339E 02	0.11	0.17
169	2.47	6.62	8.45	300	0.2796E 02	0.11	0.15
170	2.09	6.60	9.68	210	0.2372E 02	0.16	0.26
171	2.25	6.58	8.57	270	0.2361E 02	0.29	0.29
172	2.12	6.52	10.60	270	0.2695E 02	0.11	0.23
173	2.32	6.48	9.10	270	0.2714E 02	0.22	0.22
174	2.05	6.46	8.52	300	0.1934E 02	0.25	0.25
175	2.36	6.46	8.50	330	0.2571E 02	0.12	0.17
176	2.01	6.43	8.70	270	0.1936E 02	0.25	0.39
177	2.08	6.41	8.25	270	0.1916E 02	0.25	0.25
178	2.05	6.39	7.54	240	0.1640E 02	0.20	0.20
179	2.37	6.33	8.09	300	0.2444E 02	0.	0.12
180	2.05	6.32	7.98	240	0.1790E 02	0.15	0.58
181	2.50	6.28	7.96	330	0.2629E 02	0.10	0.19
182	2.27	6.23	8.03	300	0.2210E 02	0.16	0.16
183	2.01	6.20	7.85	300	0.1683E 02	0.17	0.17
184	2.27	6.19	8.39	240	0.2363E 02	0.10	0.10
185	2.47	6.13	8.05	270	0.2633E 02	0.15	0.24
186	2.07	6.12	8.95	330	0.2102E 02	0.09	0.12
187	2.28	6.08	9.74	240	0.2860E 02	0.25	0.25
188	2.24	6.01	8.23	210	0.2235E 02	0.15	0.15
189	2.30	6.00	8.77	270	0.2564E 02	0.25	0.25
190	2.19	6.00	8.20	330	0.2128E 02	0.	0.17
191	2.29	5.97	7.58	240	0.2111E 02	0.25	0.25
192	2.17	5.96	8.16	270	0.2064E 02	0.20	0.20
193	2.45	5.92	7.53	330	0.2374E 02	0.10	0.21
194	2.10	5.88	7.65	240	0.1767E 02	0.13	0.13
195	2.02	5.81	9.41	240	0.2141E 02	0.17	0.17
196	2.02	5.73	7.08	300	0.1482E 02	0.11	0.13
197	2.14	5.73	10.73	270	0.2739E 02	0.20	0.20
198	2.46	5.66	10.00	270	0.3441E 02	0.22	0.22
199	2.14	5.60	7.45	240	0.1791E 02	0.11	0.14
200	2.16	5.54	8.11	270	0.2060E 02	0.23	0.23

SERIAL NO.	HS METRES	TZ SECS	TE SECS	DMAX	POWER KW/M	F1	F2
201	2.33	5.53	7.27	270	0.2084E 02	0.17	0.17
202	2.36	5.51	6.89	300	0.1960E 02	0.13	0.13
203	2.21	5.48	7.40	240	0.1925E 02	0.16	0.16
204	2.33	5.47	7.32	270	0.2080E 02	0.09	0.14
205	2.38	5.42	7.30	330	0.2205E 02	0.10	0.10
206	2.25	5.38	7.78	240	0.2102E 02	0.11	0.11
207	2.07	5.27	6.96	0	0.1546E 02	0.10	0.10
208	2.44	5.26	7.22	270	0.2288E 02	0.16	0.16
209	2.30	5.23	6.60	180	0.1777E 02	0.	0.
210	2.18	5.19	7.11	270	0.1808E 02	0.17	0.20
211	2.27	5.17	6.93	300	0.1862E 02	0.14	0.17
212	2.50	5.15	6.46	270	0.2075E 02	0.14	0.14
213	2.08	5.08	6.89	270	0.1565E 02	0.17	0.17
214	2.10	5.07	6.61	300	0.1500E 02	0.11	0.11
215	2.27	4.99	6.21	210	0.1609E 02	0.14	0.14
216	2.28	4.95	6.04	210	0.1581E 02	0.11	0.11
217	2.30	4.92	6.27	210	0.1713E 02	0.14	0.14
218	2.39	4.93	7.21	270	0.2216E 02	0.22	0.22
219	2.99	10.00	13.32	270	0.6668E 02	0.19	0.19
220	2.91	9.11	11.21	270	0.5443E 02	0.14	0.29
221	2.96	8.76	10.68	240	0.5338E 02	0.35	0.35
222	2.70	8.64	10.83	270	0.4497E 02	0.43	0.43
223	2.64	7.86	10.17	270	0.3980E 02	0.09	0.43
224	2.75	7.79	14.02	270	0.5897E 02	0.24	0.24
225	2.52	7.77	9.60	240	0.3391E 02	0.15	0.43
226	2.74	7.72	9.38	270	0.3912E 02	0.12	0.35
227	2.94	7.64	9.40	270	0.4488E 02	0.13	0.34
228	2.76	7.24	8.85	270	0.3664E 02	0.14	0.17
229	2.66	7.20	9.22	270	0.3616E 02	0.14	0.20
230	2.55	7.05	8.81	240	0.3116E 02	0.10	0.25
231	2.69	6.97	9.13	300	0.3658E 02	0.15	0.28
232	2.83	6.84	11.12	240	0.5043E 02	0.22	0.22
233	2.99	6.79	9.33	270	0.4611E 02	0.13	0.13
234	2.67	6.77	8.80	300	0.3421E 02	0.10	0.10
235	2.58	6.71	13.00	270	0.4843E 02	0.22	0.22
236	2.58	6.70	10.19	210	0.3827E 02	0.19	0.19
237	2.94	6.58	8.62	240	0.4080E 02	0.10	0.35
238	2.90	6.56	9.29	270	0.4346E 02	0.15	0.15
239	2.84	6.56	9.16	270	0.4108E 02	0.11	0.11
240	2.55	6.51	8.43	240	0.2941E 02	0.17	0.17
241	2.68	6.50	8.78	270	0.3491E 02	0.09	0.12
242	2.57	6.48	12.47	270	0.4628E 02	0.21	0.21
243	3.00	6.34	8.45	240	0.4154E 02	0.14	0.14
244	2.85	6.33	8.42	240	0.3723E 02	0.16	0.16
245	2.61	6.31	8.24	270	0.3046E 02	0.12	0.21
246	2.97	6.30	8.55	270	0.4140E 02	0.16	0.16
247	2.96	6.28	7.57	240	0.3454E 02	0.13	0.13
248	2.78	6.27	8.01	240	0.3282E 02	0.16	0.25
249	2.86	6.16	8.41	270	0.3734E 02	0.22	0.22
250	2.63	6.14	8.47	240	0.3191E 02	0.11	0.16

SERIAL NO.	HS METRES	TZ SECS	TE SECS	DMAX	POWER KW/M	F1	F2
251	2.71	6.10	8.36	300	0.3370E 02	0.25	0.25
252	2.63	6.09	7.65	330	0.2794E 02	0.09	0.09
253	2.83	6.03	7.75	0	0.3283E 02	0.09	0.09
254	2.79	5.99	7.93	240	0.3309E 02	0.10	0.10
255	2.65	5.95	7.34	270	0.2671E 02	0.17	0.17
256	2.82	5.94	7.82	330	0.3339E 02	0.09	0.09
257	2.60	5.87	7.30	330	0.2580E 02	0.10	0.10
258	2.51	5.84	8.00	240	0.2721E 02	0.10	0.10
259	2.73	5.79	7.48	270	0.2946E 02	0.12	0.12
260	2.66	5.79	7.72	270	0.2912E 02	0.16	0.16
261	2.58	5.73	7.10	240	0.2449E 02	0.13	0.13
262	2.57	5.72	7.11	270	0.2437E 02	0.11	0.11
263	2.72	5.71	7.62	240	0.3006E 02	0.19	0.19
264	2.70	5.71	8.33	270	0.3267E 02	0.16	0.16
265	2.75	5.68	7.69	270	0.3093E 02	0.17	0.17
266	2.72	5.67	7.18	240	0.2776E 02	0.11	0.11
267	2.80	5.67	8.02	270	0.3442E 02	0.12	0.18
268	2.76	5.66	7.27	240	0.2923E 02	0.12	0.12
269	2.72	5.65	7.35	240	0.2866E 02	0.12	0.12
270	2.69	5.56	6.95	270	0.2593E 02	0.12	0.17
271	2.57	5.51	7.23	270	0.2506E 02	0.20	0.20
272	2.81	5.49	6.59	240	0.2653E 02	0.12	0.16
273	2.51	5.47	7.77	210	0.2653E 02	0.12	0.12
274	2.90	5.46	6.67	210	0.2853E 02	0.	0.
275	2.64	5.45	7.40	270	0.2738E 02	0.20	0.20
276	2.55	5.43	7.14	240	0.2436E 02	0.20	0.20
277	2.86	5.41	6.91	270	0.2947E 02	0.13	0.13
278	2.51	5.41	6.97	240	0.2286E 02	0.10	0.10
279	3.00	5.39	7.00	240	0.3267E 02	0.13	0.13
280	2.79	5.34	6.24	270	0.2438E 02	0.	0.
281	2.52	5.33	7.15	240	0.2407E 02	0.18	0.18
282	2.93	5.33	6.47	240	0.2821E 02	0.	0.
283	2.62	5.33	7.15	270	0.2601E 02	0.18	0.43
284	2.52	5.19	6.48	270	0.2091E 02	0.14	0.14
285	2.59	5.16	6.43	270	0.2215E 02	0.17	0.17
286	3.45	10.46	12.31	270	0.8369E 02	0.40	0.64
287	3.35	9.30	13.75	270	0.8603E 02	0.24	0.24
288	3.03	8.71	9.82	270	0.5018E 02	0.12	0.39
289	3.48	8.53	11.03	270	0.7639E 02	0.25	0.25
290	3.29	8.51	12.54	270	0.7706E 02	0.24	0.24
291	3.43	8.40	12.64	270	0.8295E 02	0.20	0.20
292	3.32	8.17	9.89	270	0.6091E 02	0.11	0.39
293	3.13	7.47	9.09	240	0.4887E 02	0.09	0.29
294	3.49	7.44	9.06	240	0.6072E 02	0.09	0.22
295	3.22	7.39	12.37	270	0.7082E 02	0.19	0.19
296	3.04	7.23	8.67	210	0.4317E 02	0.	0.64
297	3.47	7.02	9.64	240	0.6504E 02	0.16	0.16
298	3.03	7.01	8.57	270	0.4260E 02	0.11	0.29
299	3.02	6.99	8.91	240	0.4450E 02	0.10	0.14
300	3.13	6.89	9.89	270	0.5358E 02	0.23	0.23

SERIAL NO.	HS METRES	TZ SECS	TE SECS	DMAX	POWER KW/M	F1	F2
301	3.23	6.82	8.62	270	0.4882E 02	0.	0.
302	3.27	6.80	8.83	240	0.5180E 02	0.13	0.13
303	3.04	6.78	10.85	240	0.5712E 02	0.24	0.24
304	3.17	6.76	8.87	240	0.4892E 02	0.18	0.18
305	3.26	6.70	8.61	300	0.4993E 02	0.	0.10
306	3.38	6.69	8.41	270	0.5199E 02	0.12	0.12
307	3.40	6.65	9.32	240	0.6006E 02	0.21	0.21
308	3.29	6.55	8.35	270	0.4890E 02	0.12	0.17
309	3.01	6.52	10.26	270	0.5187E 02	0.18	0.18
310	3.01	6.37	8.17	270	0.3992E 02	0.07	0.10
311	3.45	6.34	7.86	240	0.4957E 02	0.13	0.17
312	3.50	6.25	7.60	240	0.4878E 02	0.12	0.15
313	3.39	6.23	7.64	210	0.4607E 02	0.10	0.10
314	3.45	6.18	7.75	300	0.4880E 02	0.11	0.11
315	3.36	6.13	7.64	330	0.4560E 02	0.10	0.12
316	3.10	5.89	7.49	300	0.3797E 02	0.08	0.08
317	3.30	5.86	7.51	330	0.4353E 02	0.12	0.12
318	3.10	5.70	7.20	270	0.3628E 02	0.10	0.10
319	3.30	5.68	7.11	270	0.4023E 02	0.14	0.14
320	3.08	5.54	7.30	300	0.3673E 02	0.14	0.14
321	3.57	9.35	11.82	270	0.8502E 02	0.32	0.32
322	3.73	9.18	11.90	270	0.9528E 02	0.32	0.32
323	3.63	8.04	12.09	240	0.9108E 02	0.30	0.30
324	3.72	7.95	10.36	240	0.8068E 02	0.14	0.14
325	3.57	7.36	10.16	240	0.7238E 02	0.18	0.18
326	3.53	7.01	9.82	240	0.6770E 02	0.10	0.12
327	3.88	6.66	8.46	240	0.6900E 02	0.10	0.10
328	3.61	6.65	9.17	330	0.6565E 02	0.11	0.11
329	3.64	6.63	8.74	270	0.6339E 02	0.16	0.16
330	3.87	6.45	7.79	240	0.6138E 02	0.11	0.16
331	3.75	6.41	8.28	270	0.6287E 02	0.10	0.14
332	3.83	6.33	7.61	210	0.5815E 02	0.10	0.10
333	3.56	6.19	8.04	0	0.5512E 02	0.06	0.06
334	3.55	6.15	7.52	330	0.4974E 02	0.14	0.14
335	4.03	10.13	12.42	240	0.1153E 03	0.25	0.64
336	4.42	9.28	12.12	270	0.1346E 03	0.22	0.22
337	4.36	8.75	11.37	270	0.1214E 03	0.19	0.19
338	4.36	8.61	11.14	270	0.1196E 03	0.09	0.17
339	4.25	8.36	10.54	240	0.1086E 03	0.10	0.14
340	4.44	8.12	10.11	240	0.1119E 03	0.10	0.16
341	4.05	8.01	10.08	240	0.9358E 02	0.09	0.09
342	4.13	7.86	10.08	300	0.9640E 02	0.12	0.12
343	4.38	7.80	10.74	300	0.1149E 03	0.09	0.11
344	4.30	7.53	10.38	240	0.1075E 03	0.14	0.64
345	4.04	7.37	9.93	300	0.9043E 02	0.10	0.19
346	4.22	7.24	9.86	270	0.9697E 02	0.14	0.14
347	4.23	7.22	8.78	270	0.8527E 02	0.	0.
348	4.28	7.20	9.27	300	0.9444E 02	0.	0.
349	4.35	7.05	8.82	240	0.9121E 02	0.10	0.10
350	4.45	7.02	8.93	300	0.9679E 02	0.09	0.09

SERIAL NO.	HS METRES	TZ SECS	TE SECS	DMAX	POWER KW/M	F1	F2
351	4.32	6.98	8.36	210	0.8384E 02	0.09	0.09
352	4.27	6.81	9.49	270	0.9673E 02	0.13	0.13
353	4.24	6.79	8.67	270	0.8515E 02	0.10	0.10
354	4.05	6.59	8.07	330	0.7038E 02	0.09	0.09
355	4.01	6.47	8.08	240	0.6945E 02	0.10	0.10
356	4.91	11.07	15.37	240	0.2032E 03	0.27	0.27
357	4.54	9.61	11.95	270	0.1413E 03	0.19	0.39
358	4.67	9.55	12.43	300	0.1528E 03	0.16	0.16
359	4.95	8.72	10.93	270	0.1528E 03	0.09	0.09
360	4.98	8.28	10.95	270	0.1539E 03	0.09	0.09
361	4.74	8.24	10.69	300	0.1364E 03	0.07	0.20
362	4.98	8.21	10.60	210	0.1486E 03	0.08	0.08
363	4.77	8.05	10.46	240	0.1342E 03	0.07	0.07
364	4.72	7.94	10.84	270	0.1354E 03	0.11	0.11
365	4.63	7.49	9.30	330	0.1098E 03	0.09	0.09
366	4.58	7.36	9.71	240	0.1134E 03	0.10	0.10
367	4.99	7.33	9.05	240	0.1242E 03	0.11	0.11
368	4.97	7.33	9.83	240	0.1340E 03	0.13	0.13
369	4.98	7.00	8.32	270	0.1102E 03	0.13	0.13
370	5.50	9.12	11.55	270	0.1994E 03	0.10	0.10
371	5.39	8.98	11.77	270	0.1930E 03	0.09	0.11
372	5.38	8.16	10.05	300	0.1638E 03	0.08	0.08
373	5.49	8.07	11.04	240	0.1826E 03	0.12	0.12
374	5.40	7.78	9.94	300	0.1626E 03	0.09	0.09
375	5.50	7.66	9.49	300	0.1590E 03	0.08	0.08
376	5.03	7.62	9.53	300	0.1343E 03	0.08	0.08
377	5.28	7.59	8.98	270	0.1368E 03	0.	0.
378	5.21	7.45	8.77	240	0.1295E 03	0.11	0.13
379	5.25	7.39	8.33	180	0.1215E 03	0.09	0.09
380	5.19	7.25	8.78	210	0.1290E 03	0.09	0.09
381	5.53	10.29	12.87	270	0.2239E 03	0.23	0.23
382	5.84	10.25	12.66	270	0.2452E 03	0.28	0.28
383	5.51	8.93	10.91	270	0.1876E 03	0.10	0.10
384	5.91	8.79	11.68	270	0.2279E 03	0.10	0.10
385	5.66	8.26	10.88	270	0.1971E 03	0.08	0.08
386	5.83	8.25	10.34	240	0.1968E 03	0.06	0.06
387	5.85	8.07	10.33	270	0.1978E 03	0.08	0.08
388	6.44	9.06	11.26	270	0.2633E 03	0.08	0.08
389	6.01	8.58	11.03	270	0.2264E 03	0.09	0.09
390	6.30	8.37	10.64	270	0.2372E 03	0.06	0.08
391	6.48	8.24	10.47	240	0.2450E 03	0.	0.
392	6.56	9.01	11.77	240	0.2846E 03	0.07	0.07
393	6.75	8.73	10.94	240	0.2806E 03	0.	0.
394	6.88	8.45	10.78	240	0.2871E 03	0.	0.
395	7.15	8.81	10.99	240	0.3173E 03	0.10	0.10
396	7.07	8.43	10.76	240	0.2997E 03	0.	0.
397	7.64	9.42	12.11	270	0.4018E 03	0.07	0.07
398	8.29	9.34	11.77	240	0.4569E 03	0.	0.
399	8.24	9.34	11.56	210	0.4486E 03	0.	0.

*

	POWER KW/H																								
	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125
1	33	31	90	92	87	148	151	149	233	220	224	292	219	295	289	286	287	323	322	0	339	340	335	336	
2	34	32	91	102	150	160	223	222	235	221	303	294	297	325	290	291	321	341	342	0	344	343	338	337	
3	35	45	95	106	152	162	226	227	242	232	332	307	326	354	0	324	347	345	346	0	365	366	0	356	
4	36	88	96	153	155	165	228	237	293	288	333	329	327	0	0	351	353	348	350	0	0	369	0	357	
5	37	89	97	154	156	167	229	238	301	300	0	330	328	0	0	0	0	349	352	0	0	0	0	0	358
6	38	93	105	163	157	198	231	239	304	302	0	331	355	0	0	0	0	0	0	0	0	0	0	0	359
7	39	94	107	166	158	225	236	243	305	306	0	0	0	0	0	0	0	0	0	0	0	0	0	0	360
8	40	98	109	168	159	230	244	246	308	309	0	0	0	0	0	0	0	0	0	0	0	0	0	0	361
9	41	99	110	170	161	234	249	296	311	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	362
10	42	100	111	171	164	241	310	298	312	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	363
11	43	101	112	179	169	245	316	299	313	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	364
12	44	103	115	182	172	247	318	317	314	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	367
13	47	104	118	184	173	248	320	319	315	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	368
14	48	108	174	186	175	250	0	0	334	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	370
15	49	113	176	188	181	251	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	371
16	50	114	177	190	185	253	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	372
17	51	116	178	191	187	254	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	373
18	52	117	180	192	189	256	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	374
19	53	120	183	193	197	263	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	375
20	54	122	194	195	240	264	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	376
21	55	123	199	200	252	265	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	377
22	56	124	202	201	255	267	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	378
23	57	125	203	204	257	279	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	379
24	58	126	207	205	258	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	380
25	61	127	209	206	259	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	381
26	62	128	210	208	260	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	382
27	63	129	211	212	266	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	383
28	64	130	213	218	268	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	384
29	65	131	214	261	269	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	385
30	66	133	215	262	270	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	386
46	68	135	216	276	271	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	387
59	69	136	217	278	272	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	388
60	70	138	0	280	273	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	389
67	72	139	0	281	274	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	390
71	74	140	0	284	275	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	391
73	75	141	0	285	277	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	392
76	77	142	0	0	282	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	393
79	78	144	0	0	283	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	394
80	119	147	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	395
81	121	196	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	396
82	132	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	397
83	134	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	398
84	137	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	399
85	143	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
86	145	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	146	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	DIRECTION											
	0	30	60	90	120	150	180	210	240	270	300	330
50	0	0	0	0	0	0	209	25	3	1	24	115
53	0	0	0	0	0	0	379	26	6	2	35	117
134	0	0	0	0	0	0	0	27	7	4	39	124
207	0	0	0	0	0	0	0	30	11	5	70	175
253	0	0	0	0	0	0	0	45	14	8	76	181
333	0	0	0	0	0	0	0	46	16	9	77	186
0	0	0	0	0	0	0	0	48	22	10	96	190
0	0	0	0	0	0	0	0	59	33	12	155	193
0	0	0	0	0	0	0	0	64	37	13	158	205
0	0	0	0	0	0	0	0	83	40	15	169	252
0	0	0	0	0	0	0	0	85	41	17	174	256
0	0	0	0	0	0	0	0	92	42	18	179	257
0	0	0	0	0	0	0	0	106	44	19	182	315
0	0	0	0	0	0	0	0	107	49	20	183	317
0	0	0	0	0	0	0	0	118	52	21	196	328
0	0	0	0	0	0	0	0	135	56	23	202	334
0	0	0	0	0	0	0	0	151	60	28	211	354
0	0	0	0	0	0	0	0	163	61	29	214	365
0	0	0	0	0	0	0	0	164	62	31	231	0
0	0	0	0	0	0	0	0	166	66	32	234	0
0	0	0	0	0	0	0	0	170	68	34	251	0
0	0	0	0	0	0	0	0	188	72	36	305	0
0	0	0	0	0	0	0	0	215	82	38	314	0
0	0	0	0	0	0	0	0	216	84	43	316	0
0	0	0	0	0	0	0	0	217	108	47	320	0
0	0	0	0	0	0	0	0	236	109	51	342	0
0	0	0	0	0	0	0	0	273	110	54	343	0
0	0	0	0	0	0	0	0	274	113	55	345	0
0	0	0	0	0	0	0	0	296	114	57	348	0
0	0	0	0	0	0	0	0	313	122	58	350	0
0	0	0	0	0	0	0	0	332	128	63	358	0
0	0	0	0	0	0	0	0	351	136	65	361	0
0	0	0	0	0	0	0	0	362	138	67	372	0
0	0	0	0	0	0	0	0	380	139	69	374	0
0	0	0	0	0	0	0	0	399	140	71	375	0
0	0	0	0	0	0	0	0	0	142	73	376	0
0	0	0	0	0	0	0	0	0	143	74	0	0
0	0	0	0	0	0	0	0	0	144	75	0	0
0	0	0	0	0	0	0	0	0	152	78	0	0
0	0	0	0	0	0	0	0	0	154	79	0	0
0	0	0	0	0	0	0	0	0	159	80	0	0
0	0	0	0	0	0	0	0	0	160	81	0	0
0	0	0	0	0	0	0	0	0	168	86	0	0
0	0	0	0	0	0	0	0	0	178	87	0	0
0	0	0	0	0	0	0	0	0	180	88	0	0
0	0	0	0	0	0	0	0	0	184	89	0	0
0	0	0	0	0	0	0	0	0	187	90	0	0
0	0	0	0	0	0	0	0	0	191	91	0	0
0	0	0	0	0	0	0	0	0	194	93	0	0
0	0	0	0	0	0	0	0	0	195	94	0	0

DIRECTION		0	30	60	90	120	150	180	210	240	270	300	330
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	199	95	0	0
0	0	0	0	0	0	0	0	0	0	203	97	0	0
0	0	0	0	0	0	0	0	0	0	206	98	0	0
0	0	0	0	0	0	0	0	0	0	221	99	0	0
0	0	0	0	0	0	0	0	0	0	225	100	0	0
0	0	0	0	0	0	0	0	0	0	230	101	0	0
0	0	0	0	0	0	0	0	0	0	232	102	0	0
0	0	0	0	0	0	0	0	0	0	237	103	0	0
0	0	0	0	0	0	0	0	0	0	240	104	0	0
0	0	0	0	0	0	0	0	0	0	243	105	0	0
0	0	0	0	0	0	0	0	0	0	244	111	0	0
0	0	0	0	0	0	0	0	0	0	247	112	0	0
0	0	0	0	0	0	0	0	0	0	248	116	0	0
0	0	0	0	0	0	0	0	0	0	250	119	0	0
0	0	0	0	0	0	0	0	0	0	254	120	0	0
0	0	0	0	0	0	0	0	0	0	258	121	0	0
0	0	0	0	0	0	0	0	0	0	261	123	0	0
0	0	0	0	0	0	0	0	0	0	263	125	0	0
0	0	0	0	0	0	0	0	0	0	266	126	0	0
0	0	0	0	0	0	0	0	0	0	268	127	0	0
0	0	0	0	0	0	0	0	0	0	269	129	0	0
0	0	0	0	0	0	0	0	0	0	272	130	0	0
0	0	0	0	0	0	0	0	0	0	276	131	0	0
0	0	0	0	0	0	0	0	0	0	278	132	0	0
0	0	0	0	0	0	0	0	0	0	279	133	0	0
0	0	0	0	0	0	0	0	0	0	281	137	0	0
0	0	0	0	0	0	0	0	0	0	282	141	0	0
0	0	0	0	0	0	0	0	0	0	293	145	0	0
0	0	0	0	0	0	0	0	0	0	294	146	0	0
0	0	0	0	0	0	0	0	0	0	297	147	0	0
0	0	0	0	0	0	0	0	0	0	299	148	0	0
0	0	0	0	0	0	0	0	0	0	302	149	0	0
0	0	0	0	0	0	0	0	0	0	303	150	0	0
0	0	0	0	0	0	0	0	0	0	304	153	0	0
0	0	0	0	0	0	0	0	0	0	307	156	0	0
0	0	0	0	0	0	0	0	0	0	311	157	0	0
0	0	0	0	0	0	0	0	0	0	312	161	0	0
0	0	0	0	0	0	0	0	0	0	323	162	0	0
0	0	0	0	0	0	0	0	0	0	324	165	0	0
0	0	0	0	0	0	0	0	0	0	325	167	0	0
0	0	0	0	0	0	0	0	0	0	326	171	0	0
0	0	0	0	0	0	0	0	0	0	327	172	0	0
0	0	0	0	0	0	0	0	0	0	330	173	0	0
0	0	0	0	0	0	0	0	0	0	335	176	0	0
0	0	0	0	0	0	0	0	0	0	339	177	0	0
0	0	0	0	0	0	0	0	0	0	340	185	0	0
0	0	0	0	0	0	0	0	0	0	341	189	0	0
0	0	0	0	0	0	0	0	0	0	344	192	0	0
0	0	0	0	0	0	0	0	0	0	349	197	0	0
0	0	0	0	0	0	0	0	0	0	355	198	0	0

